Circular economy in Africa: examples and opportunities

ELECTRONICS AND E-WASTE

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This article is part of a collection of insights on the circular economy in Africa. The goal of this collection is to explore the potential of the circular economy in a selection of key economic sectors in African countries and highlight examples of the circular economy in action. The sectors explored in this study are: food and agriculture; fashion and textiles; plastics; e-waste; automotive; and the built environment. The collection also considers the key role of public policy and the financial sector in creating the conditions needed for the transition to a circular economy.

The collection is the result of a joint effort led by four organisations: Chatham House; the Ellen MacArthur Foundation; ICLEI Africa; and the University of Lagos, who worked closely to combine their complementary knowledge and expertise on this broad topic. While the collection was curated by the Ellen MacArthur Foundation, it reflects a plurality of views and analyses.

ELLEN MACARTHUR FOUNDATION

ICLEI Local Governments for Sustainability AFRICA

CHATHAM HOUSE

UNIVERSITY OF LAGOS IN DEED AND IN TRUTH

Acknowledgments

We are very grateful for the support we have received in producing this article.

Special thanks go to the many leading circular economy practitioners and experts who provided invaluable perspectives in interviews and reviewed this article.

Their contribution to the article, or any part of it, should not necessarily be deemed to indicate any kind of partnership or agency between the contributors and the Ellen MacArthur Foundation, nor an endorsement of its conclusions or recommendations.

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Introduction

In a relatively short space of time, electrical and electronic products have globally become an essential part of modern life, changing the way people work, travel, and spend their leisure time. The availability and widespread use of electronics have enabled much of the global population to benefit from faster and easier communication, and better access to knowledge, data, and other product benefits. In Africa, the demand for Electrical Electronic Equipment (EEE) has increased by 2.5% annually.[1] Sales of refrigerators, television sets, and mobile phones have surged, and consumer spending in Africa, primarily by the middle-income class, has reached an estimated USD 1.3 trillion in 2010 (equivalent to 60% of Africa's GDP) and is projected to double by 2030. Mobile phone sales – specifically in Nigeria, Egypt, South Africa, Angola, and Ethiopia – rose by 65% within the last five years, doubling the global average.[2] As a result, Africa is ranked as the world's fastest-growing mobile phone market, creating multiple economic and education opportunities for the continent.[3] As the sales of electronics continue to grow rapidly in Africa, the generation of e-waste is also increasing, driven by both international trade and domestic consumption.[4]

What impact is this sector having and why is it critical to shift to a circular economy?

E-waste is a term used to cover items of all types of electrical and electronic equipment (EEE), and its parts, that have been discarded by the owner as waste without the intention of being reused.[5] Therefore, e-waste might be comprised of still functional or broken EEE and its components. Sources of e-waste can range from products (and the components therein) such as toasters and toothbrushes to smartphones, fridges, laptops, and televisions.[6] These items fall into one of the six globally recognised[7] e-waste categories which are:

- **Temperature exchange equipment** (e.g. air conditioners, freezers)
- **Screens and monitors** (e.g. TV, laptops)
- **Small equipment** (e.g. microwaves)
- **Small IT and telecommunication equipment** (e.g. mobile phones, printers)
- **Lamps** (e.g. LED lamps)
- **Large equipment** (e.g. washing machines)

In 2019, Africa generated 2.9Mt of e-waste which translates to 2.5kg/capita. At the same time, the continent has the lowest documented rate of collection and proper recycling, at only 0.9%.[8] Although the per capita e-waste generation in Africa is the second lowest globally, over 60% is derived from imports.[9]

Importations of second-hand electronics make such devices available to those who cannot afford new products, however at the same time, the built-in obsolescence of these products exacerbates the challenge of e-waste management in African countries. In addition, illegal imports of old or broken consumer electronics (sometimes under the guise of donations) often end up in waste scrapyards in countries such as Ghana, Kenya, and Nigeria. This waste has devastating impacts on people's health and the environment.

