

AFRICAN

NTIAL



© GRID-Arendal 2021

Unless otherwise stated, this publication and material featured herein are the property of GRID-Arendal and are subject to copyright by GRID-Arendal. Material in this publication may be freely used, shared, copied, reproduced, printed and/or stored, so long as GRID-Arendal is acknowledged as the source. Material attributed to third parties may be subject to third-party copyright and separate terms of use and restrictions.

ISBN: 978-82-7701-207-0 (PDF)

Suggested citation:

GRID-Arendal (2021). *Circular Economy on the African Continent: Perspectives and Potential*. 48 pages. Arendal, Norway: GRID-Arendal.

Contributing authors:

Trista Patterson, Luis Rodriguez, Peter Desmond, and Joanna Bingham

GRID-Arendal is a non-profit environmental communications centre and a partner of United Nations Environment Program. GRID-Arendal transforms environmental data into innovative, science-based information products and provides capacity-building services that inform and activate a global audience and motivate decision-makers to effect positive change. www.grida.no

Africa Circular Economy Network (ACEN) joins practitioners building a restorative African economy that generates well-being and prosperity inclusive of all its people through new forms of economic production and consumption which maintain and regenerate its environmental resources. www.acen.africa

Footprints Africa advances sustainable, scalable and inclusive approaches to development of local African economies, and supports SMEs to adopt future-friendly practices and create jobs using supply chains as a tool for development. www.footprintsafrica.co

ICLEI is a global network of subnational governments committed to sustainability. ICLEI connects leaders, accelerates action and provides a gateway to solutions through capacity building, projects on the ground and policy influence. ICLEI Africa is the convenor of the RISE Africa movement to Inspire Action for Sustainable Cities. africa.iclei.org

Guide to Text Boxes

Throughout this document are scattered text boxes in **green**. These provide snapshots of ACEN's impact in accelerating the transition to a circular economy in Africa since it was founded in 2016 as a pro-bono volunteer network. They provide clues to how the 'what next?' question will be answered in the second edition of this publication. Names denote individuals who have contributed their knowledge and experiences to various themes.

Similarly the text boxes in **blue** represent case studies which are examples of the elaborated material which is covered in the Footprints Africa case report (Warner 2020). These cases and over 350 more examples are featured on the GRID-Arendal and Footprints Africa interactive case map.



CIRCULAR ECONOMY ON THE AFRICAN CONTINENT

PERSPECTIVES AND POTENTIAL

*This report is dedicated to **Prof. Gardner M. Brown** (1935-2021): pioneer in environmental and resource economics, vibrant mentor, and gifted advocate for Africa's biodiversity, its values and the people it supports.*

ACKNOWLEDGEMENTS

The authors Trista Patterson, Luis Rodriguez, Peter Desmond and Joanna Bingham would like to thank the staff of **GRID-Arendal**: Louise Lieberknecht, Siri Karine Olsson, and Alexander Mitrofanenko for their valuable research inputs, and Georgios Fylakis for cartography.

The authors would also like to thank Hisham Ashkar for graphics and maps.

The authors are grateful to the following individuals and organizations for inputs, examples, valuable comments and suggestions: **Africa Circular Economy Network**: Oluwakemi Ajakaiye (Nigeria), Mona Alami (Morocco), Willem Baartman (Namibia), Murielle Diaco (Cote d'Ivoire), Beza Eshetu (Ethiopia), Katharina Gihring (South Africa), Sally-Anne Kasner (South Africa), Susanne Karcher (South Africa), Jocelyne

Landry Tsonang (Cameroon), Alexandre Lemille (France), Gracia Munganga (South Africa), Sarah O'Carroll (UK), David Toovey (Rwanda), Kariuki Waweru (Kenya), Chris Whyte (South Africa), Wekesa Zablou (Kenya); as well as from **Footprints Africa**: Deborah Nartey (Ghana), Elke Nijman (Rwanda), Hugo Warner (Portugal/UK), **ICLEI Africa**: Paul Currie (South Africa), Jokudu Guya (South Africa), Solophina Nekesa (South Africa); **Trinomics**: Josefine Koehler (Belgium); **Rethink Global**: Catherine Weetman (UK); **Revolve Circular**: Soren Bauer (Austria); **Circular Economy Innovation Partnership**, **the European Environmental Bureau**: Piotr Barczak (Brussels), **Circular Economy Innovation Partnership**: Ndidi Nnoli-Edozien (Nigeria); **Africa Comicade**: Michael Oscar Esio (Nigeria/Ghana); and the **African Leadership University**: Rudi Ackerman (Rwanda), and Salam Al-Khateeb (Mauritius).

