Landscaping the Repair and Reuse Economy in Kenya

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Better Futures CoLab.

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Contents

Acknowledgments

This work was commissioned by the UK Foreign, Commonwealth and Development Office's Research and Evidence Division and led by a Better Futures CoLab team, comprising Beth Munro, Kelley Rowe, Alex Losneanu and Ben Oldfrey. The landscaping of the repair and reuse economy in Kenya has been developed as part of a collaborative (CoLab) effort bringing together many stakeholders across Kenya to understand the full breadth of the opportunity and to imagine and co-design the future of repair and reuse in Kenya. It has been an incredible four months - there has been so much discussion and contributions from across the ecosystem.

This report synthesises the ideas and contributions of hundreds of individuals and deeply committed organisations to the future circular opportunity of repair and reuse in Kenya. To every single person and organisation that participated and contributed to this important piece of work, we are extremely thankful for generously contributing your time, energy and insights.

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Disclaimer

The findings in this report do not necessarily represent the views of the individuals and organisations interviewed for this research.

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Executive Summary

Repair and reuse strategies are essential, but frequently overlooked aspects of the circular economy. These practices extend the lifespan of products and retain the value added by design and manufacturing raw materials into products. Repair and reuse benefit local economies as well, by building resilience and creating jobs. While recycling and material recovery are critical to sustainability, they are only part of the puzzle, and the world is starting to realise the significance of integrated repair and reuse strategies, such as the EU's Right to Repair. Many countries in the Global South, such as Kenya, have the advantage, as there is already an established market for repair and reuse in the informal sector.

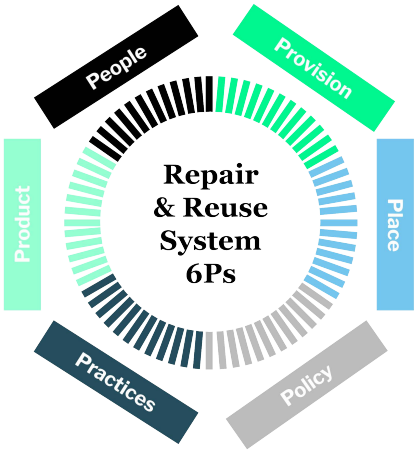
Kenya has a large and thriving entrepreneurial Jua Kali sector which accounts for approximately 83% of total employment in the country. But there is very little data on where the Jua Kali are most engaged in the 'invisible' spaces of repair and reuse. Notably, there is a lack of inclusion, policy support, appropriate incentives, frameworks and business models to allow better value retention within local ecosystems, and for repair and reuse to truly thrive.

The primary aims of this study were to:

- **seek the invisible within the invisible to better understand the full breadth of the opportunity, the landscape, and networks of repair and reuse within the Kenyan economy**, and to showcase its importance in the transition towards achieving a circular economy; and
- **trial a methodology for identifying and implementing collective systemic approaches** to inform the wider sector and allow holistic and locally led circular approaches.

Taking a 'CoLab' approach to landscaping the repair and reuse market in Kenya

We worked closely with local partners including Shujaaz Inc., Busara Centre for Behavioural Economics, The Incubator Nest and many other key stakeholders to landscape the repair and reuse market. Collectively, we wanted to hear stories from repairers and customers and together build a vision for the repair and reuse economy in Kenya.



Treating the system as the unit of experimentation using the 6P framework

Repair and reuse cannot be understood in isolation. We believe we need to look at repair and reuse as part of the wider circular value chain, and therefore treat the system as the unit of experimentation. A key part of our approach has been to understand the leverage points across the circular economy landscape and to map the linkages that ensure the retention of value. We captured the full breadth of system factors that will need to be considered when intervening in repair economies in a 6Ps model. For this phase, the **focus was on PRODUCT, PEOPLE and PRACTICES.**

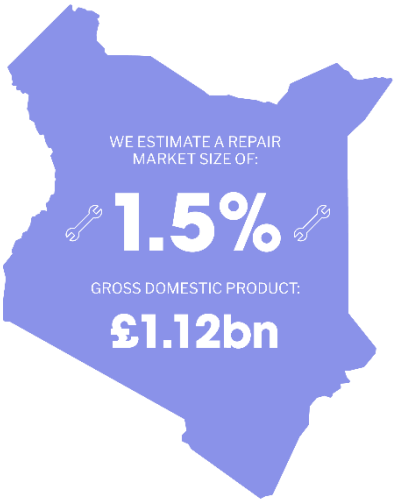
PRODUCT: What gets repaired and reused in Kenya and how big is the market?

- **We estimate that Kenya's repair market is worth a minimum of 1.5% of its economy, or £1.12 billion.** This conservative estimate was calculated by looking across three different levels of the economy:

→ **MACRO:** We compared repair markets globally against gross domestic product

→ **MESO:** We analysed product-specific import of spare parts to Kenya

→ **MICRO:** We surveyed Kenyan businesses to find out about repair expenditure versus revenues.



- **Five key product categories emerged as significant in the repair and reuse space: automotives, electronics and mobile phones, clothes and shoes, medical devices, and appliances.** The first three account for the most repair and reuse in Kenya, while medical devices and appliances show significant scope for increased repair and reuse.

PEOPLE: The story of repairers and customers who need repair

- **Trust and transparency emerged as large barriers** for repair customers, with concerns that a Fundi might sell their items or replace the parts with faulty ones.

- **Young people are the key players in repair and reuse**, but their lack of control over their roles, combined with low-income push them to the bottom of the value-chain and lock them in the cycle of hard work, humiliation, and chronic poverty.

- **There is not a single pathway to skills acquisition or training for would-be repairers,** with a lack of certification opportunities, despite the recognition among repairers that certificates can make a difference to building trust with customers.

- **There are generally fewer women in the industry**. Women not only have to deal with the negative societal norms and perceptions of the industry, they also must deal with discriminating customers who doubt their skills and capabilities to effectively repair items/products.

- **There were mixed attitudes to repair and reuse, depending on the demographics and specific part of the repair and reuse value chain probed.** Acquisition of spare parts and the negotiation process was viewed negatively by customers and those outside of the industry. These were seen as dirty and deceptive processes, which lack transparency. People with low-income levels repair their items more often while high income earners opt to buy new items instead.

PRACTICES: Visible and invisible business models for repair and reuse exist

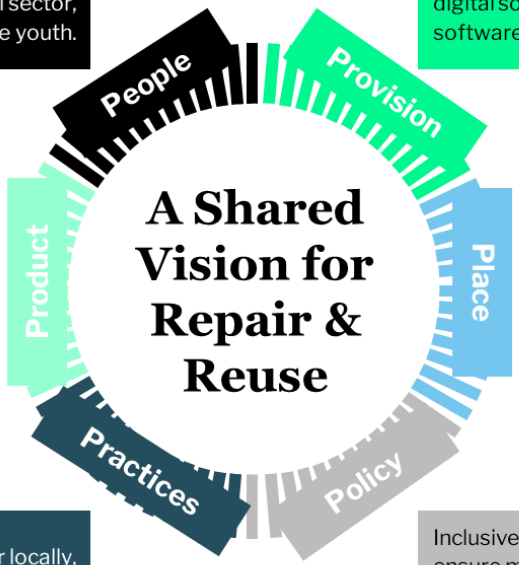
- **Many businesses in Kenya do not define what they do as "reuse" or "repair".** Many would simply say they provide the services that their customers demand, or that they make things work again, or that they are specialists or innovators, or simply makers.
- **Repair and reuse are rarely standalone businesses in Kenya and these practices are often found embedded in other businesses.** Repair and reuse might be a side hustle for a Fundi, a sole trader, a complementary service offering as part of the ethos of a small business, or standard practice for multinational companies in particular sectors (automotive, energy, appliances).

Building a vision and thesis for the repair and reuse market

We see a future for repair and reuse in Kenya where...

Trust and transparency between actors and customers/users is supported through skills certification and formalisation in Jua Kali sector, easily accessible for the youth.

Targeted investments & alternative funding models are developed to support local production of spare parts, digital solutions for new marketplaces, and tracing software.



Manufactures take responsibility for products, cradle-to-grave, enabling localised opportunities for repair and reuse.

Hyper-localised communities of repair and reuse are the first port of call for customers.

Parts distribution & manufacturing occur locally, enabled by the accessibility of tools, equipment and product repair knowledge.

Inclusive policies and incentives are developed that ensure manufacturers take greater responsibility for their products' lifespan and local integrated supply chains being incentivised for repair and reuse, generating new opportunities for fundis from the Jua Kali sector.

1. Introduction

Repair and Reuse as part of the wider action in the circular chain in Kenya

Repair and reuse strategies are **essential aspects of the circular economy** and are critical to unlocking value in this area and building local resilience and job creation. While recycling and material recovery are essential for sustainability, they are only part of the puzzle, as they do not retain all the value that design and manufacturing add to raw materials. This value creation is very expensive in terms of energy, money and human resources. **Repair and reuse activities are an optimisation or extension of the useful life of products** or components that aim to retain this manufactured value that has been added (see our full definition of repair and reuse overleaf).

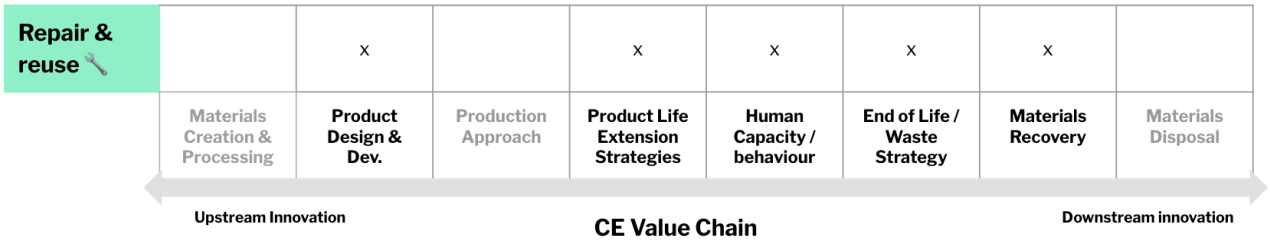


Figure 1. How repair and reuse could inform integrated product strategies across the CE value chain to retain value and function for local consumers in a sustainable manner.

Repair and reuse largely occur as secondary activities, rather than as an integrated aspect of an overall product or sector strategy, but the wider world is waking up to their importance [1]. Lower middle income countries (LMICs) are one step ahead, with an established repair and reuse informal sector.

"Almost everything in Kenya can be repaired"

Kenya has a thriving entrepreneurial Jua Kali sector[2] for repair and reuse. However, this burgeoning sector lacks policy support, incentives, frameworks, and business models to allow better value retention within the local systems. Moreover, repair and reuse exist predominantly in the Jua Kali sector (which itself is inadequately understood) or embedded within other businesses. So, landscaping the repair and reuse economy in Kenya comes with the challenge of **seeking the invisible within the invisible**.

We aim to address these issues and capture this lost value by:

- Better **understanding the full breadth of the opportunity, the landscape and networks of repair and reuse within the Kenyan economy.** In particular, we wanted to know where repair and reuse can be found, what it looks like, who is doing it, and what products are the most repaired. Working closely with local partners and stakeholders, we wanted to hear stories from repairers and customers and find areas that are ripe for support - be that through policy, financing strategies, development work, and design and manufacturing innovation. We want to bring repair and reuse front and centre to showcase how important it is to the circular economy, and why we ought to pay more attention to good practices;
- **Trialling a methodology for identifying and implementing collective systemic approaches** to inform the wider sector, and allow holistic and locally-led circular approaches.

Our definition of repair and reuse

We are primarily concerned with **repair** - which we define as **the returning of products to their originally intended function in good or adequate condition.** This definition assumes that a product is not working at its optimal or intended function. A closely allied term – maintenance – is often used alongside repair, because this is a practice that keeps a product functioning adequately and avoids (or slows down) degradation *(e.g. automobile repair and servicing).* This is where manufactured value is retained in its fullest. In a circular strategy, retaining the manufactured value for as long as possible (ideally to the end of the optimal lifespan of products) should be the goal, prior to breakdown back to raw materials for reprocessing.

Therefore, our focus is on retaining manufactured value. This includes:

First life of products (whether for first or subsequent owners)

- Repair and maintenance of products to originally intended function *(e.g. automobile repair)*

Second life (ad infinitum) of products

- Remanufacture/refurbishment to original intended function *(e.g. manufacturer-led laptop refurbishment)*
- Reuse of full or partial products and manufactured components (*e.g. second life battery cells → new full batteries)*
- Hacking of products or components for altered or new functions *(e.g. used motorbikes parts to electric bikes)*

While important we are NOT looking at:

- Reuse processes concerning formless materials (e.g. composting food waste)
- Material recovery (e.g. plastic recycling)
- Use of by-products of production (e.g. chipboard production)
- Refilling of containers, as a form of reuse

Repair and reuse form part of a wider system of material and product flows. Critically, however, they result from different user behaviours and choices - the decision to keep something or give it away on the basis of a functional or faulty product. We have captured this as a starting point for a system diagram for Repair and Reuse specifically (Figure 2).

System-Level View of Where and How Repair and Reuse Occurs

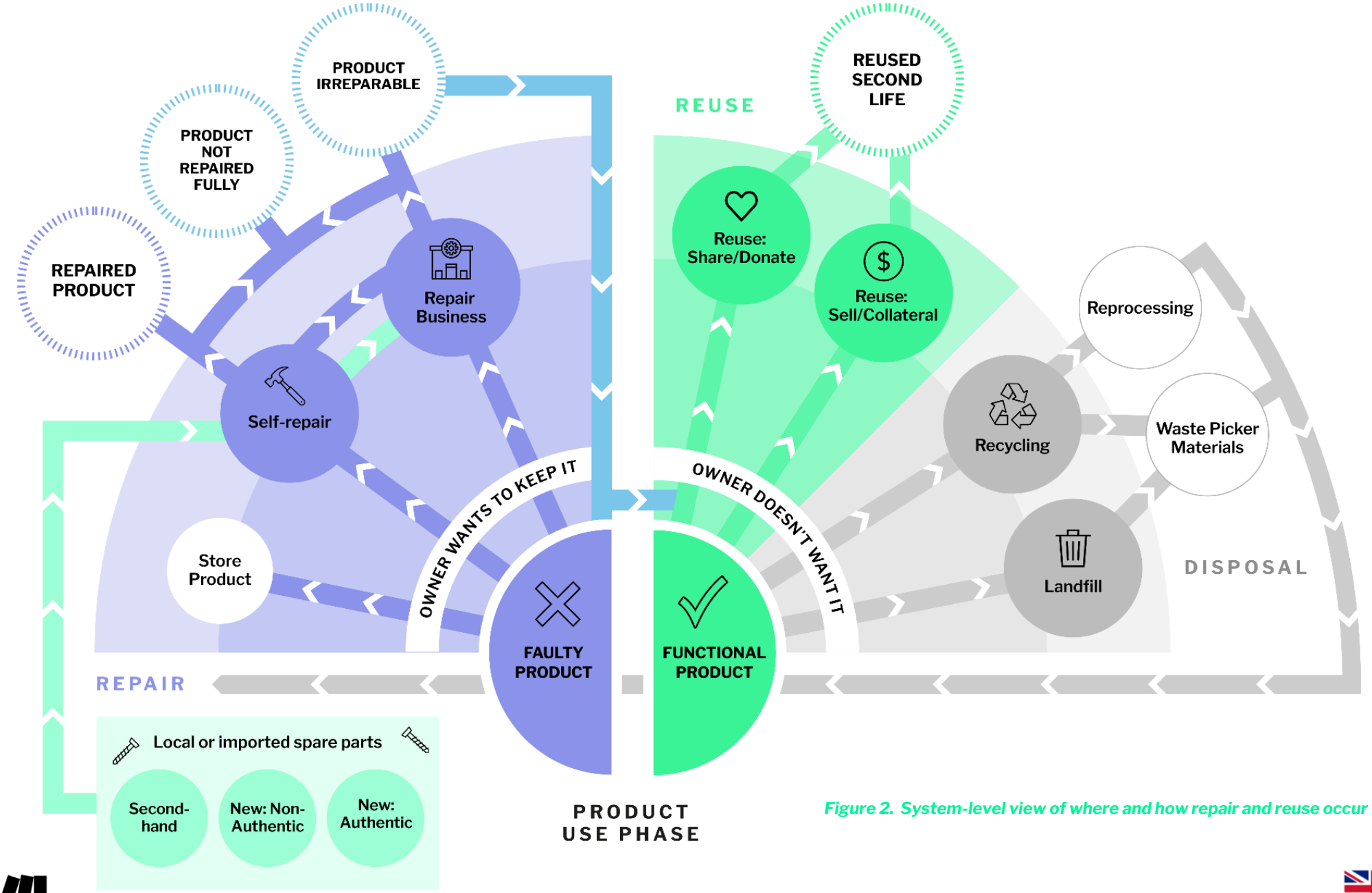


Figure 2. System-level view of where and how repair and reuse occur

2. Our Approach

Treating the system as the unit of experimentation

We believe we need to look at **repair and reuse as part of the wider action in the circular value chain**, and therefore treat the system as the unit of experimentation. Importantly, repair and reuse cannot be understood in isolation, and a key part of our approach has been to understand the leverage points across the circular economy landscape and to map the linkages that ensure the retention of value.