The handling of e-waste in Africa is often limited to crude processing means in backyards (e.g. smashing or breaking open casings), manual stripping to remove electronic boards for resale, burning to liberate and recover selected materials,[10] and the depositing of other bulk components, including cathode ray tubes (CRTs), in open dumpsites. These processing methods subject workers and local residents to land, water, and/or air borne pollution, and expose them to a whole range of different heavy metals and organic chemicals that exist in e-waste components.[11] ▶

For these reasons, e-waste management has emerged as a policy priority in Africa, with countries such as Ghana, Rwanda, Nigeria, and South Africa publishing policy frameworks to improve e-waste management, including introducing the Extended Producer Responsibility (EPR) policy.[12] Despite these efforts, 70% of e-waste within Africa is still disposed of at dumpsites, and the inherent value of the materials and the potential economic opportunities are lost.[13] **The circular economy can offer immediate solutions to this problem by extending product life cycles, and recovering functional and material value from e-waste. Eventually, in a circular economy for electronics, consumer electronic products will be kept in use for as long as possible, then professionally remanufactured for reuse, refurbished, or repaired, and the valuable components within them will be separated and recycled. Below, examples and opportunities from across the continent are discussed, highlighting the existing circular economy practices in action.**

The impact of design considerations

The influence of product design on the end-of-life performance of electronics and the recovery, treatment, and disposal of related secondary materials is crucial. The current approaches to product design (which often deliberately prevent life-span extension),[14] technical and perceived product obsolescence issues, and the use of toxic substances such as lead, cadmium, mercury, and plastics treated with flame-retardants need to be addressed if a global solution to e-waste generation and management is to be found.

Rethinking the design of products is critical to enabling the economic reuse of assets, as well as their components and materials. Information is also central to obtaining the optimum utility from devices. Information-sharing can help manufacturers and users see the true value as well as the life cycle impact of these devices, including their whereabouts, condition, and recovery potential. Better data, for example in form of a “tear-down” instruction manual[15] can enable products to be repaired or refurbished in a more time-effective manner, in some cases even by the original owner/user. Through implementing material passports, producers can allow for the highest value retention and recovery further down the line. Without these considerations at the design and manufacturing level, a circular economy for electronics will not be possible.

ELECTRONICS AND E-WASTE

CIRCULAR ECONOMY STRATEGIES

1

Repairing, remanufacturing, and upcycling to extend use cycles and create employment

There are thousands of repair and refurbishment businesses across Africa. They play a key role in bridging the so-called digital divide between wealthy consumers and those whose access to electronic equipment is limited by prohibitive costs. One example is the Otigba computer village in Nigeria, which is a hub for new computers, used imported computers, and refurbished devices. It has over 2,500 daily sales, including assembling, repairing, and refurbishing units for computers and ICT.[16] In Accra and Lagos alone, the repair and remanufacture sector generates income for more than 30,000 people.[17] Repair and refurbishment presents a real economic opportunity, which can be further scaled up. One example of that is WeFix, a South African repair specialist founded in 2006, which has grown into a nationally known brand, with a revenue of over USD 26 million.[18]

There are also other businesses which create value from e-waste and help to keep products and materials in use through upcycling. In Tanzania, the BuniHub maker space in Dar es Salaam is home to a 3D printer built entirely from e-waste parts – this success drew at least eight enquiries from other countries. In Ghana, the KLAKS 3D team in Kumasi are now running a computer company that builds 3D printers from e-waste. **Businesses focused on repairing, remanufacturing, and upcycling electronics benefit people by providing income opportunities, and benefit the environment by extending a product's end-of-life, therefore reducing the need for virgin materials and decreasing harmful waste and pollutants.**

2

Capturing the economic opportunity of urban mining

Urban mining is the process by which resources are extracted from complex waste streams. The economic opportunity for e-waste urban mining in African countries is significant. Smartphones are a good example of urban mining in practice: almost 1.5 billion are shipped every year, with each unit containing components worth over USD 100 – this represents a potential USD 150 billion of value that enters the market each year.[19] This value should remain in the system. Even if the materials present in smartphones were recovered through recycling – the least valuable loop of a circular economy – they could be worth up to USD 11.5 billion.[20] Yet, globally, only 17.4% of e-waste is documented to be formally collected and recycled.[21]

Urban mining can now be more economically viable than extracting metal ores from the ground. It can also be harnessed to curtail the continuous depletion of Africa's natural reserve of precious metals and the negative environmental impacts that entails. However, in cities and countries where the materials recovery of e-waste is a source of revenue for many, any solution to addressing e-waste value chains must include the safe and equitable integration of informal workers who already depend upon e-waste for their livelihoods.[22]