About the cover: These images, by several photographers, are part of the **#hiddenflows** exhibition by RISE Africa, which sought to reveal the unseen resources in our cities. Central images are by **Katumba Badru**, a multi-award winning freelance photojournalist based in Uganda, from his standout photo essay entitled "My trash your trash" (www.thenatureofcities.com/hidden-flows-rise-africa). His work has been published widely in the Wall Street Journal, Vogue, New York Times, etc. Contact for commissioned work: **@katumbabadru** **instagram**

CONTENTS

INTRODUCTION	7
UNDERSTANDING CIRCULAR ECONOMY	9
Circular economy is evolving and responding to particular objectives	9
Circular economy recognizes biosphere limits	10
Circular economy can contribute to advancing development and climate agendas	14
Circular economy can contribute to a resilient recovery from COVID-19	16
ENABLING ENVIRONMENT, CONSTRAINTS AND OPPORTUNITIES TO PROMOTE CIRCULAR ECONOMY INITIATIVES IN AFRICA	23
Circular economy constraints and opportunities are multiple and sector-specific	23
Multiple actors are driving the transformation to a circular economy in Africa	28
Circular economy policies have different objectives and are complemented by suitable incentives	29
Overview of national policies in Africa	30
Regional circular economy policy and collaborative efforts	32
CIRCULAR ECONOMY EXPERIENCES IN AFRICA	34
Circular economy is widespread across Africa	34
Selected examples of circular economy initiatives in Africa	38
CONCLUSIONS AND RECOMMENDATIONS	43
REFERENCES	44

Circular Collaboration: an African Approach?

Bezawit Eshetu, Ethiopia

The transition to a Circular Economy in Africa requires systemic change, rather than sector or stakeholder-based approach. It calls for more innovative partnerships and collaborations that can redesign economies to ensure inclusivity and collective impact. It will require working together to inspire, generate ideas, share and deliver knowledge towards unlocking technological and innovative capacities as well as human and natural capital resources in a sustainable and regenerative way.

INTRODUCTION

Policymakers, donors, development agencies and the private sector are currently exploring and promoting development models to help countries achieve the Sustainable Development Goals (SDGs) and fulfil the needs of the growing African population while supporting vulnerable and disadvantaged groups. The continent of Africa possesses a vast wealth of opportunity with respect to natural and human resources, though how these are deployed is of particular importance in light of the challenges the continent faces. Ninety per cent of the world's extremely poor and half of the world's food-insecure people live in Africa. About 90 per cent of the Sub-Saharan workforce relies on informal, vulnerable employment, with insufficient access to water, health and education services.

Circular Economy (CE) approaches present substantial opportunities for reconfiguration of economies, workforce, and resource use in Africa, where implementation of CE may be more feasible than in wealthier countries whose industrialization and infrastructure build-up over time has itself created path dependencies and lock-in. Breaking path-dependency is of heightened importance as Africa's economy shrunk by 2.1 per cent in 2020, pushing the region into its first recession in 25 years. External shocks (for example, the COVID-19 global pandemic and natural disasters), climate change, fiscal constraints, governance problems and inequality represent major challenges for African economic development.

To be economically, environmentally and socially successful, Circular Economy development models should focus on inclusive and society-wide benefits, avoid "take-make-waste" extractive industrial practice and decouple economic activity from the consumption of finite resources and non-renewable energy. In this regard, CE appears to be the most contemporary and practical means for African nations to redesign and reintegrate resource systems, improve livelihood resilience, and contribute to advancing the SDGs, international commitments (for example, the Paris Agreement on Climate Change) and the post COVID-19 recovery. In practice, this will involve each nation and region creating or adapting designs, business models, and policies to make material savings, increase productivity, create new jobs, and incentivize new products and materials management processes. Solutions must present net benefit across their life-cycle inclusively and at scale.

There is increasing interest in CE worldwide, with stakeholders sharing successful experiences and discussing the enabling environment needed to capture a share of the projected \$ trillions in CE business opportunities. Despite the growing interest, until recently, there has been little to no mention of cases or examples from the African continent, even though many CE principles are deeply embedded in African traditional production and consumption practices.