The 6Ps framework

We've captured the full breadth of systemic factors that will need to be considered when intervening in repair economies in a 6Ps model.

- **People:** Identify and understand the drivers and barriers of repair and reuse for all those involved in the repair and reuse ecosystem, this includes repairers in the formal sector and fundis (craftspeople and repairers) in the Jua Kali sector, manufacturers, innovators, entrepreneurs, consumers, researchers, investors and policymakers.
- **Product:** Determine what products dominate the repair and reuse economy, which do not get repaired, and identify any integrated product strategies across the circular economy value chain.
- **Practices:** Identify and understand the different business models that exist in the dynamic and complex system of repair and reuse within the circular economy and explore the intersection between the formal and Jua Kali economy.
- **Provision:** Study alternative funding mechanisms and capacity development interventions to achieve scale and fully support the growing repair economy in the formal and Jua Kali sector.
- **Place:** Explore place-based approaches to design tailored and replicable repair and reuse strategies, as informed by the local ecosystem.
- **Policy:** Identify what existing policy frameworks support the ecosystem for repair and reuse and explore how local and national governments could incentivise actions to optimise product life extension strategies.

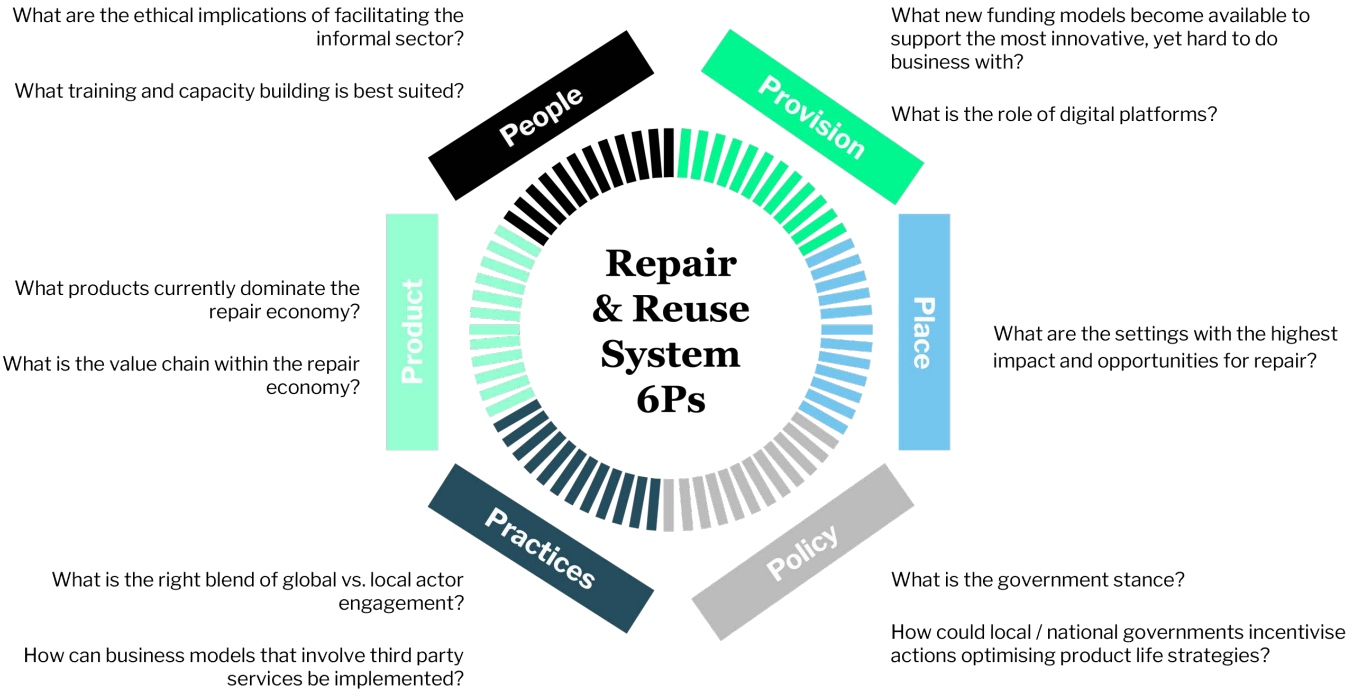


Figure 3. Repair and Reuse System 6Ps Diagram

Taking a 'CoLab' approach to landscaping the repair and reuse market in Kenya

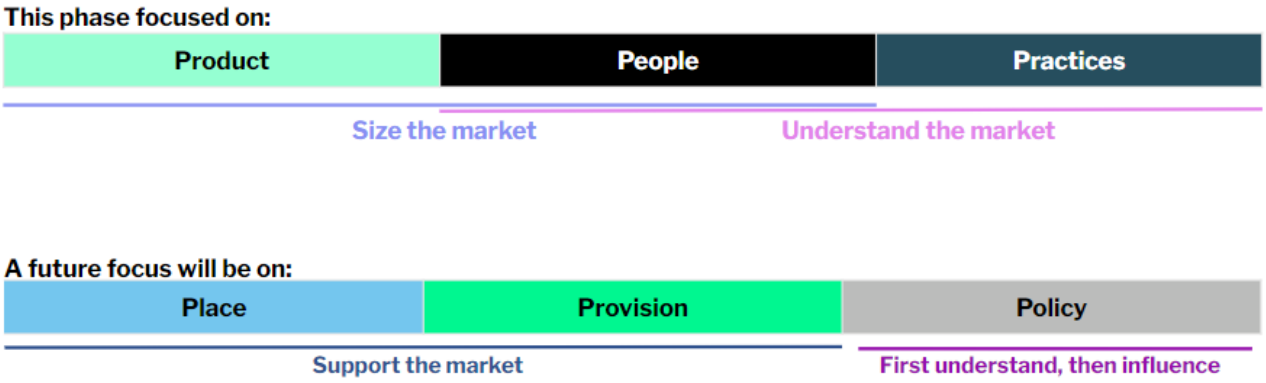
One of the key aims of this work was to trial the 'CoLab' methodology for identifying and implementing collective systemic approaches to inform holistic and locally-led circular approaches.

The 'CoLab': 1) bringing together key stakeholders to imagine the future of repair and reuse in Kenya, and then 2) realise it collaboratively (the Co) and experimentally (the Lab).

This phase of the project focused on the first part of being a CoLab: bringing the ecosystem and multidisciplinary research partners[3] (including Shujaaz Inc., Busara and the Incubator Nest) together to explore, map the possibilities and collectively imagine a better future for the repair and reuse market in Kenya.

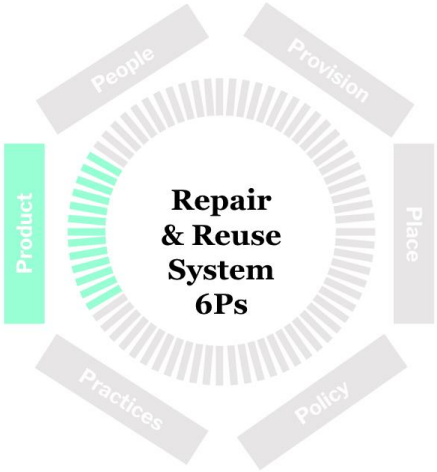
A literature review and initial stakeholder interviews (see full methodology described in the Appendix) informed our **priority 3Ps for this phase - Product, People and Practices**. Following this initial phase of analysis, Shujaaz, Busara and the Incubator Nest, were onboarded to help answer key questions related to these 3Ps with the goal to size and understand the market.

We believe we need to first size up and understand the market before we can design the right support mechanisms or influencing policy. Therefore, a future phase of work will be required to look into more detail at the remaining three Ps (Place, Provision and Policy), based on signals of what already might be emerging in this phase.


This phase focused on:
Product
People
Practices
Size the market
Understand the market
A future focus will be on:
Place
Provision
Policy
Support the market
First understand, then influence

3. The Landscape of Repair and Reuse in Kenya

In the sections that follow, we present our findings and stories of repair and reuse, as it particularly relates to Product, People and Practices.



Product: Just how big is the repair and reuse economy?

Globally, the repair and maintenance of products is estimated to be worth £930 billion (GBP) and is projected to increase by 10% this year.[4] While this only reflects 1.35% of combined global Gross Domestic Product (GDP), the rate of growth suggests that this market will see substantial economic development over the coming years, especially in countries like India[5]. Reports on maintenance and repair market values at the national or product levels have been calculated for a handful of middle to high income countries. In Kenya, the size of this market is unclear as market research has not been conducted and a centralised data collection system for this does not exist. But estimating this market size for Kenya helps position repair against other industries and activities, and can make the case for future investment and infrastructure. Based on the methodology outlined in the Appendix, we have estimated this market size according to a three-pronged approach – macro, meso and micro – based on overall GDP, product categories, and business expenditure, respectively.

a. MACRO: The big picture

By looking at market reports from middle to high income countries, we estimate that repair activities make up between 0.5% - 1.5% of overall GDP. This estimate, based on aggregated data from market reports, is in line with the global market size. A conservative assumption, based on aggregated data from other countries, would suggest a repair market size for Kenya of 1% of GDP[6], and would put its value at **£748 million in 2019 and £770 million in 2020.**[7]

b. MESO: The story of imported products

The UN Comtrade data allows us to further estimate the size of the repair and reuse sector by looking at specific import categories (denoted by HS Codes). For 2019, Kenya imported £13.5 billion worth of products and materials across all sectors. Manufacturing in Kenya only accounts for 8.4% of GDP (2019), with agriculture (35%), construction, and tourism making up much of the rest of the economy.[8] Imports are therefore essential for many goods, but also needed to support Kenya's main sectors. Spare parts imports, which accounted for £160 million of imports in 2019, support both the manufacturing sector, but also agricultural activities and other services.[9] As we examine below, spare parts for motor vehicles, mobile phones, and air conditioners make up 57%

of all spare parts imports. **Exclusive of bulk materials or second-hand products, spare parts account for 1.2% of all imports annually to Kenya.**

Spare parts imported for repair

The UN Comtrade data and HS Codes enable us to focus on five key sectors: automotive, appliances, telephones (including mobile devices), appliances, medical devices and solar panels, as reflected in table 1 below.

These figures tell us two main things:

- Firstly, while vehicles account for the largest absolute imports, the HS categories for telephones (likely driven by mobiles) and large household appliances have the two highest relative imports of spare parts for repair. According to the table above, mobile phone spare parts are highly in demand relative to the original product imports, with nearly twice as much spent on spare parts as found for vehicles.
- Secondly, these total spare parts import percentages map on to other global repair market sizes, where available. For instance, the percentage of the **vehicle repair market** relative to GDP in the US is 0.3%, in the UK is 0.98%, and Australia is 0.6%. For **appliances,** the market size relative to GDP in the US is 0.02%, in the UK it is 0.01% and in Australia it is 0.12%. Unfortunately, there is insufficient granular data on **mobile phone repair markets** globally for comparison because this is usually grouped together with other electronics such as computers and laptops, and no data on medical device and solar panel repair globally. Albeit, this supports the HS Code import data for spare parts, at the Meso-level, as being a reliable estimate for the overall repair market size.

Table 1. Breakdown of vehicles, telephones, appliances, medical devices and solar panel product categories (2019)

Product category	Total product import value	Total import of spare parts	Spare parts (%) product category	Spare parts (%) of total Kenyan imports
Vehicles (incl. Motorcycles and goods transport)	£907 million	£85 million	9%	0.6%
Telephones (incl. Mobile)	£188 million	£34 million	15%	0.25%
Appliances*	£124 million	£17 million	14%	0.13%
Medical devices**	£72 million	£1.6 million	2%	0.01%
Solar panels	£28 million	£2.5 million	8%	0.02%

- **This includes: Refrigerators, freezers, dishwashers, laundry machines, air conditioners*
- ***This includes: general equipment used in medical/surgical, mechano-therapy (incl. oxygen therapy), breathing apparatus, orthopaedic devices, imaging machines*

As valid as that estimate is likely to be, it must also be noted that the spare parts figures cannot be solely taken at face value. As a major trade hub for the East African region, products, including parts, may be imported to Kenya but have a final destination elsewhere, for example Uganda. Re-export data for Kenya is not available, so it is impossible to officially track how many goods would have left the country shortly after their import into the region. In 2019, Kenya exported £47 million in automotives, £2.9 million in appliances, and £5.1 million in phones. It is not known if these are refurbished goods or new locally produced products destined for export. These export values have not been factored in the market sizing estimates as presented above. Additionally, spare part imports may be indicative of the market for local assembly of Completely Knocked Down vehicles[10]. These are vehicles that are shipped from the brand manufacturer entirely in parts and need to be assembled. Notably, the HS Codes do not distinguish between second hand parts and new parts, nor do they indicate whether these are for local assembly. In 2019, Kenya banned the import of used spare parts for vehicles, so the data presented here reflects mainly newly produced imported parts. Even with the caveats described here, the import of spare parts for vehicles, appliances, telephones, solar panels, and medical devices amounted to 1% of total imports to Kenya (£140 million), which is a significant proportion of total imports.

Challenges in sizing the reuse market

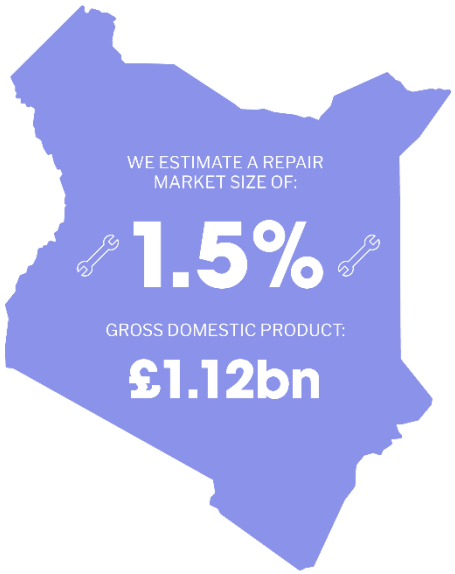
The reuse market for individual products is much harder to estimate, because much of the activity in the secondary market (particularly in the cash economy) is extremely difficult to measure accurately. In short, most of this activity occurs between friends and family, informally and not for profit. However, **in 2019, second hand clothes imports to Kenya were valued at £136 million (or 1% of all imports to the country**). In 2020, this had dropped to £90 million, or 0.67% of all imports to Kenya. This drop of 33% was due to a temporary ban on imported second hand clothes between March and August of 2020, amid now proven unfounded fears that COVID-19 could spread on clothes. The import of used clothes to Kenya has generated substantial commentary and academic study. As with many African countries, there has been some opposition to the import of clothes from other countries, with proponents arguing in favour of local manufacture, with traditional designs and innovation. Kenya has not imposed a ban on the import of second hand clothes, despite such a proposal by the East African Community and implementation of a ban in neighbouring Rwanda.[11] The retail of second hand imported clothes remains a large, albeit controversial, segment of the Kenyan economy.

Other used HS Codes include scrap metal and other scrap materials. But these are not reused items as outlined in the definition of reuse in the introduction section of this paper. There is no further distinction in the HS Codes for other used items, particularly at the consumer product level. Thus, sizing the reuse market further using this method is **not** possible.

c. MICRO: The business perspective

For the last estimate, we sought responses from individual businesses in Kenya, through the online survey (Repair Survey for Businesses in Kenya) in February 2022. Better Futures CoLab asked businesses if they provide repair services and whether they require repair for their own machinery and equipment to run their operations. At an individual level, businesses who completed our online survey spend an average of £6,600 per year repairing their own machines and equipment. This compares with average annual revenues of £365,000. While there are additional expenses not captured by our survey data, including labour costs, this suggests that **internal repair (e.g. equipment repair) expenses account for a minimum of 2% of revenue**. Of the businesses who provided repair services for customers, they spent an average of £12,000 on **spare parts, which accounted for 3% of their average total revenue.**

If the above three levels are compared (Macro = 1%, Meso = 1.2%, Micro = 2.5%), we can estimate that Kenya's repair market is worth a minimum of 1.5% of its economy, or £1.12 billion.



Kenyan businesses who completed our Repair Survey have a strong belief in local manufacturing. They consistently told us of their desire to see quality designed, repairable products, easy access to spare parts (ideally manufactured locally), and a recognised certification process to support repair services. They also had great ideas about how to make repair services more accessible:

"For products to be easily repairable, the electronics components used to manufacture these systems should be locally available and the government should support it by having some standards that each component should have. Most of the electronics and machines when they breakdown, it becomes so expensive to repair them since the spares are not locally available and are very expensive."

"[We need] reverse logistics for [a] sustainable environment. Manufacturers need to have a system to recall end-of-use and repairable electronics products."

"[Repair] can change consumer culture from linear to circular, especially if [the] repair experience is as good if not better than [the] shopping experience - so we need to create "Repair Malls" where people go to get their stuff repaired, buy repaired items, and combine that with cafes/restaurants/entertainment to do while waiting for repair to be completed."

Product: Five categories explored

Following the market sizing of the repair market in Kenya, we identified the following product categories through publications and stakeholder interviews as major categories of interest:

a) **Automotives**
b) **Electronics and mobile phones**
c) **Clothing and Shoes**
d) **Medical devices**
e) **Household appliances**

Generally, the product categories with visibility on repair services are like others globally – automotives, electronics, and textiles. This relates to our use of these items in important facets of our lives. Clothing is obviously essential for nearly all cultures, but more and more vehicles, and electronics are also critical for facilitating livelihoods, connecting us to jobs, friends and family, and as visible ways of self-expression. Another reason for the high visibility of their repair and reuse, however, is the structure of businesses and systems that facilitate repair and reuse. In these product categories, guarantees, warranties, insurance policies, take-back schemes, and localised points of collection and redistribution are ubiquitous. These systems are not without their limitations and challenges, but their existence does facilitate higher levels of repair and more visibility and discussion of repair.