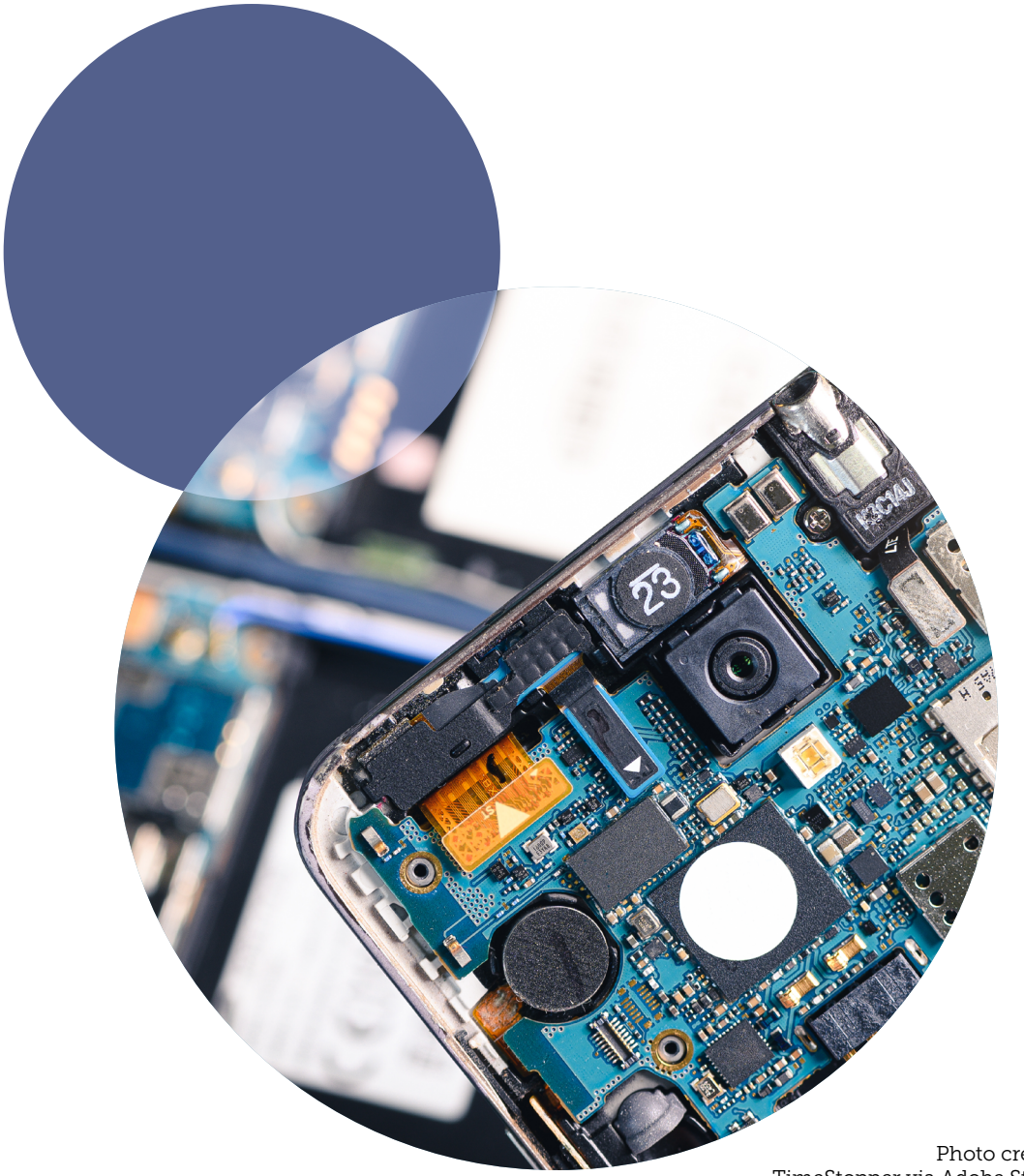

Photo credit:
TimeStopper via Adobe Stock

3

Scaling up e-waste recycling to create income generation opportunities

The development of e-waste collection, grading, and recycling facilities represents a key opportunity for African countries in terms of value creation through the capture and effective recycling of precious commodities. A large percentage of the e-waste generated from African communities is not recycled due to poor access to collection facilities. The establishment of community e-waste collection centres will provide technical and material supply chains for the recycling of electronic products, and ensure the value of e-waste is harnessed at the grassroots level and prevented from ending up in landfill. The creation of innovation hubs, co-working spaces for repair activities, and e-waste Material Recovery Facilities (MRF) with associated training resources will provide human and technical capacities for e-waste circularity and ensure resource reutilisation, offering economic and ecological gains. If the sector is supported with the right policy mix, it could lead to the creation of millions of jobs.[23] One example of e-waste recycling in practice is E-Terra Technologies Limited, a Nigerian company offering e-waste collection, recycling, and shredding of hardware. This focus on e-waste recycling as a socioeconomic tool can drive community prosperity and accelerate circular economy participation.