This document aims to fill this gap, promote knowledge-sharing and increase visibility of the wide diversity of African CE initiatives, supporting policymakers, the private sector and a broad community of practice to create innovative business opportunities and value networks.

This document briefly summarizes key CE concepts; examines the enabling environment (drivers, barriers and opportunities) for promoting CE initiatives in Africa; reviews African CE experiences and policies in diverse sectors; and presents conclusions and recommendations. Blue and green text circles highlight Footprints Africa (cases) and African Circular Economy Network (ACEN) discussion topics which are elaborated on their websites.

LONO

Côte d'Ivoire

LONO has developed community-scale, decentralised technology to allow farmers to use agricultural waste to create nutrient-rich fertiliser and clean gas for cookstoves. The team are passionate about local technology, which is appropriate, accessible and easy to maintain in the context it was intended for.



Indigenous African Culture

Dr. Ndidi Nnoli-Edozien
Chair, Circular Economy Innovation
Partnership

"Indigenous African culture plays a key role in circularity. The circular economy responds to a design problem and nature is an intuitive part of being African. When you improve the environment, you improve people's livelihoods."



UNDERSTANDING CIRCULAR ECONOMY

Circular economy is evolving and responding to particular objectives

The term “circular economy” originally appeared in the material flows and industrial ecology literature in the 1970s, but the field has recently evolved, incorporating inputs, concepts and tools from other disciplines and practices such as functional service economy, cradle-to-cradle design, biomimicry, natural capitalism and blue economy systems. It has also explored intersections and synergies with well-being economics, systems thinking, urban metabolism, social ecological systems and bioeconomics.

The definitions of CE have also evolved from an initial focus on material flows – for example, “an economy that reduces the consumption of resources and the generation of waste, and reuses and recycles waste throughout the production, distribution and consumption processes” (UNEP 2011) – to broader definitions that focus not only on economic but also on natural and social aspects. These recent definitions advocate reframing economic growth objectives to instead promote society-wide benefits that are in synergy with the biosphere by decoupling economic activities from the consumption of finite resources. Emissions, by-products or damaged and unwanted goods are considered raw materials or nutrients for new production cycles and for regenerating natural systems (Ellen MacArthur Foundation 2020; Weetman 2020).

In the African context, the regenerative element of CE and the local impacts are central. ACEN defines CE as: *“an alternative model that will allow African cities to pursue their development agenda along a pathway that ensures economic growth is decoupled from use of finite materials, enabling green growth and industrialization by closing the loop of resources and by developing regenerative and circular systems”* (ICLEI Africa and ACEN 2020).

Circular economy in the African context is envisioned as systemic, inclusive and operative at multiple scales. The importance of regenerating and recirculating in the local CE system is complemented by a vision for Africa in the global circular economy. This means that while trade and exchange of materials and products continue (powered by renewable energy), negative impacts and excessive use of raw materials extraction is limited; high consumption levels of Northern economies is limited to per-capita levels that can be sustained by the planet (and not degrade the environment of the global south), while pre-export African nations contribute high value added throughout the product life-cycle, and very tight controls are placed on waste accepted from abroad to only allow in materials that can be safely re-purposed in African nations.

Circular economy recognizes biosphere limits

The circular economy is so named because it presents a contrast from the traditional, linear “take-make-waste” mentality. In the linear model, a continuous supply of resources is extracted from “outside” the system, to be manufactured, distributed, consumed and finally disposed once again “outside” the system (see grey line, Figure 1). However, nowadays it is clearer that there really is no “outside”. Resources are finite, and the use of linear models affects the environment and the health of people. For instance, 2 million tons of sewage, industrial and agricultural waste are released every day into water all around the

world, and pollution prematurely kills 8.3 million people per year (Alliance Disposal 2020).

The circular model proposes to maintain consumption, resource extraction and waste production within the limits of the biosphere by:

- 1) refusing and reducing consumption;
- 2) repairing, refurbishing and remanufacturing used goods;
- 3) repurposing and recycling components and materials for new use;
- 4) replenishing both physical and natural capital in the process;
- 5) innovating new ownership/user models that de-couple consumption from virgin material extraction,

and 6) powering with renewable energy sources (see colored lines, Figure 1).