There are two other product categories/sectors that require special attention - off-grid solar products[12] and batteries, and the healthcare sector. There is some important research work being conducted on these sectors and further investigation in these sectors has been identified as of significant importance in Kenya. These have been singled out as being unusual, either because of innovative repair and reuse practices or because of a lack of understanding of these sectors, where this is not the case in other countries.

a. Automotive

"It depends on the car if it is a new model or an old one. You repair a new car so that you maintain the shape of the car. It was the car radiator that was leaking. I decided to buy the glue but it did not work because it needed to be welded by the gas burner. I just could not fix it by myself. So I took it to the garage. There are items that might be difficult to repair compared to others. Those that require special tools to do the work. The vehicle sensor is hard to repair and the starter."

Male, 41 years, Electronic repairer and mechanic, Busara research

The automotive sector is a rapidly growing part of the economy in Kenya. By 2030, vehicle registrations are projected to outpace population growth.[13] In 2019, 88% of vehicle registrations were of used vehicles, while only 12% represented new vehicles. This proportionality is representative of a high degree of imported used vehicles to Kenya, and also an active repair market in Kenya itself. But imports, of both used and new vehicles, made up over 90% of new vehicle registrations in 2019, indicating a small local automotive manufacturing industry.

Instead, the **automotive industry in Kenya is primarily involved in the assembly, retail and distribution of motor vehicles**, in five main sub-sectors: Motor vehicle assemblers, trailer assemblers, motorcycle assemblers, parts and components manufacturers, and body builder's sub-sectors. There is a single Kenyan car manufacturer – Mobius Motors – established in 2009, which aims to design and make cars specifically for the African market, at a price comparable to that of a used sedan.[14]

Because of a lack of local manufacturing, when it comes to vehicle repair, new authentic/genuine parts can be imported, some can be manufactured locally, or second-hand authentic parts must be sourced locally (Kenya has banned the import of second-hand vehicle parts, as of 2019). The alternative to this is the use of unauthentic parts – either cheaper, typically lower-quality imported or made-up locally. The manufacture of unauthorised spare parts in the Jua Kali sector has been shown by Odongo *et al.* to have negative health outcomes for repairers.[15] Specifically, some workers had reduced kidney function and high levels of lead in their blood. A lack of acceptable personal protective equipment was used in these informal settings. The recommendation by the authors was for public health intervention measures at the Jua Kali automobile repair workshops to curb such occupational health risks among the artisans.

The formal local manufacture of parts for the automotive industry takes place at 25 firms throughout Kenya. According to a recent report by the Kenya Association of Manufacturers (KAM), these firms have a combined average capacity utilisation of 36%, and KAM recommends that the Government of Kenya incentivise local automakers to use locally produced parts, because the import of substandard (unauthorised) parts means local parts manufacturers cannot compete for

business.[16] Unfortunately as found by KAM - **"acquisition of the latest technology for assembling and manufacture of spare parts is hindered by the lack of affordable long-term financing options for the sector"[15].**

The automotive industry is a complex but significant part of the Kenyan manufacturing economy and fuels much of the repair and reuse activities. In fact, there are no landfills for cars in Kenya, because vehicles and parts do not go to waste. If they cannot be reused, the materials will be recycled. However, much of this activity operates in the Jua Kali sector. While from an environmental perspective, the non-landfilling of parts from the automotive sector is a good thing, the location of much of this activity in the Jua Kali sector, means that there are dangerous, unhealthy and unregulated practices that have other societal impacts.

Customer research completed by Busara has shown that **people most often access car repair services after accidents**. But after the damage is fixed, more issues often arise, and customers must take their car back for further repairs. There are heavy financial implications for such follow-up repairs, which are usually unplanned. This happens once or twice in the lifetime of the vehicle.

For motorcycles, customers reported needing to go to the dealer to diagnose the issue. Smaller issues like a bulb replacement and basic maintenance are often done by users themselves. But **motorcycles are usually sold off within 3 years for an upgraded model or due to accidents are given to scraps.** During major accidents almost all parts of the motorcycle have to be changed, but repairs for parts are usually cheap.

b. Electronics and mobile phones

"Frequently repaired: Electronics. Why? Because, something like a phone is very prone to being broken, like falling down or we sit on it. The TV can get an overcharge from the grid and it can easily get spoiled."

Male, 32 years, Utawala, Businessman, Busara research

In contrast to the automotive repair market, many of the repairers that we interviewed in the formal and Jua Kali sector described repairing electronics and mobile phones. **Globally, the repair market for electronics is valued at £75 billion GBP and mobile phones have in many ways become the archetype of the repair problem in the 21st century.** Most of them have been designed for obsolescence, yet contain rare metals that should be recycled. This subjects many electronics to disassembly in informal workshops in low-income settings and can lead to toxic and dangerous unmonitored recycling practices. Despite mobile phones being relatively expensive to purchase new, increasing numbers of people globally own phones. If an owner wants to repair a mobile phone, they can be very difficult to

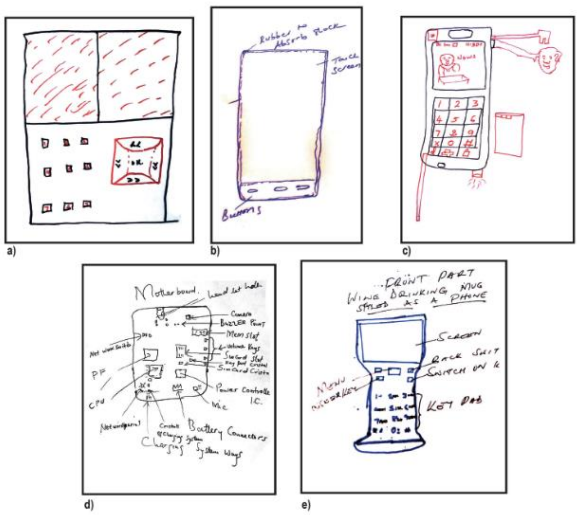
fix, because parts are not interchangeable and the large multinational companies who manufacture the phones charge exorbitant prices for spare parts.

Media coverage and public-led campaigns to change the unrepairable nature of mobile phones, and other electronics, including laptops, has become common around the world. The European company, Fairphone, has created a mobile designed to be repaired and makes spare parts and repair information widely available. However, these new style phones tend to be limited to the European market. The buzz around repair and mobiles has led to some change, including interchangeable parts being made available from more traditional electronics companies. It is not only the availability of spare parts that limits mobile phones from being repaired, but also access to necessary software for repair programs. iFixit – an online forum for product repair – has rated smartphone repairability, with most achieving a score of 6/10 or less.[17]

According to research by GSMA, **there are 135,000 people working in the mobile phone industry in Kenya.**[18] Most of these work in the informal sector, and 43% are youth working in the informal mobile sector. However, GSMA's findings suggest that for a significant number of youth working informally in the mobile industry value chain, their job in the mobile industry is part of a range of income-generating activities. These include working to support mobile infrastructure, mobile related manufacturing, retail of handsets and informal service plans, and app/content development. Youth working informally in non-retail segments of the industry primarily repair mobile phones, and men make up 85% of mobile phone repairers.

The electronics and mobile repair landscape in Kenya has been the subject of several academic studies. These ethnographic studies demonstrate that repairers are highly skilled, but generally self-taught at repairing phones, and that they repair imported, knock-off "China phones" with greater frequency than other models.[19] One study also demonstrates that repairers have strong ideas about how mobile phones might be better designed both for repair and for the Kenyan rural market – many identified that people frequently use their phones as torches and need to be able to easily grip and clean their phones after days spent doing agricultural or other manual outdoor work.[20]

Figure 4: Mobile phone repairers' drawings of redesigned phones more suited to the rural Kenyan lifestyle (Wyche et al., 2015, Figure 1)



Common faults with mobile phones include cracked screens, displays not working, the phone falling in water, or not charging. Since phones are personal items, people urgently rush to repair them but also find it difficult to leave their phones for long periods with repairers. People are afraid to diagnose the faults themselves or attempt self-repairs for fear of causing further damage. In Kenya, mobile phones require repairs almost once a year for every user and there is a huge variation in cost of repair.

The barriers to repair operations of electronics will be discussed further in the "People" and "Practices" section below, but it is important to note here that despite limitations and high cost, according to our survey of repair in Kenyan businesses, mobile phones and electronic devices may comprise **at least 25% of the total repair market in Kenya**. Mobile phones are regularly cycled – they are reused, repaired, refurbished, and disassembled for recycling and parts sale. Electronics are highly valued as working products and for their individual material components. However, both repairers and consumers alike have expressed a desire to have mobile phones last longer, be made locally, and in turn, be more functionally appropriate for the African lifestyle.

c. Clothes and shoes

As noted above, there is a huge market for second hand, imported clothes in Kenya. Many people make their livelihoods selling bundles of clothes from European, American, and Asian markets. In Swahili these bundles, and by extension the clothing, are referred to as *mitumba*. Mitumba selling is a relatively attractive business because it requires low skill to enter, and as little as Ksh.500 (£3.30 GBP) capital to start, depending on the quality of the second-hand clothes and cost of the bundles.[21] On the one hand, trade in used clothes from high-income nations to middle- to low-income nations saves these clothes from landfill. However, there is an environmental cost to shipping these clothes around the world, and it is argued that we need to do away with fast fashion as an acceptable business model altogether.

The further argument against this cycling of used clothing is the decline in the local textile manufacturing industry in Kenya, which was a traditional pillar of productivity. **In the 1980s, Kenya's textile manufacturing sector employed as many as 500,000 people, but now it only employs 50,000.**[22] In a survey of local textile makers, 81% felt that the import of second-hand clothes has had a negative impact on the Kenyan clothes industry, and 48% felt that there should be a ban on the import of second-hand clothes to Kenya.[23] However, currently Kenya does not produce enough cotton to support fully local production for the scale of demand. Thus, heavy reliance on the import of fabric, at a minimum, is necessary. Increasing local production of new textiles is a priority focus for Kenya and has the potential to re-emerge as a thriving sector, with appropriate infrastructure and incentives.

A significant middle ground also exists between the import of second-hand clothes and local production of new garments. This is the reuse, repair and recycling of textiles in Kenya itself. Africa Collect Textiles (ACT) is an example of a Nigerian and Kenyan based company that incentivises local used textile collection and supports local repair and recycling of garments for resale.[24] They support local designers to remake and sell clothes that ACT have collected in bins set up throughout Nairobi and Lagos. Additionally,

below ("Practices") we describe one tailor who has found a market gap in her local community for repairing garments as well as making new ones, and 8% of businesses surveyed provided textile repair and recycling services.

Research into customer journeys has shown that smaller alterations or repairs on clothes can easily be done at home. Common reasons to go to the tailor include needing a button or zip repaired, for alterations, and for bigger items like jeans. A customer often must go multiple times for alterations, because customers reported that tailors usually are unable to get the measurements right in the first go.

People revisit repairers between 3-6 times for the same item of clothing. The rate of shoe repair is even higher than that of clothes and happens more frequently with lower quality shoes. **Customers reported fixing shoes 5-6 times with different pairs within 3 months.** Most shoe repair is done at home, however, with items like super glue to repair the shoes instead of going to the cobbler. The clothing and shoe repair and reuse market, while currently highly dependent on imported goods, has the potential for expansion and small companies are finding profitability here.

A Story Of Repair

A journey into clothing repair

Purity is a young college graduate who quit her job at a university to start her own repair business. Purity identified a gap in the tailoring market. She noticed that no one wanted to do repairs and would rather just make new clothes. “I wanted to capitalise on this”. Notably, the margins for new clothes were higher but Purity saw this as her opportunity to create her very own business in repair.

Purity shared this remarkable story with the Shujaaz research team.

“After completing form 4, I studied hospitality and tourism at college. I graduated in 2018 and got a job at St. Paul’s University in 2019. I only worked for 3 months before we closed due to Covid 19. I knew I didn’t want to just stay like that and thought of doing tailoring. People said it’s tough and impossible, no one from our home is a tailor. I was determined to do tailoring, I knew that If I went back to SHOFCO (an NGO in Kibera that supported my education and linked me to the St. Paul’s job), they would quickly find me another job, but I chose not to.

So, I approached a person who was running a tailoring shop and was trained. She then linked me up with people from NITA (National Industrial Training Authority) and I did my exams. I was surprised that I knew how to use the machine in a day, this gave me some hope. I started by sewing curtains, sheer curtains, pillows and bedsheets. I then left that and started sewing bags, handbags, ransack [bag] for Ankara and leather materials and I was good at that. I later went back to know more about dressmaking, but still faced challenges sewing men’s trousers.

When I completed the training, I didn’t have a sewing machine. I would get clients, but I would go back to the trainers to work with

her machine and pay her something. But I knew I had to do something, so I worked out a mechanism to get a hustle that would give me money to get my own machine. I got an opportunity to supply chapatis and breakfast to the nearest banks (Equity, Cooperative and KCB). This would complement the money I earned from my tailoring hustle.

I finally saved enough and acquired my own sewing machine. This for me was a dream come true. I am currently operating from my house; I cannot afford a store now. If you want my services, you can reach out through my Facebook page or if you know me personally. I rely a lot on referrals for business, and I ensure I am reliable and meet the customer's needs on time so that I get more referrals.

I do both new clothes and repairs. I realised repair has a lot of money. Like along Olympic-Karanja Road, many tailors don't want repairs, they just want to make new clothes. This is something I have capitalised on, and I accept repairs at KSH 300. So, repairs have a lot of money, you can pay rent with that money. And for any pieces that remain off the materials, I do make things like bowties and sell at KSH 100. At times people bring trousers and want it to have Ankara patches. I then sew in the patches.

I personally do not plan to stop doing repairs, I don't want to be like fellow retailers who have ego when they grow their business. I am sure my business would grow soon, and I will get a store. I am currently trying to save consistently to ensure my business grows.

d. Medical devices

Access to medical devices in Kenya is critically low, and most of the available equipment is in bad condition since the hospitals lack enough resources and expertise to repair broken machines or service those that are working. Mbagathi Hospital in Nairobi, has the country's only CT scanner, which overheats when used and can only be used on two patients daily. This has created a backlog of waiting times for the scanner of 6-12 months. Only three public hospitals in Kenya have an MRI machine.[25] A survey of 22 hospitals found that pulse oximeters and vacuum extractors (relatively low-technology devices) were only functional in 3 and 15 cases, respectively.[26]

Health technologies are overwhelmingly designed for highly resourced environments, where reliable infrastructure and trained biomedical engineers are available to regularly maintain equipment. According to the WHO, **while up to 70% of medical equipment in sub-Saharan Africa is donated, only 10%–30% of donated equipment becomes operational**[27].

Biomedical maintenance departments remain one of the most neglected services in many hospitals. A study of Kenya and 4 other sub-Saharan African countries demonstrated that less than half of hospitals assessed had equipment repair and maintenance services.

Even where services are available, performance is still lacking. KNH, the largest hospital in the region, has its own procurement/supply chain office and a biomedical engineering facility responsible for maintenance and repair of its equipment. **A 2012 government audit at KNH noted that the hospital was unable to repair, maintain or replace equipment in a timely manner.** The report recommended that KNH management developed a policy to ensure timely acquisition, maintenance and replacement of fixed assets, as well as create a more sustainable financial stream to fund these activities[28].

There is hope though through potential local actions. A study including data from 60 resource-poor hospitals located in 11 nations in Africa, Europe, Asia and Central America concluded that a majority of laboratory and medical equipment can be put back into service without importing spare parts as long as the right skills were put to use[29].

One initiative underway currently aims to develop medical equipment within Kenya. The Maker Project aims to test the effectiveness of an innovative partnership ecosystem network in producing and maintaining equipment. Evidence shows that some locally produced, simple devices can be more affordable than foreign imports. To date, four medical device prototypes have been developed. Two have been evaluated by the National Bureau of Standards and one has undergone clinical testing.

Parallel to these issues found within hospital and clinical settings is the currently inadequate provision of services to those in need of assistive technology for daily living such as wheelchairs, prosthetic limbs, hearing aids. When provision of devices does occur, repair and maintenance services are lacking. While specialist repair services exist, UNICEF found that in developing countries 28% of respondents reported that specialist repair services were not available and 47% reported that only limited repair services were available. The study showed that only a minority (25%) reported that these repair services

were available, which compares to 62% in high income countries.

A 2019 study conducted by AT2030 in Kibera, the largest informal settlement in Nairobi and one of the largest in Africa, investigated the repair practices of wheelchair users. **Nearly all wheelchairs used in Kibera required some form of repair within a year, and all participants reported that they usually had major repairs (ie. welding) done at least 3-5 times before the chair was no longer viable.** From the interviews of just eight participants, nearly every part of the wheelchair was given as examples of what has been broken, and most failures rendered the wheelchair completely non-functional. However none of the participants stated any access to wheelchair specific expertise for repair, seeking out welders, bicycle repairers and other tradespeople who might have applicable skills. This lack of specialism has a highly detrimental effect on the efficacy of the resulting repair, with trust in the repaired devices being low, leading to poor continued use of the provided device.