4

Harnessing the enabling role of technology for e-waste management

Another key strategy for e-waste management in Africa is the adoption of digital solutions in the e-waste management and recycling value chains. Employing digital solutions to enhance operational efficiency is seen as particularly relevant for the high transport and logistical costs associated with the trade of recyclables and haulage, especially for cities and economies that do not have direct access to deep berth ports. Another area in which technology can play a role is in increasing the transparency in trade and the mitigation of waste crime. This can include the use of drone imagery and blockchain, as well as the publication and real-time update of price indexes for popularly traded recyclable commodities. It is expected that such applications will become ever more relevant with the new Basel Convention "Prior Informed Consent" requirements which are going digital in the next few years. This change will require countries to submit photographic evidence that they are meeting the conditions of the convention and trading a resource rather than just exporting waste to another country. This move from the paper format to digital photographic evidence is expected to increase compliance.

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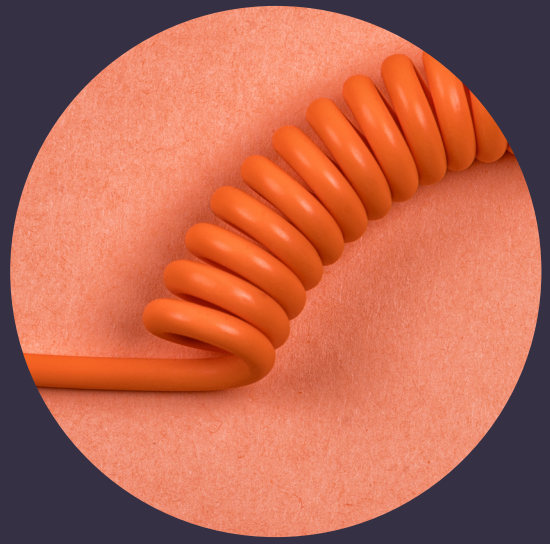
Case study

Driving community prosperity and accelerating the circular economy



E-Terra Technologies Limited is Nigeria's leading e-waste management company. It offers e-waste collection, recycling, and shredding of hardware and data.

The company manages e-waste by either refurbishing or recycling locally, providing refurbished products, or harvesting components for reuse in the manufacturing of new products. Hazardous components are sent to recycling partners (local and international) for further processing and proper disposal.

In 2017, E-Terra acquired an internationally standardised cathode ray tubes (CRT) recycling facility, making it the first company in Nigeria and West Africa with updated technology to safely and securely process 200 CRTs per day. E-Terra's cable recycling equipment can strip and shred 100kg of cables per hour in an environmentally friendly manner. E-Terra also possesses bulb recycling equipment that can safely treat/scrap 1,500 spent florescent tubes per day.

Overall, E-Terra's pioneering recycling processes reduce the need for mining for new metals and materials, and minimises the exposure of workers to the toxic components of e-waste.

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Case study

Policy spotlight: Nigeria mandates that electronics producers take responsibility for their products

The EPR programme for e-waste in Nigeria was launched in 2016, with the aim of putting more responsibility onto the importers, exporters, manufacturers, assemblers, distributors, and retailers whose products end up as e-waste. It is coordinated by the Nigerian National Environmental Standards Regulations Enforcement Agency (NESREA), which has sought to set up regulations to address issues such as illegal imports of electronic goods and e-waste, and implement a registration requirement for e-waste recyclers.[24]

This regulation mandates all producers of various brands of EEE products subscribe to the EPR programme. Every company placing products onto the market in Nigeria must comply with the EPR policy framework. Compliance requires that producers – including but not limited to brand owners, manufacturers, importers, and distributors – register with the Producer Responsibility Organization (PRO) through which a take-back or buy-back programme can be implemented to ensure that producers cover the costs of the environmental management of their products across their life cycle. Two government accredited recyclers – Hinckley Recycling Associates and E-Terra Technologies – have already been registered to carry out environmentally sound recycling and started operating under the scheme.

In the context of the EPR policy, the Nigerian government cooperates with the Global Environment Facility (GEF) and the UN Environment Programme (UNEP) to bring together players from international organisations, the private sector, and civil society as well as electronics manufacturers, including Dell, HP, Microsoft, and Phillips.

Photo credit:
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