Conceptualizing and safely assimilating waste and emissions ‘inside the system’ involves a diversity of activities. The Sanitation and Wastewater Atlas of Africa for example, lists water reuse for agriculture; reclaimed sewer wastewater for potable use; treated wastewater for aquaculture; recycled wastewater for agriculture; untreated wastewater for irrigation; and non-sewer wastewater recycling for agriculture and energy (AfDB, UNEP and GRID-Arendal, 2020).

Africa and Europe Cooperation

Chris Whyte, South Africa

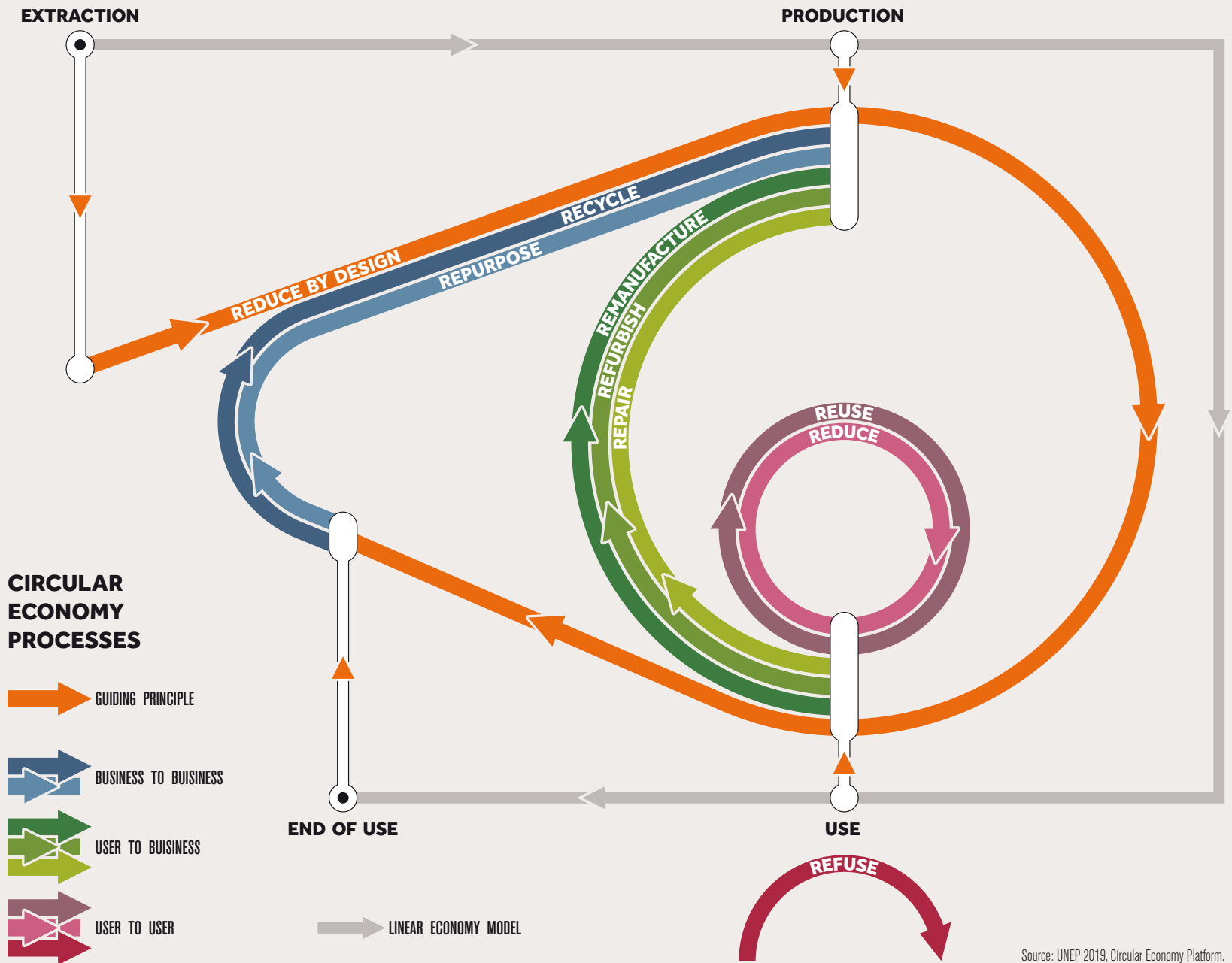
The European Commission has published a series of studies on “Circular Economy in EU-Africa Cooperation” looking at the continent overall and specifically at eight African Countries: Morocco, Egypt, Ghana, Senegal, Nigeria, Rwanda, Kenya, and South Africa. They focused on identifying key CE trends including the enabling policy framework, key economic sectors and business initiatives, CE impact / benefits as well as opportunities for further CE-related cooperation between European Union and Africa.