"this one has a problem, the way it was welded, some people when they weld they don't do it well and when it got pushed you find there is a problem"

Kibera resident and wheelchair user, AT2030 Study

The impact of having a broken wheelchair was considerable across all participants. They are generally immobile for the duration and require assistance from friends or family to get the repair done. Costs of wheelchair repairs varied greatly, and not due to differing parts, similar jobs seemed to vary, usually ranging from 200-2000 KES, with one participant stating that they had paid 5000 KES in the past. Considering the frequency of major repairs this is a significant portion of the income of the users. The average income in Kibera is 3977 KES per person per month, and it is assumed the actual income of PWDs will be much lower than this average.

Linccell Technology

On the left, Lincoln Wamae, Founder of Linccell Technology, has developed a modified wheelchair suited for the Kenyan terrain, using localised spare parts.

Kijenzi

Helping the local value chain to overcome obstacles

Located in Kisumu, Kijenzi brings local, distributed manufacturing to low resource settings around the world. From its early days where it began in 3D printing healthcare products in Kenya, Kijenzi looks to digital manufacturing to connect institutions in the public good to global supply chains so that they can serve billions.

In Kenya, they noticed that half of all medical equipment in rural hospitals did not work and many other hospitals did not have the equipment they needed to treat their patients. Replacement parts for medical devices are often expensive to replace and the lead times to obtain the replacement part are normally very long.

Kijenzi's cloud-based system allows them to leverage the network of engineering design from around the world – so have the unique ability to 'print' on demand.

e. Appliances

"There was also a microwave that was brought to me for repair and I could not. So I was forced to take it to a professional for repair. It was the thermostat that was bad. But because I deal with wiring I thought that was the problem. That was where the confusion came in. The transformer was old but sometimes it can happen in the transformers of new microwaves. He had stayed with the microwave for over 6yrs. Immediately the transformer was changed and it started working again."

Male, 31 years, Nairobi, Electrician, Busara research

The final segment of the market that warrants a brief description is the repair of appliances. As with vehicles, a significant portion of repair of appliances is initially covered by manufacturer or retailer warranties, and repair of these products has become somewhat normalised globally. However, unlike vehicles, insurance policies are not usually obtained, so beyond warranty periods, the user will likely have to pay for specific repairs. Unlike mobile phones and electronics, faults are anticipated by users but decisions to repair are made based on the price point of a new machine. For many, buying a new machine becomes the obvious choice economically, as parts can be expensive, and the purchase of appliances is growing in Kenya as per capita income grows.[30]

Of the businesses surveyed, 12% repaired appliances, and spare parts for appliances make up the third largest category of all spare parts imported to Kenya. The lifecycle of appliances likely falls somewhere between that of automotives

and mobile phones, though not enough data has been surfaced to fully map this out.

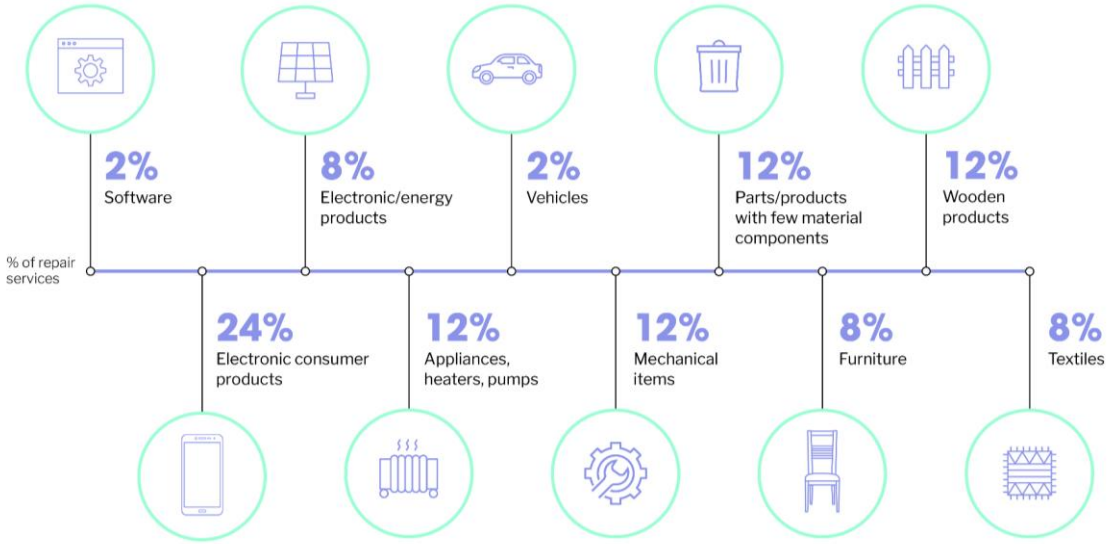
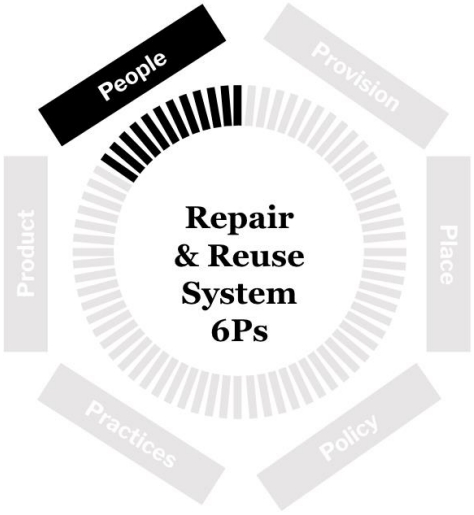


Figure 5: Categories of repaired items, along a technology spectrum, as reported in the Repair Survey for Businesses in Kenya (February 2022)



People: Repairers and Customers

Communities, trust, and networks form the backbone of the repair and reuse industries in Kenya, both in the formal and Jua Kali sectors. In collaboration with partners at Shujaaz Inc, Busara, and Incubator Nest, we sought out people and their stories and investigated the barriers and motivations to repair and reuse. Structured interviews and surveys found pathways to skills training, systemic barriers, unexpected actors – brokers, lenders, mentors – and a disconnect (not necessarily negative) between formal definitions in circularity and what people in Kenya consider to be repair and reuse. The relationship between scrap materials and waste to repair and reuse was closer than anticipated.

a. The issue of trust

"With the Jua Kali sector you must have some knowledge on almost everything. The repairmen are not trustworthy and you can only repair an item at a place where you trust the repair man. They switch items in the shops. After about 2 weeks they start selling off parts of the item you brought for repair."

Male, 31 years, Nairobi, Electrician, Busara research

Relationships between people – customers, users, repairers, craftspeople, brokers, mentors – consistently emerged as a key facet of repair and reuse. Repair and reuse are practices, but they are also social activities, and the **issue of trust** came out strongly. The aim of repair is to return a product to a functional state and usually the product is still highly valued by a user. This value may be emotional, functional, or monetary, and the owner/user does not want to risk devaluing their product through a repair activity. In customer surveys, many participants expressed a concern that a Fundi might sell their items or replace the parts with faulty ones. Therefore, customers preferred to get a referral from someone they trusted who can vouch for the services of the fundi. If

people do not have a recommendation or have a regular repairer, they search for one in their local neighbourhood, or secondarily, search for online reviews. But in both cases, customers want to build a relationship with a repairer. If they have a bad experience with a repairer, they will seek out someone new for their next repair. In the absence of a recommendation, this trial-and-error approach is the main route to finding a trustworthy and skilled fundi. The approach requires, however, enduring one or more bad repair experiences before finding a regular fundi. The recommendation route is viewed as a more secure route to quality repair.

In-depth interviews conducted by Busara with consumers of repair in a middle-income bracket demonstrated that their interactions with a repairer affected how they felt about the repair of an item. Specifically, customers who participated in these interviews experienced negative emotions when they picked up their repaired item, usually because of a breakdown in expectations, communication, or service delivered. The **customers had to confront the repairer because they were not satisfied with the repair outcome**, but the confrontation was socially complicated if the repairers were recommended or a personal contact. A lack of quality control and transparency throughout the repair and reuse industry was an issue for customers and repairers alike.

The Busara research has captured four journey maps based on different consumer personas, as detailed in the full Busara report.[31] All journeys across all personas highlight issues of trust and lack of transparency in the pricing phase of repair, and all customers profiled experienced a confrontation phase with a repairer. A customer persona example is captured on the following page.

Key Characteristics

- Knows the repairer via friends and spouce and builds a personnal connection with the repairer
- Proactively communicates on what happened and what has been tested
- Not so much autonmy in the process, cares about the funactionality
- Not comfortable of confronting with the repairer because of the personal connection

Ideal Scenario

It is easy to find spare parts and the repairer can prioritize his items to fix. The price said initially is what it is, no extra or second payment.

Journey Map
Curious Connector

	BEFORE REPAIRER	TO REPAIRER	PICK UP	CONFRONT	STRATEGY
ACTIVITIES	• Assess - to figure out what caused the problem • Self test - to fix the problem	• He explains what has been tested • He discusses with repairer for preliminary diagnosis • Repairer gives hypothesis, asks for more to diagnose and to et spare parts • He asks for price and date	• He waits for the call from repairer when it is ready • He comes back, test it before taking it home	• He asks for explanation, but tends not to argue • If not repairable, he asks the repair to help sell good spare parts	• He accepts the reasons or excuses given by repairer
EMOTIONS					

PAIN POINTS	• *Feels disappointed and insecure when he has to acknowledge that he cannot fix it by himself and needs to ask for help*	• *Disappointed because of waiting time*
		  ◦ *availability of either spare parts or the repairer*
		  ◦ *tries to understand and adjust the emotion*
		• *Frustrated when extra payment is required because repairer finds that the problem is not what was thought earlier*
				• *Does not feel good to confront, but is not 100% happy either*	

OPPORTUNITIES		• How Might We create a market where spare parts and information of availability are easily accessible? • How Might We create a standard procedure that facilitate predictable range of cost?		How Might We create an environment where consumers know where and how to deal with unsatisfied repaired products without diminishing the relationship with repairers?	

Figure 6. An example of a customer journey map created as part of Busara's research into consumer behaviours and attitudes to repair. Taken directly from Busara research

b. The power of networks

For the Jua Kali repair sector, networks and personal contacts were critical to successful operations and barriers to entry. As depicted in figure 7 below, when starting out, particularly for the youth, **many repairers will work under a more experienced fundi and use their tools before they have enough capital to run their own shop**. Additionally, networks are critical for accessing parts (through brokers) and getting customers based on a repairer being recommended by another repairer, friends or family. Some **young repairers also leverage online social platforms** to learn more and to market their services and products. Those who lack access to these networks and are not able to build relationships with other repairers and customers will not be successful.

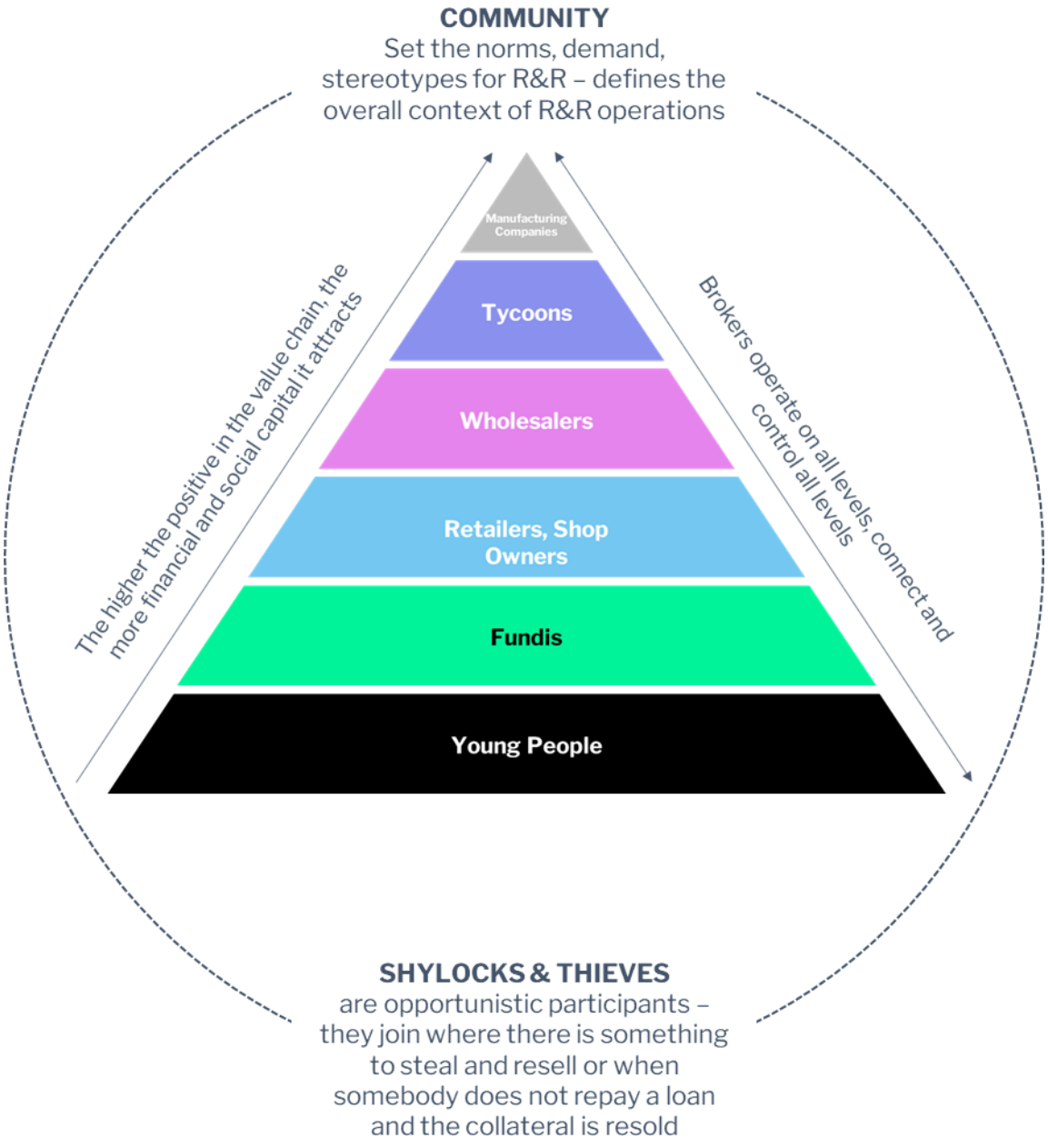


Figure 7. Young people are at the bottom of the value chain, as captured by Shujaaz research

Young people in Repair and Reuse markets co-exist with other actors in the bigger value-chain, while brokers control and connect all levels and actors.

The table below describes each of the different roles within the Repair and Reuse market in Kenya.

Table 2. The repair and reuse value chain adapted from Shujaaz research

Repair and Reuse Actors	Repair and Reuse Roles
Young people, who work in repair and reuse	• Young people generating income through repair and reuse. • They might be employed by formal/informal businesses or do small tasks on their own (e.g., pick cartons, plastic, do small repairs). • Few own a business/hustle. • Some examples would include hustles like plumbing, electricians, tailors, carton pickers OR repair or processing factory labourer.
Brokers	• Intermediaries, who "broker" relationships/transactions among other actors – e.g., people who connect carton pickers with carton-processing business owners. • There are different levels (depend on the actors they connect), e.g., "high-end" brokers have the capacity to accumulate very large amounts of valuable materials (e.g., scrap metals) and sell them in bulk directly to large-scale producers, including foreign companies. • Young people can be found at the bottom of the "brokery" -- e.g., connecting pickers of materials with those who collect and deliver to the repair and reuse business owners. • Young people can be employed by a broker to help sort materials. • This is an aspirational hustle for young people because of the control brokers exercise over the industry and the income they generate.
Repair and reuse business owners (Retailers and wholesalers)	• Owners of the shops that buy damaged items, sell spare parts for repair, sell items that have been modified for reuse, etc. • Some might own repair services as well. • Can offer apprenticeship or internships to young people, can also employ young people.
Loan sharks (aka "shylocks", locally)	• Informal lenders, embedded in the community. • Mostly older people with good connections to brokers and other repair and reuse actors. • Might serve as the source of startup capital for young people in repair and reuse. • Take used items as collateral, and sell them if loans are not repaid.

A Story Of Repair

Max, a 26 year old electrician living in Mukuru Slums in Nairobi

“He is one of the most important people in this community, without him, most homes and businesses in Mukuru would not have electricity.”

A story narrated by Mukuru participants from the research led by Shujaaz Inc.

‘Max’ is a young gentleman who lives in Mukuru slums. He has sharpened his skills in repairing electronics in his community over the years by working under someone. Some of the things that he is known for include, repairing electronic gadgets such as television and fridges. He does not have a fixed shop; therefore, people would call him, and he would pay them a visit. Having lived in Mukuru for years, Max noticed that there is a bigger issue when it comes to access to power in his community. Since Mukuru is a slum area, most of the community members are poor and some people cannot afford to pay for power connections through Kenya power. This problem presented an opportunity for him to make more money. He decided to broaden his skills and venture into the illegal power connection. According to young people, Max has helped most people have electricity and they say he is one of the most important people in his community. His main work tools include a ladder and wires.

He does not work alone as he must liaise with a contact at Kenya power (unofficially), who provides materials like fuses for power connections. The money they get from this activity is then split between the two. Power installations depends on the house/ business, they usually charge KES 1000 for a place of business and KES 500 for a home. For home electricity connections, the homeowner buys most of the equipment such as bulb, bulb holder, wires etc. For the initial assessment, he will be paid around KES 800 .

People recognize that what he does is not legal, however they also feel that through his work, the community’s a better place. Children have access to power hence they can comfortably do their homework.

c. Skills and training

"I used to follow some 3 people who were my champions when it came to electricity. Whenever they went, they tagged me along. So, the more I tagged along, the more I learnt."

Unknown, Male, Youth Electrician in repair, Mukuru-Nairobi, Shujaaz Inc. research

Material and product knowledge, alongside access to tools and parts, are the foundation to entering business as a repairer. As will be explored further below, sometimes repair operates as a standalone business and other times as a side hustle on top of other skilled work (tailoring, plumbing, woodworking, product assembly). Thus, **there is not a single pathway to skills acquisition or training** for would-be repairers. As outlined below, we have identified six potential avenues for skills training, outlined in Figure 8:

- Self-taught repairer (does only repair)
- Self-taught craftsperson (does more than repair)
- Apprenticeship (informal and formal)
- Training via NGO/CBO workshop or seminar
- TVET training
- Company training

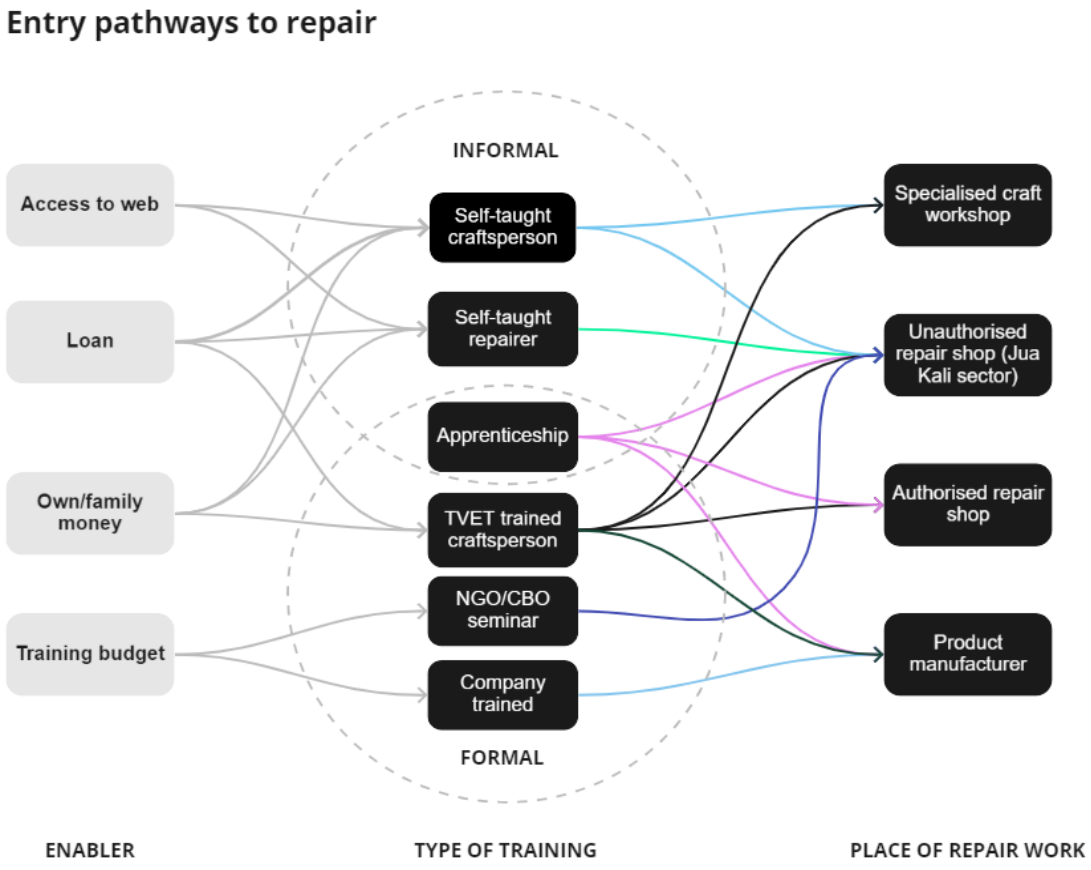


Figure 8: Entry pathways to repair as understood from Shujaaz research

For most young Kenyans, self-employment in the informal sector is their only option for securing income, and a livelihood. The informal sector is already the primary job creator in Kenya – according to the Kenyan Bureau of Statistics, the informal sector creates over 90.7% of new jobs.[32] Formal skills acquisition and training requires funds to support this, and there are limited opportunities to take very short, free courses to advance skills in repairing electronics and/or other complex products. Thus many people working in repair acquire skills through being self-taught or through an informal apprenticeship. There are an abundance of online videos and instructions for repairing common products like laptops and mobile phones, however, this requires a reliable internet connection.

Other repairers become apprentices under more experienced craftspeople and repairers – this is particularly common in the Jua Kali sector, where mentorship can be a critical element of starting one's own business. However, opportunities for apprenticeship and internship are sparse because of the unstable nature and low income in repair – only people, whose business is growing can afford an apprentice (because they have to take time to teach them and have to share work and income they get).[33]

While making money was the primary motivation for starting a repair business, other motivations included a passion for running a business, to continue family legacy, or as a way of nurturing their talents.

Some repairers are also specialist makers or craftspeople, so are trained to design or make their own/company new products.

They may then transfer these skills to repairing their products or other products for customers. To a lesser extent, repairers have undergone formal training in TVETs or have been exposed to youth seminars organised by NGOs/CBOs. But no certification programmes for repair exist, despite the recognition among repairers that certificates can make a difference to building trust with customers. Education and skills define how creative and successful a young person can be in repair and reuse businesses – those with low education have difficulty innovating/finding creative ways to run a business and are pushed to the bottom of the industry.

"I mostly deal with clothes - fashion, tailoring. It is something that I experienced when I was young. My mum was a tailor in Kisumu and she used to have a sewing machine. I stayed with my mom for long. Now, I mostly do fashion, designing, sewing, repair and all those things. I also have a side hustle, but I have partnered with a female friend, where we sell bags, earrings, anything to deal with women, online."

Youth, Male, Tailoring and repair, Kibera - Nairobi, Shujaaz research

d. Customer attitudes to repair and reuse

There were mixed attitudes to repair and reuse, depending on the demographics and specific part of the repair and reuse value chain probed. Acquisition of spare parts and the negotiation process was viewed negatively by customers and those outside of the industry. These were seen as dirty and deceptive processes, which lack transparency.

However, overall, **the attitude of customers towards people who get things repaired was positive**. A majority felt that doing repairs was desirable, useful and oftentimes favourable. Analysis by Busara on the reasons people do repairs were seen to be influenced by three factors:

- Environmental values
- Situational variables
- Psychological variables

Environmental awareness and positive attitudes towards practices that are environmentally friendly were noted as drivers for consumer choices. Participants reported that people may send things for repair with the aim of reducing their environmental footprint. Such people were viewed as having increased awareness of the effects of disposal on environmental impact.

"I will see them as an environmental hero who is protecting our environment from pollution."

Male, 32yrs, Utawala, Busara research

In some cases, repairs were said to be necessitated by someone's inability to afford a replacement. Participants viewed such people as having financial constraints or other competing priorities for their money. In other cases, participants viewed such people as being economical, possessing good personal finance management skills since repairs allowed for increased affordability and obvious benefits such as saving money.

"The old items are more durable than the items that are currently sold because the old materials are strong and the past fundis were much honest in their work"

Male, 45yrs, Kagundo Road, Busara Research

Consumers were generally willing to repair broken items, however, their intentions could easily be hampered if repairs were seen to require too much effort compared to replacement. Availability of repair facilities and skilled personnel were key determinants when deciding on repairs. In addition, the number of times repairs had been done also influenced the decision to do repairs. Products that had been repaired several times were more likely to be replaced.

Table 3: Consumer barriers and enablers to repair

Barriers to customer engagement with repair	Enablers to customer engagement with repair
Cost of repair	Available reparability information
Number of times an item requires repair	High cost of replacement item, or savings acquired through repair
Desire for newness/latest version	Perceived value of item
Effort required to find repairer	Importance of supporting repairers and their skills
Previous negative repair experience	Opportunity for self-expression and creativity with new parts, amendments to item

The age of a customer and gender of a repairer were noted throughout the surveys and interviews in Kenya. **Older people (aged 35 and above) are more likely to repair items or take them for repair compared to younger people (aged 20-30)** who are more influenced by fashion and technology trends and would prefer to buy new items than keep outdated or spoiled ones.

People with low-income levels repair their items more often while high income earners opt to buy new items instead. The majority of the consumers look at the usefulness, importance and frequency of use of the item. *(For example: radio for a respondent who listens to it every day for music; laptop for another respondent who relies on it for work and social life.)*

"I can say that most of the youth don't want to use items that are broken. They like new things, they call it "manyanga". They don't want to repair items. If an item gets broken, they will just keep it or they will sell it at a cheaper price, get the money, add some money on top and buy another item."

Busara research

e. Women in the repair and reuse industry

"I think a lady can't handle something delicate. If my phone has a crack and I approach a male phone repairer, within 30 minutes my phone will be done. Also, the boys have connections. When you need an item, they always know where to source them."

Male, young person, Shujaaz research

There was a **strong gender bias towards males as repairers**. An SMS survey conducted on Shujaaz audience in February 2022 revealed that at least 28% of young people in the industry have not seen a girl in the industry with approximately 60% saying they have just seen a few or some.

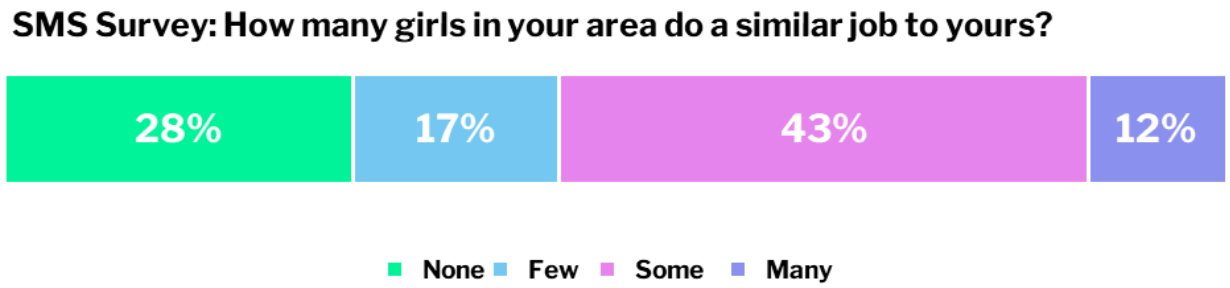
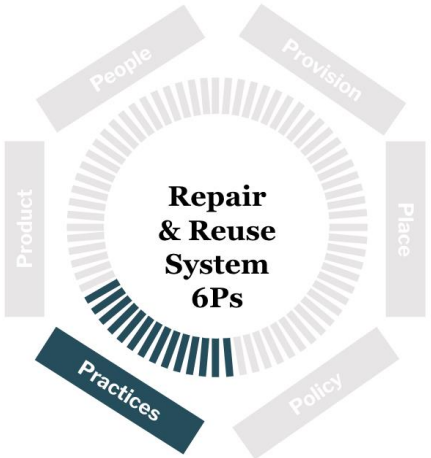


Figure 9: There are generally fewer women in the industry than men. Shujaaz Inc. research

Societal norms are much harsher on women and girls working in the repair and reuse industry. Most stereotypes are tied to pervasive, old myths describing women as being weaker and less capable than men. For example, a widely-shared misconception is that women are not capable of doing sophisticated repairs such as repairing electronics, cars or motorbikes. And while women are well represented in **connectivity retail of mobile phones (such as data and data plans)**, the number of women working informally in well-remunerated jobs such as handset retail, content and app development, and phone repair is notably low.[34] The lack of women in these roles may be due, in part, to cultural biases that consider phone repair and STEM training to be the domain of men. Overcoming this bias requires advocacy as well as targeted programmes for young women to take up jobs in phone repair and app development, both of which are flexible and relatively lucrative activities with high job satisfaction and the opportunity for on-going learning and upskilling. In terms of physical capacity, women are still labelled as unable to manage wood or scrap metal. The century-long stereotype that women are only capable of working with clothes or arts is very much alive among those working in repair and reuse.

The invisibility of women in repair services does not, however, mean that they are not engaging in repair and reuse activities. For example, NTECH Solutions (based in Mombasa) in partnership with 'Boost Your Learning' (an initiative by Close the Gap - Kenya), have recently launched a 'Women in ICT Repair and Maintenance' training programme' to address these gendered gaps in repair.

We know that it is often the role of women to repair and reuse items in the domestic sphere, such as cookstoves in rural Kenya, clothes and shoes, and take decisions about the repair of household appliances.[35] However, the repair and reuse activities of women in the household is something that is difficult to quantify. On the flip side, **women are seen as honest players** in the industry and have an upper hand if well established in the industry.



Practices: Exploring Repair and Reuse Business Models

"Many youths really hustle out here through repair. I personally do mechanics and it is also good as a side hustle [..] if it mostly entails electronics I don't think so, because I don't have that knowledge"

Shujaaz SMS survey participant

Repair and reuse businesses are rarely standalone businesses in Kenya. Instead, **repair and reuse practices are often found embedded in other businesses**. Repair and reuse might be a side hustle for a sole trader, a complementary service offering as part of the ethos of a small business, or standard practice for multinational companies in particular sectors (automotive, energy, appliances).

Repair and reuse occur more prominently where warranties are standard practice and products are more expensive. The perceived value of a product and a customer's relationship with a product (because it was a gift, or it is an important part of the household, or because it is a "good make") lead to higher demand for repair and reuse. Businesses that offer repair of such items have sustained customers. The repair and reuse of electronic products seems to be a complex and ever changing but potentially lucrative part of the market, which is why some companies and traders offer it in addition to other repair and reuse services. Electronics repair is competitive, so businesses who offer this service need to be flexible and diversified.

What makes a business a 'Repair and Reuse' business?

Part of the invisibility of repair and reuse in Kenya is that many businesses do not define what they do as "reuse" or "repair". Many would simply say they provide the services that their customers demand, or that they make things work again, or that

they are specialists or innovators, or simply makers. Our business survey highlighted that “repair” activities are not analysed as separate lines of revenue, and many who identified that over 75% of their activity is “repair” would not call themselves “repair businesses”. This makes analysing business models a difficult task. Repair and reuse activities are hidden within wider models.

Despite this, businesses surveyed identify multiple benefits associated with repair activities, including environmental and economical (Figure 10).

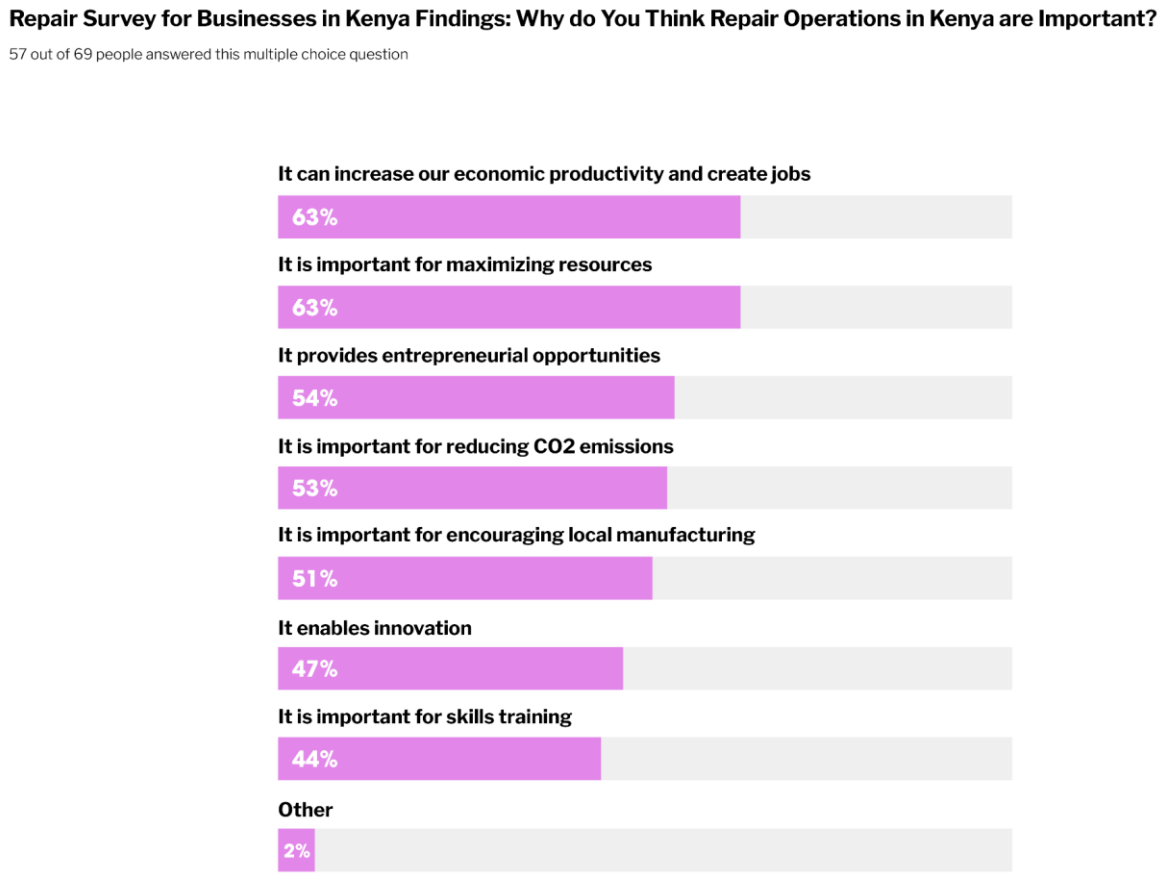


Figure 10. Repair survey for businesses in Kenya findings

a. Business models identified in Kenya

With an understanding that there was a small sample size, the following business models surfaced in our survey of Kenyan business and through our repair meetups. These models offer cost savings for the clients and realisation of other added opportunities. There was a predominance of small repair facilities operated by a specialist – Motorcycle repairer, phone repairer, plumbers, clothing tailors, furniture craftspeople, for example, but also large-scale warranty repair centres such as WeFix and Carlcare Service. Overall, we have categorised repairers as either a 100% repair business or a blended model as described in the table below.