Linear North v Circular South Consumption

Murielle Diaco, Cote d'Ivoire

“The circular economy has always been present in Africa; many practices are entrenched in African societies, such as the sparing use of raw materials, the reuse of products, and ‘tontines’ (economic cooperatives), which are part of the participatory economy for promoting the sharing of knowledge and services. With the global trend towards ‘Westernisation’, Africa is caught in the middle. We’re leaning towards a consumerist economy and starting mass production, with enormous pressure on African populations and their leaders to consume more, and in a linear fashion. It is even more difficult given that we are in an internationalised world, so major industrial groups in the food and other sectors are arriving in Africa with these devastating models.”

FIGURE 1



Source: UNEP 2019, Circular Economy Platform.



African Leadership University

Rudi Ackerman and Salam Al-Khateeb

ALU is a higher education institution for a higher purpose with campuses in Rwanda and Mauritius. It aims to transform the African continent and our world by "selecting, developing, and placing three million ethical and entrepreneurial young leaders into highly productive roles by 2035". ALU has integrated elements of the circular economy into their operations and campus design including architecture, reusable plates and cutlery and food waste composting into fertiliser.

How can a Circular Economy Contribute to Food Security in Africa?

Elke Nijman, Rwanda

Emerging African economies are hugely dependent on agriculture and under great pressure to solve for food security amidst increasing climate challenges. The current food system generates high quantities of waste and food losses due to inefficient farming and post-harvest handling techniques. A circular economy helps to improve food security and agricultural productivity through regenerative farming practices & post-harvest handling techniques, converting organic waste & by-products into farming inputs and closing nutrient loops.



Circular economy can contribute to advancing development and climate agendas

The CE model creates value and new economic opportunities by creating space for new services; new energy, material and process efficiencies; lower-cost, locally-available and more reliably-sourced inputs; new markets for by-products; reduced emissions and new savings via lowered fossil fuel and waste management costs. These CE outputs are crucial factors in advancing the Sustainable Development Goals (SDGs), particularly SDG 1 (No Poverty), SDG 3 (Good Health and Well-Being), SDG 6 (Clean Water and Sanitation), SDG 7 (Affordable and Clean Energy), SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation and Infrastructure), SDG 11 (Sustainable Cities and Communities), SDG 12 (Responsible Consumption and Production), and SDG 15 (Life on Land) (Schroeder et al. 2019).

Circular Economy contributions to each of the mentioned SDGs may be interlinked with other benefits. For instance, CE interventions related to SDG 9, such as building resilient waste management systems, might lead to improvements in the achievement of SDG 3, for example, reductions in morbidity due to waterborne diseases (AfDB, UNEP and GRID-Arendal, 2020). For every dollar invested in water and sanitation services, there is a \$4.30 return due to reduced health care costs for individuals and society, as well as greater productivity and involvement in the workplace through better access to facilities (World Health Organization 2021).

These catalytic effects are of strong interest to the development aid practitioners. However, many CE investments will be quantified in

terms of progressing multiple SDGs only if the beneficiary populations are visible and results are captured in quantified form (a major challenge in economies dominated by informal labor). Other important criteria in documenting CE success, is to establish clear causal relationships, also across sectors; the materials and manufacturing processes are well-defined; and the terminology (“responsible”, “well-being”, “infrastructure”) and indicators reflect the impacts and the realities of how each person in Africa experiences genuine progress (Bassi et al. 2020).

CE practices can contribute to the transformation of the way goods are produced and used in Africa, and this can support better trajectories for national climate targets, as well as climate resilience and adaptation. Greenhouse gas emissions can be reduced by using improved fuels and technology, making material flows more efficient, and maintaining the utility and value of materials and products for as long as possible. More efficient water re-use systems and crop diversification may increase the resilience of agricultural systems to droughts and provide climate change adaptation pathways (AfDB, UNEP and GRID-Arendal, 2020).