Table 4. Types of business models identified

Category	Examples of product segments	% of repair done in business	Revenue from repair services
100% Repair Business*	Furniture; Electronics; Bicycles; Vehicles.	50-100%	Average of £10,000 /annum; ranges between 15-80% of total revenue
Blended 1 – Manufacturers who also offer repair of products	Furniture; Clothing; Electrical wiring; Plastic by-products; Toys; Plastics in healthcare.	10-50%	Average of £5000 /annum; 1-70% of total revenue
Blended 2 – Service provider or retailer who also offers repair of products	Software developers; Energy services; Pest control services; Agricultural products	10-50%	Average of £4400 /annum; 0-50% of total revenue

***Notes:** The gap between proportion of repair done and revenue generated from repair indicates there must be other activities that also sustain these businesses, but they self-identify as repairers.*

Digital marketplaces connecting supply with demand

Digital technologies and integrated digital platforms play a major role in creating connections that go beyond the current form of traditional buy-sell/trade/exchange online marketplaces. There is an increasing emergence of digital marketplaces in Kenya that helps to connect Fundis operating the Jua Kali sector to potential customers. Whilst we consider digital platforms as part of 'Place' (according to the 6Ps framework we're using), we have engaged with a few such businesses during this phase of work, including:

- **Fundi On Call**: a platform that provides individuals the opportunity to connect with screened and verified independent professionals for household improvements and repair technicians for all household appliances including fridges, washing machines, microwaves, freezers as a few examples. Verification is an important value offering to address the elements of trust in procuring repair related services.
- **JuaKali Workforce**: this platform is designed to facilitate the livelihood opportunities by connecting clients with skilled workers from the informal sector.
- **JuaKali Smart**: is a unique online marketplace that allows customers to purchase certain items directly through the platform or to connect with Fundis that specialise mostly in the design, make up and repair of wood and metal products.

There are numerous digital platform business models to be explored further which are suited to the localised context across Kenya. The three examples shared above have identified the gap that exists between customers and Fundis (operating in the Jua Kali sector) across many different repair service needs. The role of digital platforms and associated technologies provide significant opportunity to connect customers with Fundis but also has the exponential opportunity to connect Fundis across the whole value chain to other key actors such as those who handle spare parts or provide product repair insights, repair knowledge and repair problem-solving community connections.

A Story of Building a Repair Platform

Stephen, a small electronics expert living in Nairobi

“After being in this industry for over 10 years, he is now building a repair solutions platform to help with diagnosis and pricing of repair work. He is keen on how repair pricing is derived and how to build a trusted repairers pool for the region. ”

‘For the past 10 years, Stephen has been selling and repairing smartphones. Personal computers were only added as a repair service 2 years ago. For Stephen, he realised that individuals and families, especially those with children, were having more repair needs. This is a lucrative market but the upfront diagnosis for each item, from the customer, is a challenge.

Most users may not know how to establish the number of RAM slots on their PC or motherboard model number. If we were

having this problem, how widespread was it for both users and technicians alike? We see this as a growing challenge. We estimate the number of PCs in Kenya to be 6.5 Million for a total population of 51 Million. The number of products in households using chips is also growing: with improved incomes and infrastructure (e.g. the rolling out of 5G networks) being some of the contributing factors.

To respond to the need of getting information on the pc from the user,

Stephen and his team are developing a detection engine which is 85% complete. This part of the platform is aimed at making life easier for the customer. The app extracts operating system (OS) information of the product which is then provided to the technician via the app, without the customer having to know where to find it.

On the web-app, there is a 3rd party technicians sign up page, with an embedded user-review powered rating system to encourage ethical repair and use of genuine/ high quality parts in the repair work to encourage 'transparent' repair.

Stephen is hoping the platform will encourage responsible repairs that leave the earth a little greener. It's a costly journey; building the app, the enabling ecosystem and putting together the team, but the benefits far outweigh the costs.

Success for Stephen looks like creating employment for the +60% unemployed youth in Africa, bringing happiness to customers who have had a repair job well done and leaving our Earth a little greener by encouraging sustainable repairs and encouraging reuse for another couple of years."

The Journey of a Repair Process, Including Decision Points, Barriers, Actions

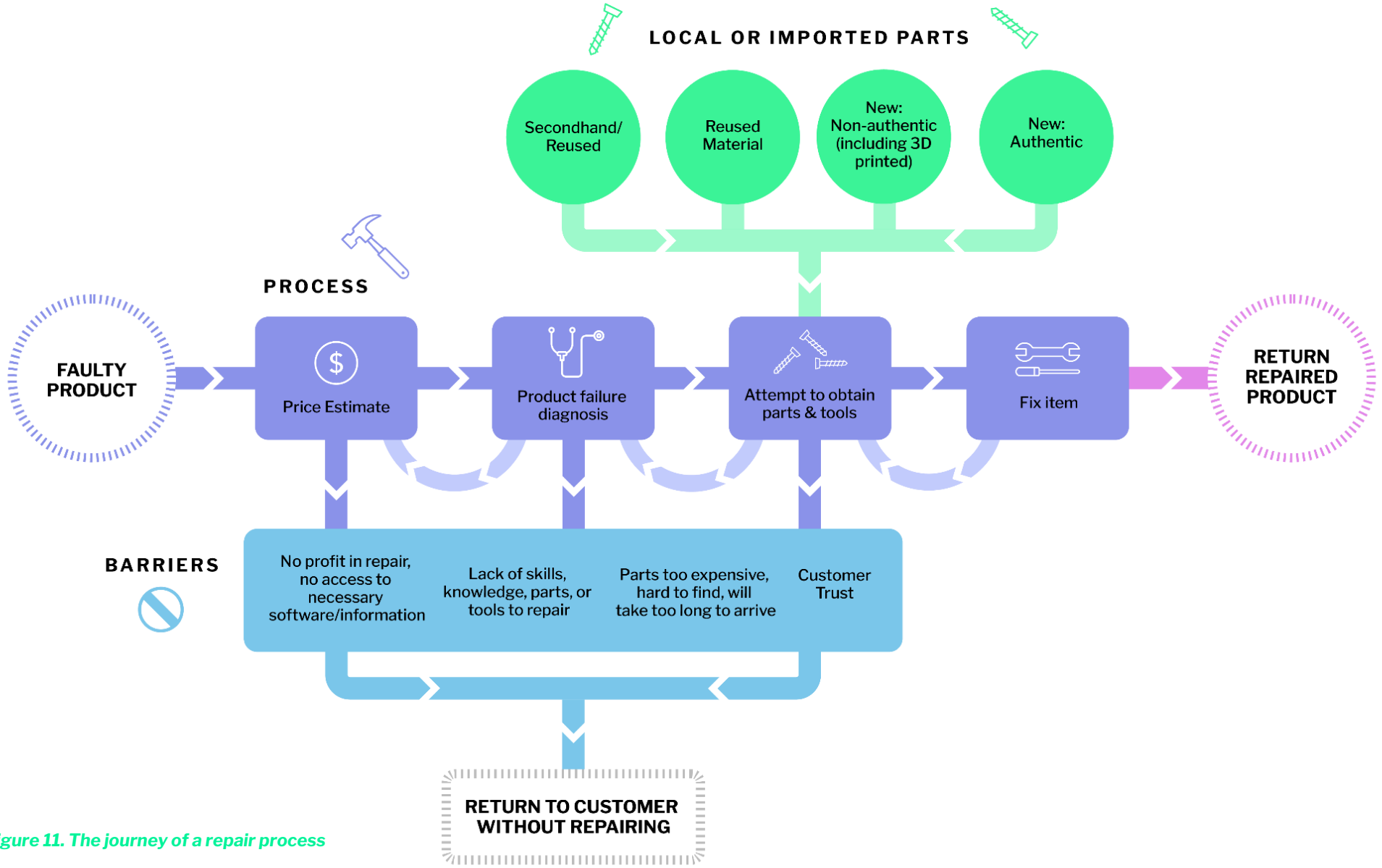


Figure 11. The journey of a repair process

The business models presented above function either because they have a high enough volume of customers to be profitable, or just enough work to sustain themselves/their families (in the Jua Kali sector), or because repair is a minor part of their business. All of this is to say that repair is not an overly profitable activity by itself. Spare parts are costly and difficult to source, and combined with labour costs and other overheads, the price the customer would be required to pay often exceeds the price of a new item.

In our business survey, across all types of businesses that offer repair services (100% repair, Blended 1 and 2), **the average expenditure on spare parts for repair services was £12,000/year, but the average reported revenue from repair services alone was only £5,500/year**. This would amount to a loss of £6,500/year on average, without accounting for the cost of labour, taxes, and other overheads. This extraordinary finding highlights how unsustainable many repair businesses would be without other work, or a high enough volume of customers to enable providers to buy parts in bulk and make deals with brands and insurance companies for their authorised servicing.

"Sometimes one looks for some rare missing parts and they are in something we collect [..] and accumulate as many junk as we can and start selling them [..] The junk is the motherboard from the eWaste items collected [..] You know in (inaudible) in the estates, there are those people whose maybe fuse or cable is not functioning. So, when such items are disposed, they are sold to the fundis who then repair them and sell them in the hood. So, in that process, one may interact with the motherboard, which the motherboards also goes along with some other items. So, when dismantled one might get the copper lining. One kilo of copper is 600/-."

Young Fundi, Mukuru Nairobi

A compounding factor for the **unaffordability of much repair for customers is the price paid for scrap materials**, which means that products are sometimes more valuable disassembled. This is particularly true for mobile phones and other metal goods. Recycling technology and investment in this aspect of circularity has given scrap materials a route to profitability that broken, but intact, products cannot compete with. The profit in recycling, upcycling and even some remanufacture, is that profit arises from what would otherwise be waste. The profit in repair is only there when there is huge customer demand (as with mobile phones), or high volume.

But the **repairers we met were passionate about their work and we found that the value in repair often lay outside of profits.** Repair offered service providers and customers alike emotional and intellectual value, social value, and environmental value. Interestingly, these drove some of the repairers to continue their trade against financial barriers.

A Story Of Repair

Mark – A bicycle repairer from Kisumu

Mark runs a niche bicycle repair business located in Kodele Market in Kisumu. He considers himself a Jua Kali Artisan. He has been in the bicycle repair business for more than 10 years. Mark is a highly sought after Jua Kali because of his talent and experience. His customers are loyal and travel from as far as Nairobi, Mombasa and even Eldoret with their bicycles for Mark to repair. Mark is also known for his incredible talent in repairing mountain bikes and other specialised bicycles.

“Baiskeli za kisasa ni ngumu kuzielewa. Lakini inabidi nizitengeneze. Kwa sababu nimefanya kazi ya baiskeli kwa muda mrefu, mimi hujaribu kutafuta mbinu ambazo naeza zitumia kurekebisha baiskeli za kisasa kwa sababu hakuna mafunzo yeyote kuhusu urekebishaji wa baiskeli hizi huku nje. Sasa ni kujaribu tu na kujikosoa na hatimaye naeza kutengeneza. Mimi huhakikisha kuwa nimehudumia wateja wangu vizuri wanavyotarajia.”

Translated to English: "The new bicycles coming up these days, I don't understand them. But, I need to work on them. I have to find ways of using my experience to work out how to repair these new modern bicycles. There is no way of getting training out there. It is a process of trial and error. But I always make sure I get it right for my customers."

Sourcing the right quality spare parts that are affordable is a major challenge faced by Mark. Every few days, he journeys across to Uganda to source affordable spare parts to service his customers. He is limited to 2/3 bicycles at a time. The low volume access to spare parts affects his ability to grow and generate a sustainable livelihood. Demand for repair is not the issue but sourcing parts has become hard. As technology and product design change, so do the bicycles. Keeping up the modern bicycles and additional tooling that is required to repair these bicycles has been challenging.

Building trust with his customers is very important. Mark has seen other bicycle repairers pivot towards motorised bicycles or motorcycles "this is great, but I have found my niche in bicycle repairs because despite the challenges I see this as a viable business for me to continue to grow". For all others wanting to get into repair, Mark advises to not rush into any business of repair to make quick cash – there are no quick and easy paths to creating repair businesses. A repairer must develop their talent and be passionate about the work they want to do and service their customers well.

b. Barriers and enablers to repair and reuse business success

Drawing on the conversations and insights gained from the various Repair Meetups[36], repair and reuse entrepreneurs identified these as the key ingredients for success.

Servicing your customers was the biggest success factor identified during the repair meetups. As presented in table 5 below, routes to customer satisfaction included:

Table 5: barriers and enables to business success

Barriers to business success ⯃	Enablers to business success ☆
Unable to find quality repairers (fundis)	Being proactive in communication with the clients.
Unable to find or afford quality spare parts	Obtaining certification and accreditation of technicians by the responsible statutory bodies.
No access to quality tools	Paying attention to details.
Access to financing to scale business, or lack of path to scale business	Offering reliable and on time delivery services.
Not having access to parts pricing or being able to diagnose the problem to quote the appropriate price.	Quoting the correct pricing at the time of accepting the work.
Lack of educational support and certification	Listing of repair technicians' examples on a Google directory.
Greater profits in selling component parts as scrap than in repairing or reusing items	Support from government for loans expanding the sector.

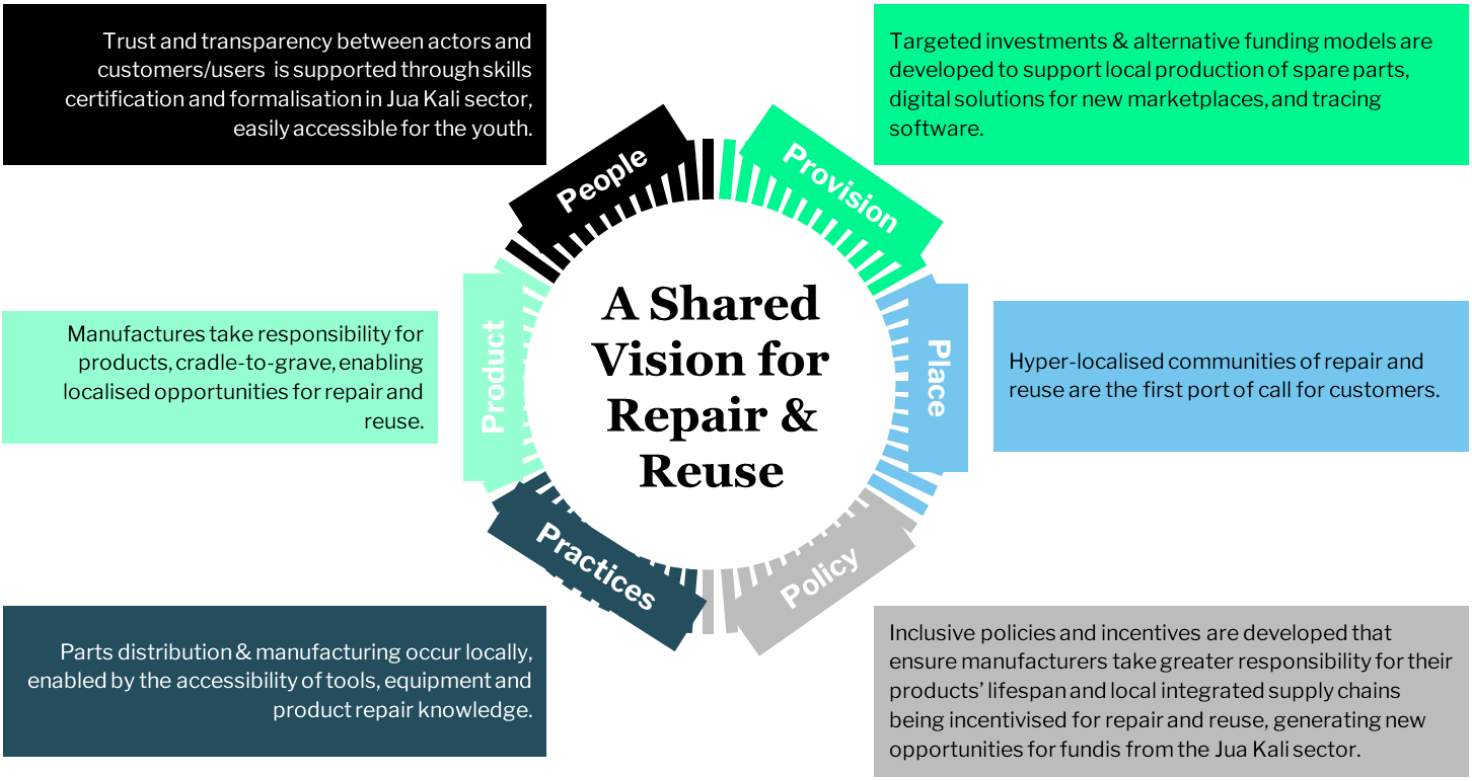
4. Building a Vision...

and Thesis for the Repair and Reuse Market in Kenya

This work set out to understand the landscape, networks, evidence gaps, needs, and size of the repair and reuse economy in Kenya **to collectively imagine a better future and a vision for the repair and reuse market.** We did this by bringing together the brightest players from repair and reuse communities (whose voices are not often heard and who normally don't engage with each other), leaders from across the ecosystem, as well as local and global experts, innovators, researchers, and our local partners - Shujaaz Inc, Busara Centre for Behavioural Economics, and The Incubator Nest.