Tackling climate change and transitioning to a CE is not something a single country can do on its own, nor can circular economy within African nations be pursued without corresponding economic transformation at the global level, acknowledging important elements of not just local or national, but global circularity. It is therefore important to integrate climate change and CE considerations in foreign policies and

international agreements (Ashraf et al. 2020). Thus the visibility of Africa must sharply rise as wealthier nations develop globally comprehensive circular economy policies and strategies. A whole-systems approach to circularity will explicitly account for embedded raw materials in imports, as well as resulting wastes and emissions- not just in-country, but those created in, exported to, or impacting lesser developed nations. Improved policy advocacy in international circular economy forums can raise the visibility of issues arising from circular economy policy of myopic or limited geographic scope.

Important examples illustrate the climate mitigation and adaptation potential of CE practices, guiding policy and investments. For example, the application of CE strategies and nature-based solutions in the irrigation gardens of the Sashane river (Zimbabwe), using a combination of sand dam water storage and low-lift solar-powered pumps, allows farmers to access water for supplementary irrigation and mitigate the risks related to water availability (United Nations World Water Assessment Programme 2018). Globally, in industry and construction, the application of CE practices in the cement, aluminium, steel and plastic sectors could help reduce emissions by 40 per cent in 2050. When applied to the food system, the reduction could amount to 49 per cent in the same year, i.e. 9.3 billion tons of carbon dioxide equivalent in 2050 (Ellen MacArthur Foundation 2019). Because African nations are anticipated to be among the most impacted by climate change, the global uptake of circular processes also has bearing on African future conditions.



Women and CE

Josefine Koehler, Belgium

The emerging CE trend is an opportunity to better integrate women and the youth into green industry and entrepreneurship. As the transition from a linear to a circular economy demands diverse skill sets and innovative and inclusive business models, there is a clear role for women, young and old. There are numerous women-led examples which confirm the relevant role African women play within the transition towards CE, for example Docteur Fatiha Association in Morocco and Hive Earth in Ghana.

Circular economy can contribute to a resilient recovery from COVID-19

The COVID-19 recovery requires a focus on resilience. The pandemic has revealed the vulnerability of global systems to protect the environment, health and economy, with prolonged impacts on the African continent. Policies that are aligned with CE principles can play a vital role in recovery packages by stimulating value creation and economic resilience. Thus, every dollar invested in energy efficiency renovations can yield five dollars in public finance returns. Retrofitting 2 million homes for energy efficiency could create nearly 2 million new jobs. Replacing just 20 per cent of single-use plastic packaging with reusable alternatives globally offers an economic opportunity worth at least \$10 billion, while saving about 6 million tons of material. Investing

\$78 billion to \$116 billion in accelerating the adoption of regenerative annual cropping (planting diverse cover crops, no tillage and multiple crop rotations) could save \$2.3 trillion to \$3.5 trillion in lifetime operational costs (Ellen MacArthur Foundation 2020). A green COVID-19 recovery could also cut expected emissions in 2030 by up to 25 per cent and boost the chances of keeping temperature rise to below 2°C by up to 66 per cent (United Nations Environment Programme [UNEP] 2020). However, countries have fallen short in their commitments to build back better after the COVID-19 pandemic, with just 18 per cent of announced recovery spending going towards “green” investment (O’Callaghan and Murdock 2021).

The Circular Humansphere

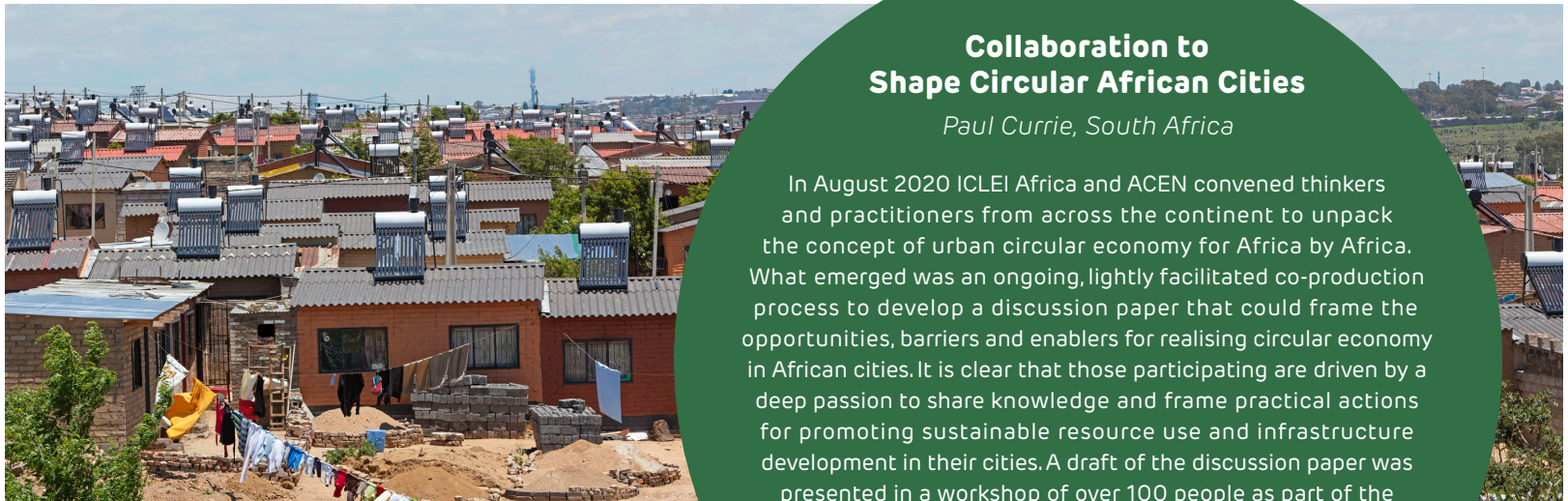
Alexandre Lemille, France

ACEN supports contributions to several CE databases representing activity across the African continent. Alexandre Lemille compiled one of the first case maps for ACEN. He notes: “Early discourse on CE excluded the human dimension. In order to achieve a Circular Humansphere, the economy must be seen as a tool with the sole purpose of meeting the needs of people, access to services has an advantage over ownership of objects, and the human dimension of the circularity model must be elevated.”

Collaboration to Shape Circular African Cities

Paul Currie, South Africa

In August 2020 ICLEI Africa and ACEN convened thinkers and practitioners from across the continent to unpack the concept of urban circular economy for Africa by Africa. What emerged was an ongoing, lightly facilitated co-production process to develop a discussion paper that could frame the opportunities, barriers and enablers for realising circular economy in African cities. It is clear that those participating are driven by a deep passion to share knowledge and frame practical actions for promoting sustainable resource use and infrastructure development in their cities. A draft of the discussion paper was presented in a workshop of over 100 people as part of the World Circular Economy Forum in November 2020.



© iStock/THESLIFT777



Dignified Wear

Ghana

Mabel Suglo founded Dignified Wear, a social enterprise that uses circular economy principles and employs members of the disabled community to turn waste into value. They manufacture and sell shoes, handbags, traditional clothing and accessories using waste tyres and discarded fabric from local dressmakers. The embellishments often feature beads manufactured from brokenglass. Mabel is a multi-generational entrepreneur, inspired by her grandmother who despite disability single-handedly brought in the income necessary to raise her family.



Five Big Bets for Africa's Path to Circularity

*African Circular Economy Alliance,
Cote d'Ivoire*

Research undertaken in 2020 for ACEA by Dalberg identified five sectors in Africa with immediate opportunities for increased circularity, jobs creation, and environmental protection. These are: waste conversion, recycling plastic waste, redesign of mass timber, e-waste recycling and recycled garments. Inclusivity, and strong versus weak sustainability are crucial elements of long-term success.

Circular Economy and Mobility

Willem Baartman, Namibia

Circular transport begins at the fuel source. Transport is a major contributor to greenhouse gasses and is where positive change can be implemented quickly to curb our emissions. Circular thinking provides the mobility sector's urgent need for a new business model; clean energy as well as new mobility solutions are required for the future with their material life cycles carefully managed. Africa has a key role to play in the future of global mobility as both a responsible consumer and producer of materials for the industry. In some African countries, ethanol and biofuel for transport and farm machinery already have lower production cost than in Brazil, US and EU. Investments are needed to support small-holders and capitalize on favorable natural conditions and abundant land/labor.