Rather than focusing on specific incremental opportunities on what could be achieved today, as a CoLab, from across the ecosystem we collectively imagined and co-created a 'better future' for the inclusive circular opportunity for repair and reuse economy in Kenya.

Together we see a future where...



Potential innovation and research interventions to help us achieve the future vision

As part of the pathway towards achieving the collective circular future vision for repair and reuse in Kenya, through the CoLab approach, we co-designed a set of potential future innovations and research interventions. We address each "P" in our system view of repair and reuse below and introduce meaningful mechanisms for improvement.

PEOPLE: Trust and transparency between actors and customers/users is supported through skills certification and formalisation in the Jua Kali sector and easily accessible for the youth.

Lack of trust and transparency across the repair and reuse value chains emerged in our work with customers and repairers. Many customers felt uncertain about pricing and felt concerned about leaving their valuable products with repairers, particularly those they did not know or had not used before. **Customers** also felt that there was not enough transparency during negotiation and through the communication process.

Equally, some **repairers** felt immense pressure to negotiate the correct price upfront without knowing the full extent of the 'fault' in the product and were uncertain of the replacement parts needed for the repair work. In addition, most repairers felt there was no path to recognition of their skills and indeed no clear entry path for young people to gain skills in the repair space.

In addition, the key roles that **brokers and lenders** play in the trade and acquisitions of parts and materials also highlight the opportunity to engage with these actors to improve transparency and trust across the value chain in repair and reuse activities.

Potential innovation interventions:

- **Create better certification and training opportunities** to enter into the industry, to bolster existing and future skillset requirements, and to build longstanding and trustworthy customer relationships. In the formal sector, there is an opportunity to liaise and co-partner with TVET institutions to help people develop suitable repair skills for the industry to thrive into the future. Our partners in Kenya also recommended partnerships with local NGOs and community based organisations to create awareness of the repair industry and make it more visible to both repairers and customers alike.
- Explore opportunities for subsidised **formal internships** that would map young people to experienced mentors, such as Jua Kali fundis, to acquire the necessary technical skills and entrepreneurial acumen to succeed into the future.
- There is also an opportunity to run **targeted training programmes for young people** that will equip them with skills around reuse and repair techniques. This could include business skills, financial management skills, value add techniques etc. These blended approaches and non-traditional routes could improve perception, entry and trust in the sector.
- Support a shift in young people's behaviour away from commercialisation (when commodities are a perception of wealth). This could be achieved through the design and implementation of interventions such as **media campaigns to normalise repair and reuse in society**.

Future research questions to be explored:

- What specific technical training skill interventions are required for certain product categories such as mobile phones, solar panels (incl. off-grid),

electronics, automobiles and textiles primarily in the Jua Kali sector? And what market access approaches are best suited for this to ensure these are accessible?

- Is there an interest in redressing the gender balance in repair activities?
- How much do people self-repair in Kenya? Would Kenya specific repair communities, such as Repair Cafes or online community platforms such as iFixit, be useful and considered valuable?
- Do individuals choose to get repairers only to avert losses? How do we promote general sustainable behaviour in these micro-economies?
- Brokerage appears to be a powerful way to control all elements of the value-chain from participants, prices, social status, etc. How can the brokerage system be used to introduce positive inclusive changes to the value-chain?

PRODUCT: Manufactures take responsibility for products, cradle-to-grave, enabling localised opportunities for repair and reuse.

This landscaping work demonstrates that products with manufacturer support for repair and reuse, and those with important personal value (monetary or emotional or functional), get repaired more than others. This finding correlates with other studies on repair.[37] We know that when a product is supported for repair and reuse it means that there are clear pathways (e.g. people know where to go to get something repaired), an availability of repairers and reuse pathways, and a relatively low or zero cost to consumers when items are repaired under some type of warranty or part of a take-back scheme. When such conditions are not available, barriers to repair and reuse increase.

In our survey of Kenyan businesses, 35% of respondents felt that all manufacturers should be required to design and assemble products for repair; this was the third highest initiative recommended to improve repair circularity. This would also apply to brands that do not have a manufacturing base in Kenya where products (new or used) are imported.

There are both theoretical and practical ways for manufacturers to incentivise and support localised repair and reuse activities, including upstream design-for-repair innovations and downstream product service innovations.

Potential innovation interventions:

- Incentivise manufacturers to **design-for-repair** which can include modularity among product ranges, ie. where a part on Model 1 can be swapped for a part on Model 2, and modularity across different manufacturers as well. Design-for-repair can also refer to making parts and information on how to repair easily accessible.
- In addition to design-for-repair, manufacturers should consider **product-service system models** such as extended warranties, service contracts,

subscription models, product-as-a-service (rental), and pay-as-you-go value propositions. At present, these models are easier to implement if the manufacturing occurs in-country. Alternatively future communities of decentralised and authorised repair need to be explored further to determine how to overcome repair barriers particularly for brands that are not manufactured in-country.

- Healthcare products could benefit from business models that include servicing of equipment and medical devices in the continent. Currently, many healthcare settings do not have trained engineers required to service and maintain equipment, and relevant authorisation from the original equipment manufacturer to repair or replace broken parts of the equipment. As a result, healthcare equipment, related products and tooling, when they break down, are unrepaired. These items become redundant and ultimately, it is the community who suffers the most.

- There is a huge opportunity for **global and local organisations to train engineers and repairers to service healthcare devices, perhaps** alongside locally and on-demand, **3D printed spare parts**. As noted above, the healthcare sector is particularly complicated by original equipment ownership models and when devices and equipment have been donated (donor/grant funding). They lack the necessary preventative maintenance, supporting infrastructure and approved localised repair frameworks to ensure the full benefit of the healthcare equipment into the long term future.

In the future: "Companies (global companies) are taking an active role in stewarding their products from cradle to grave. They are focusing on supply chains locally both for producing more appropriately and for creating spare parts supply chains."

John, Kijenzi

Future research questions to be explored:

- For products with a low repair incidence (some medical devices and household appliances), where are the product-cycle failures? e.g.: lack of trained service engineers? Pricing? Behaviour change?

- What materials can be recycled back into the repair economy and how might this inform new emerging business models. e.g.: Additive manufacturing and digital design? IoT track and trace, and embedded product history tracking capabilities?

- How could the complementary circular economy practises of upcycling, remanufacturing to repair and reuse within the existing value chains be supported to include design for repairability including end-of-life product strategies?

PRACTICES: Parts distribution and manufacturing occur locally, enabled by accessibility of tools, equipment and product repair knowledge.

A main barrier to repair activities, in particular, is the cost of spare parts. Customers and repairers told us that spare parts make repair activities unaffordable. Where spare parts are not available locally, the lead time for repair increases significantly when imported spare parts are needed and not readily available. For some products, like mobile phones which customers use every day, waiting for a spare part to arrive is not desirable - they want their product fixed as soon as possible. The COVID-19 pandemic has further highlighted the need for local resilience in supply chains.

Potential innovation interventions:

- **Support local manufacturing and local spare parts supply.** Improved supply chains, localised production of products and spare parts provides the opportunity to improve supply chains for repair and reuse. This will allow for skills upgrading and job creation (in the formal and Jua Kali sector) to be facilitated through the increased localised demand opportunities. Cost reduction is possible through reduced lead times (particularly for spare parts), shorter transportation distance (and associated costs), and overall reduced maintenance costs due to an improved locally available after-market and sales support.[40]

- In Kenya's Health Policy 2014–2030, the promotion of local production, research and innovations of essential health products and technologies, has been identified as a key action area, where strategic investments will need to be made to facilitate the attainment of set health policy objectives[38]. Local production using 'context-aware design' through product development partnerships (PDPs) is one of the suggested solutions to improving access of medical devices.[39]

- **Enable digital tracing technologies to support spare parts and repair services for product-life extension and end-of-life product strategies**. Digital parts tracing is an alternative approach to improve transparency in availability and pricing of spare parts in the Kenyan market. A Brazilian platform – Spare Track – aims to do just this. The reliance on online systems, however, may only work in certain parts of Kenya and requires reliable and accessible internet systems, with a risk of deepening the digital divide. Innovation interventions in this regard need to incorporate and address elements of accessibility.

- **Facilitate tool sharing and access to equipment** for repairers in the Jua Kali sector who do not own their own. A sharing economy could save on the need for start-up capital and further encourage circularity through the need for fewer individually owned tools and equipment.

Future research questions to be explored:

- To what extent could new technology or tools enable a smoother diagnostic phase, either for a product user ahead of accessing repair services, or with repairers themselves?

- What percentage of products are not able to be fixed by repairers, and is this the result of spare parts unavailability, lack of tools/training, or time required to repair a product?
- What are the barriers to reuse for users, beyond a cultural desire for new items? Would localised collection of products (as is the practice by Africa Collect Textiles) increase reuse?

POLICY: Inclusive policies and incentives are developed that ensure manufactures take greater responsibility for their products lifespan and local integrated supply chains are being incentivised for repair and reuse, generating new opportunities for fundis from the Jua Kali sector.

Government initiatives and policy have the potential to significantly influence (and scale) the repair and reuse industry in Kenya. Extended Producer Responsibility (EPR) regulations and waste from electrical and electronic equipment (WEEE) directives currently being introduced in Kenya could accelerate activities in repair and reuse markets, if addressed appropriately. The current focus in EPR regulations in Kenya are to scale the circular economy and waste management sector. In this study, it is evident that the repair and reuse economy have not been considered, at this stage. Many other stakeholders, including Fundi's in the Jua Kali sector would need to be engaged to ensure an inclusive approach is developed.

Potential innovation interventions:

- Use the momentum of **EPR and WEEE directive to pave the way for reuse models** to expand into other products, as the value retention becomes clearer, and businesses become more accustomed to avoiding waste.
- Encourage producer responsibility organisations (PROs) to **collect e-waste, test components and recirculate working electronic components into secondary applications.** This might also provide the opportunity for additional income streams (**EPR certificates**) to be earned by PROs from large brand manufacturers of consumer electronics.
- Landscape the potential **impact of policies like the Right-to-Repair for Kenya**, and look at additional incentives such as support for capacity development, technical training, start-up capital funds, and tax relief on spare parts or repair labour as examples.
- Explore the potential for **product stewardship legislation** that would require manufacturers to take responsibility for their product life extension and end-of-life product strategies.

Future research questions to be explored:

- Will introducing a fee and subsidy PRO based system in eWaste divert revenue or access to activities in repair or components from reuse from the Jua Kali sector to the formal sector?

- Similar to the EPR fee structures, could fees from the responsible eWaste waste users and/or producers be used to enhance the informal repair and reuse sector to increase repair and reuse activities?
- How can EPR regulations be implemented to maximise the inclusive participation of stakeholders in the formal and Jua Kali sector that enable and promote the repair and reuse market in Kenya?

PLACE: Hyper-localised communities of repair and reuse are the first port of call for customers.

Communities are critical in the procurement of repair and reuse activities - customers more often than not source repairers locally and are more likely to donate or buy/sell reused items in these spaces. Repair and reuse activities thrive in local networks. By positioning repair and reuse as a hyper-local activity, there is additionally the opportunity to build trust and transparency.

Potential innovation interventions:

- Develop **regional supply chains for repairers and spare parts**, and investigate the opportunities for regional repair hubs (e.g. East Africa)
- Support **young people to become advocates for repair and reuse** to thrive in their neighbourhoods and communities
- Pilot the concept of a **'Repair Mall'** with access to common repair equipment and workshops where micro repairers can rent time on equipment they can't afford individually
- Support **digital communities of repair and reuse** that connect consumers and repairers. These virtual platforms can encourage relationships between consumers and repairers (e.g. communication, negotiation, etc. can all happen transparently there).

Future research questions to be explored:

- How might decentralised specialised communities of repair work in Kenya? What role can peer-to-peer or crowdsourced skills/knowledge transference contribute to this?

PROVISION: Targeted investments and alternative funding models are developed to support local production of spare parts, digital solutions for new marketplaces, and tracing software.

We have heard from stakeholders from donor programmes, impact investors and key decision makers across the innovation and entrepreneurship ecosystem in Kenya that there is a desire to explore opportunities to invest in companies that are scalable, innovative, and have an impact footprint. Funding and capacity development for businesses in the formal sector and those that operate in the Jua Kali sector has been identified as critical areas of support for the repair and reuse market to grow sustainably. As presented in the previous section, 100% repair business models are not common. For many, profit margins are generally low, market access can be a challenge, and navigating the complex supply chain for spare parts are some of the main barriers for businesses in repair to scale and grow.

The traditional investment models for startup capital, capital equipment and working capital to support procurement of spare parts and materials (as an example) are not necessarily designed to suit the financing pre-requisites for startup, micro, small and medium sized entities, particularly in repair and reuse business models. Most times they do not have the necessary internal structures and long term financial track records, and have a limited asset base which in short might be considered as too high risk from an investment perspective.

As the regulation environment and incentives for repair and reuse become more embedded in Kenya, investment opportunities are likely to increase. Importantly, the consideration for suitable capital support for both the formal and Jua Kali sector needs to be explored further. Effective funding models will play a major role in enabling the transition towards a localised circular and inclusive economy for repair and reuse.

Potential innovation interventions:

- Investigate the potential for investment in **digital track and trace platforms**, as these have been discussed as routes to innovation in circularity. For example, the automotive repair sector in India is projected to increase to $25 billion USD by 2030 from $8 billion USD in 2020 using online service platforms.[38]

"The India car services and repairs market is currently quite fragmented, but tech platforms are building out quality and affordable solutions in this segment by offering services such as doorstep pick-up and drop low-cost service and post-service warranty to customers. Tech platforms are also providing service workshops with genuine and affordable spare parts, tech-led demand generation and efficient logistics support resulting in higher margin and increase in footfall."

- Explore capital expenditure investment opportunities into **more sophisticated equipment that can enable accurate testing, refurbishment and reapplication** for electronic equipment especially

Future research questions to be explored:

- What type of capital is being invested and in which market segments of repair and reuse? And what is the average ticket size of investment?
- What alternative funding models can support repair and reuse grassroots entrepreneurs and innovators?
- What repair and reuse business models are desirable, feasible and viable to fund from the perspective of impact investors?
- Would the injection of capital change attitudes, norms, and what behaviours would prevail in the value-chain? What type of such financial support would be most effective, e.g., investing in an e-commerce platform for youth working in the industry to connect directly with the buyers, invest in government or commercially run refuse-collection point?

5. Closing Comments

Repair and reuse are a thriving but invisible segment of the Kenyan economy. Many small firms and entrepreneurs provide repair services, and reuse is active, if somewhat undetectable. An ethos of value retention of resources exists in Kenya, but the circular industries have also suffered from cheaply made, lower priced imported items, driving people to throw away products when they break because the economics of repair do not make sense.

With our local partners, we met passionate repairers, fundis, innovators, customers and advocates for the circular economy - who loved Kenya, their country, their trade and the products they used both for functionality and pleasure they brought to their lives. For those in repair and reuse, many did not imagine creating a livelihood for themselves in this space. Notably, financial gain is the primary driver for many in the Jua Kali sector to enter repair. At a certain point along this journey, the livelihood opportunity created in repair and reuse goes well beyond monetary value.

Creating purpose, developing your skills and talents, fostering your growing passion in repair and reuse to service your customers, and to be valued and respected in your communities is key.

We are pleased to have been able to bring together different groups of repairers, customers, policy makers, investors, innovators, and researchers to talk about repair in Kenya, and this project hopefully marks the start of a network of stakeholders to move forward.

To build on the current conversations, there will be a series of webinars on the Future of Repair in April 2022, where we will continue to engage and build on a future vision for repair and reuse in Kenya. The social and community spaces of repair and reuse speak to these practices being at the very core of the human-material interaction. We want to continue to co-create a more sustainable and prosperous future for Kenya, where circular practices become embedded in everyday choices.

Appendix

A. Methodology - detailed view

Our approach relied on bringing the ecosystem together to map the possibilities for the repair and reuse market in Kenya. Our approach involved several methods to answer the research questions comprising:

- literature review of available evidence;
- key informant interviews;
- four roundtable 'Partner and Learn' discussion sessions;
- one online repair meetup and four in-person repair meetups in Kenya;
- an online survey of businesses in the formal economy in Kenya;
- youth focused MSME and Jua Kali economy research; and
- consumer research in Kenya.

We worked and learned together with our partners using a combination of methods to address the research questions across the 6Ps framework, as follows:

i. Literature review

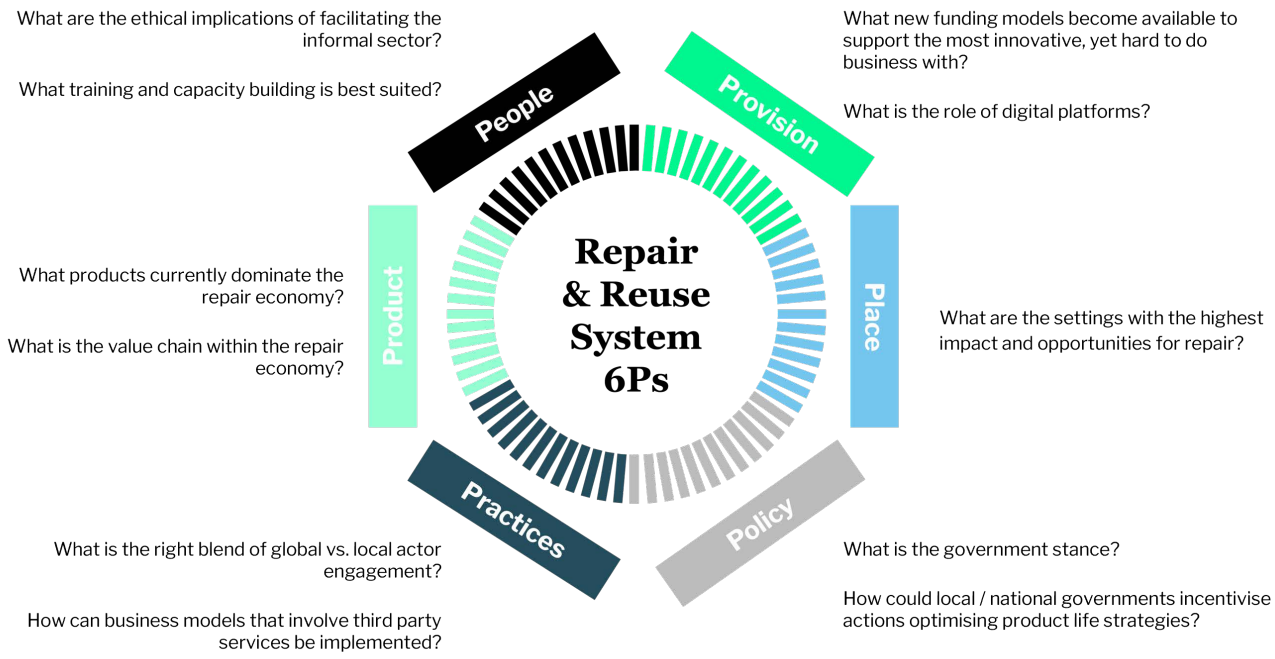
A desk-based literature review on repair and reuse was conducted at the beginning of the project to establish an understanding of the existing Kenyan repair and reuse ecosystem. This included a review of academic and grey literature, as well as an analysis of secondary data sources to complement the primary research data.

The literature review helped contextualise current understanding of repair and reuse within circular economy frameworks. It also enabled a baseline understanding of which sectors have been previously studied in Kenya – these included consumer electronics, especially mobile phones, vehicle repair, repair and care of mosquito nets, textile reuse, and issues around skills training and health outcomes of repairers. These studies were complemented by those examining the informal sector in Kenya more generally, and studies on consumer repair behaviours, repair barriers and enablers, and the Right-to-Repair trends in high-income countries. We identified gaps in the literature for the repair and reuse of specific products in Kenya, including appliances, construction materials and medical equipment and devices. Also absent was an understanding of business models for repair, market size and consumer behaviour specific to Kenya. It was these areas that this project has sought to investigate.

The boundaries of the scope on 'repair and reuse' for this research is limited to the optimisation of the useful life of products and components that retain the manufactured value that has been added, as defined in the Section One of this report.

As presented in Figure 1, the initial phase of this project mapped questions and desk-research onto the 6P framework. The initial insights observed are captured in the figure overleaf:

An initial diagnosis across the 6P framework



ii. Stakeholder engagements

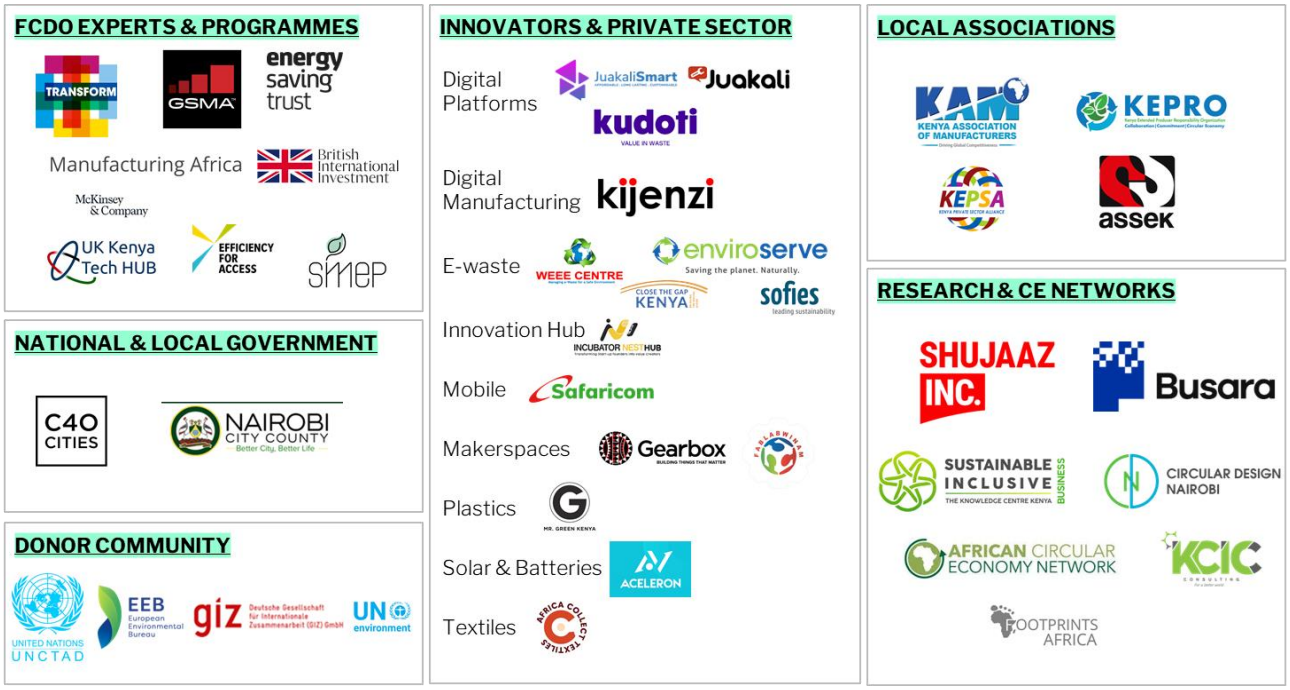
Qualitative engagements and consultations with stakeholders from across the ecosystem were conducted in three main approaches: 1.) Stakeholder interviews, 2.) Partner and Learn Roundtable Events, and 3.) In-person repair meetups.

- **Semi-structured interviews** with key informants from a variety of organisations were completed between November 2021 and February 2022. A total of 33 interviews were conducted. The interviews followed a semi-interview format that was tailored to the stakeholders and their specific areas of expertise. All interviews were conducted online through video calls. Written notes were taken during each interview and analysed to identify key themes, linkages and takeaways for the report.
- A series of four virtual **Partner and Learn events** were hosted between December 2021 and March 2022. These events brought together a multidisciplinary group of stakeholders to collaborate on the project. The Partner and Learn events were intentional about convening a multidisciplinary group of stakeholders, including leaders, local and global experts and local partners to learn from each other and co-design a vision and opportunity space for repair and reuse in Kenya. These sessions were highly engaging by design, where the research partners shared emerging findings and insights and open engagements, discussions and additional inputs were provided by all the participants. A total of 47 participants took part across these four events.
- A series for five **Repair Meetups** were hosted between February and March 2022. The first event was hosted virtually with a total of 43 participants. The four remaining Repair Meetups were hosted in-person taking place in Kisumu, Mombasa and Nairobi, with a total of 42 participants taking part. The

Repair Meetups were hosted and facilitated by The Incubator Nest, a Kenyan based entrepreneur incubator support business.

These three main approaches were designed to better understand the landscape of the repair and reuse economy and to convene all parts of the ecosystem to discuss and understand the barriers and gaps, linkages and key synergistic opportunities, and to explore the collaboration and partnerships needed to support the future vision of repair and reuse in Kenya. Across the engagements, the qualitative data gathered was analysed using an inductive approach. The key themes surfaced have been organised according to the 6Ps framework.

➔ **Select stakeholders engaged**



iii. MSME and Jua Kali informal economy research - led by Shujaaz Inc.

Led by Shujaaz, a Kenyan based research partner, a mixed-method approach was undertaken integrating both qualitative and quantitative data focused on the participation of youth from different counties across Kenya. This blended approach relied on Ground Theory and Phenomenology frameworks for data collection, analysis and interpretation. The approach allows for a rapid, multi-layered and localised immersion programme driven by the principle of triangulation and 3-layered inquiry and was guided by four key principles: participatory interaction; immersion; peer-to-peer data interaction and reflective sessions; and value for all.

The **qualitative phase** consisted of three data collection workstreams:

- Focus group discussion sessions with youth-led MSMEs in the repair and reuse sector engaged as entrepreneurs, employees, and or consumers. Adopting a snowball technique, participants were recruited from the Shujaaz and MESH digital platforms.
- Follow up positive deviant interviews with successful repair and reuse youth entrepreneurs were completed. Participants were identified during the Focus Group Discussion by fellow participants.
- Key informant interviews with key actors from within the local value chains of repair and reuse were completed.

The **quantitative phase** consisted of an SMS survey. The questions for the survey were designed based on the findings of the qualitative phase of the study. The survey was administered to youth who actively engage in the repair and reuse sector and are registered on the Shujaaz and MESH digital platforms. A total of 1000 respondents were reached with 335 actual respondents taking part in the SMS survey.

A total of 43 participants took part in the qualitative phase and 1000 participants took part in the quantitative phase. The age of respondents varied between 20-34 years of which 49% were female and 51% were male. The participants are located in 21 different county's across Kenya including: Bungoma, Busia, Garissa, Homabay, Kakamega, Kericho, Kiambu, Kirinyaga, Kwale, Kisumu, Migori, Mombasa, Nairobi, Nakuru, Narok, Nyandarua, Nyeri, Siaya, Taita Taveta, Tharaka Nithi, Trans Nzoia, Siaya and Vihiga.

iv. Consumer research - led by Busara

Led by Busara a Kenyan based research partner, an exploratory qualitative approach was undertaken to understand the behavioural and structural factors including the repair and reuse economy in Kenya. This included customer data collection by way of in-depth interviews, behavioural persona creation, and journey mapping. A total of 56 participants took part across 20 neighbourhoods in Nairobi.

v. Market sizing of the repair and reuse market in Kenya

The size of the repair and reuse market in Kenya has not been formally studied. This is in part because of its invisibility – repair and reuse are embedded in existing businesses and to a large extent in the Jua Kali informal sector. In fact, approximately 80% of Kenya's employment occurs in the Jua Kali informal sector[39]. In consultation with our partners at UNCTAD, a three-pronged approach was developed to size up the repair (and to a much lesser extent, the reuse) market in Kenya. This approach is complementary – the estimates generated in each of the three-prongs should be taken together with the others, as no one individual gives a clear picture of the size of the market:

➔ Level 1: Macro-estimation compared to other country estimates

An existing assessment of the repair market as part of the overall Kenyan GDP does not exist. To this end, the size of repair markets in other countries (such as the global repair market estimate at 984 billion GBP) was compared against GDP to arrive at a percentage size of the repair market.

➔ **Level 2: Sector specific estimation (aggregated)**

Using the international classification system for trade, Harmonised System (HS) Codes[40] import data was sourced from UN Comtrade for spare parts (such as automotive and appliances) and was used to obtain an aggregated value for specific sectors. This aggregated view was then used to develop a meso (mid-level, product focused) estimation of the repair economy in Kenya.

➔ **Level 3: Survey for formal economy of repair**

An online survey was designed to elicit responses concerning activities and experiences of repair to gain insight into scale and practices of the repair segment of businesses, including standalone repair service businesses and businesses where repair forms a part of their business operations.

The survey was conducted online in English between 07 February – 04 March 2022. The survey was distributed through various professional groups and mailing lists including, Kenya Association of Manufacturers network, the Sustainable Inclusive Business Kenya network, the KCIC Consulting network, the Association of Startups and SME's Enablers of Kenya network, the Kenya Business Community LinkedIn Group, as well as social media (LinkedIn and Twitter) and targeted emails to potential stakeholders and relevant organisations. The survey received a total of 69 completed responses. A range of respondents participated, including those from the agriculture, energy, professional services, manufacturing, waste management, education, construction, and retail sectors. The participants' businesses were located in the following Kenyan counties: Bungoma, Isiolo, Kakamega, Kiambu, Kilifi, Kwale, Kisumu, Makueni, Migori, Meru, Mombasa, Nairobi, Nakuru, Tana River, Trans Nzoia, Siaya, Usain Gishu, Vihiga and West Pokot.

The data was collected through the Typeform platform which also allowed for secure data collection by the Better Futures CoLab.

B. Links to partner final reports as part of this study

i. Shujaaz Inc.|

- Link to full research paper titled '***Youth and the Repair and Reuse in Kenya***'
- **Shujaaz Inc** is a network of social ventures based in Nairobi, Kenya. They believe the generation of young people can transform our global society for the better – that's why they work to break down barriers so that young people can take control of the future. Established in 2009, their 2x Emmy-award winning team run their three social ventures:
  - ➔ Shujaaz, our multimedia youth platform and East-Africa's biggest youth brand
  - ➔ Hustla MBA, our innovative peer-to-peer training venture
  - ➔ MESH, an online community for entrepreneurs, launched in 2021

Their social ventures inspire, entertain and mobilise 9.5m young people across East Africa, and in 2021 were used by 71% of 15-24-year-olds in Kenya. Their network connects young people with the information, skills and opportunities they need to take control; embedding them in a digital and real world community that gives them the self-belief they need to succeed, in their context and on their terms. Through all the work done, grounded in research, Shujaaz have proved that when young people take control of their lives, they create transformational change.

ii. Busara Centre for Behavioural Economics

- Link to full research paper titled ***'Consumer Behavioural Research on Repair and Reuse Market in Kenya : An Initial insight into the customers journey'***
- The **Busara Centre for Behavioural Economics** (Busara) is a leading research and advisory firm with extensive experience in designing and testing behavioural interventions that contribute to poverty alleviation in the Global South. We utilise behavioural science to help clients understand behaviours, and design and test solutions to scale their products, programs and policies. Our work prioritises rigour, relevance, creativity, excellence and teamwork, and relies on deep collaboration with clients, as well as strategic partnerships with governments, NGOs, private companies and academics across the Global South. We are unique in our approach and the tools that we employ, offering significant advantages over other firms in helping clients to achieve their goals.

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D. Endnotes

[1] EU Right to Repair as an example.

[2] International Labour Organisation. (2021, March). The informal economy in Kenya. Retrieved from: https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/documents/publication/wcms_820312.pdf

[3] Shujaaz Inc, Busara and The Incubator Nest are all Kenyan based organisations.

[4] https://www.thebusinessresearchcompany.com/report/repair-and-maintenance-global-market-report

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[6] Kenya GDP in 2019 was £74.8 billlion and in 2020 was £77.0 billion https://datacommons.org/place/country/KEN?utm_medium=explore&mprop=amount&popt=EconomicActivity&cpv=activitySource%2CGrossDomesticProduction&hl=en

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[9] We have used 2019 as the benchmark, pre-COVID-19, year. But we can additionally note that imports across all products, including spare parts, will be reduced by 12% in 2020, due to the pandemic supply chain and manufacturing impacts. No 2021 data was available at the time of writing this report.

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[16] https://kam.co.ke/wp-content/uploads/2021/04/Automotive-sector-profile-2020-1.pdf

[17] https://www.ifixit.com/smartphone-repairability

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[24] Kasper and Stroomer 2021.

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[31] Busara report

[32] Shujaaz report. See also Kenya National Bureau of Statistics, 2019 Kenya Population and Housing Census Volume 4: Distribution of Population by Socioeconomic Characteristics, December 2019.

[33] Shujaaz report.

[34] https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2021/12/YouthEmployment_R_WebSingles_2.pdf

[35] Rhodes et al. 2014.

[36] Repair meetups held in Kisumu, Mombasa and Nairobi in February 2022

[37] Bakker et al. 2018; Ben Ayed 2019; Camacho-Otero et al. 2019; Evans 2019; Houston et al. 2016; Nazlı 2021; Scott and Weaver 2014.

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