MASS Design

Rwanda

Most harmful impact is built in at the design phase of any product, so architects and designers play perhaps the most critical role. At MASS, the team think deeply about the mission of any project and use the design process to ensure the completed structure will fulfil its mission. Their deep concern for the health of humans and the ecosystem is reflected in every aspect of their work.



Academic Programme

*Jocelyne Landry Tsonang,
Cameroon*

Learning technical and change management skills are essential to lay the foundations of circularity in higher education and the workplace. ACEN has initiated three strands as part of its Academic Programme: Africa CE Research Group with CEIP (Nigeria), Learning Material for universities and businesses with the ACEN Foundation (Netherlands) and Student Programme with Wits University (South Africa).

@ Stock/ Jonathan Erasmus

@ Mr Green



Mr Green

Kenya

Mr Green empowers informal workers collecting plastics who, in addition to payment, gain access to educational and financial products among other benefits. They have made vital steps towards closing the loop in plastic processing in Kenya, collaborating with multinational companies to ensure recycled plastics are used in their packaging.

Africa Leapfrogging from Linear to Circular

Peter Desmond, UK

What lessons can we learn from the evolution of industrialised economies to create a more sustainable, equitable and prosperous society in Africa? Could the circular economy be the critical link in avoiding ecosystem degradation, expensive or scarce resources, and unethical, unsafe employment practices? In a similar way Africa has leapfrogged traditional landlines onto mobile phone technology which helps avoid the high infrastructure cost of land-based communications and enables innovative systems like M-PESA mobile banking in Kenya.



ENABLING ENVIRONMENT, CONSTRAINTS AND OPPORTUNITIES TO PROMOTE CIRCULAR ECONOMY INITIATIVES IN AFRICA

Circular economy constraints and opportunities are multiple and sector-specific

Given that CE is an overhaul of the whole economic system, its promotion as a development model for Africa requires an enabling environment. This involves diversified understanding of CE drivers (Figure 2) and how they relate to place-based and sector specific incentives. Collaboration with entrepreneurs and practitioners can develop policies and regulatory frameworks, technical and financial support, and market linkages to overcome barriers to CE development and adoption.

Governments and decision makers require information to design, implement and evaluate effective policy instruments and incentives to overcome barriers to increasing resource efficiency; reduce waste; promote recycling, reuse and remanufacturing; and create demand for sustainably-designed products and resource saving services.

Many authors have extensively analysed and classified the barriers to and drivers for moving towards CE (e.g. Ritzén and Sandström 2017; Kirchherr et al. 2018; de Jesus and Mendonça 2018). There is no consensus in terms of defining categories for both drivers and barriers. In most cases, they respond to the context of specific sectors (for example, agriculture, energy, waste, construction systems) and involve a combination of financial,

institutional and regulatory constraints; cultural, organizational or social factors; and technological and informational considerations. An extensive list of barriers and drivers can be found in Figure 3.

In African contexts, critical barriers and opportunities have been identified and discussed in selected sectors including water and sanitation, waste, food, energy, building and industry (ICLEI Africa and ACEN 2020). Overall, economic/financial and institutional/regulatory barriers seem recurrent across sectors, while opportunities appear to be more context-specific (see Table 1).

Power relations, vested interests and institutional relationships impact the ability of actors in African countries to implement CE policies and business models (Desmond and Asamba 2019). Global value chains (GVCs) of companies create an imbalance of power relations and economic inequity in lower income countries. For example, GVCs rely upon Africa to provide cheap raw material for the manufacture of higher value products for wealthier consumers. However, the implementation of CE initiatives might create greater value for lower income countries and support global consumers. For instance, the

refurbishment of Caterpillar engines and solar turbine parts in South Africa helps reduce waste, minimizes the need for raw materials and provides consumers with cheaper and quality-guaranteed products (Barloworld Equipment 2021).

The vast cultural, demographic and economic differences across African countries influence their economic starting conditions, development strategies and their capacity to adopt circularity. In recent years, more than half of Africa's economic growth has been driven by five countries – Algeria, Egypt, Morocco, Nigeria and South Africa – and growth has been inclusive in only 18 of 48 African countries (African Development Bank [AfDB] 2020a). Greater understanding and measurement of enabling conditions leading to inclusive development are urgently needed. Moreover, transitioning to circular practices requires an integrated Afrocentric approach (ICLEI Africa and ACEN 2020); this includes learning from best practices already implemented but adapting them to new contexts, specifically those which will address urgent (current and future) food, water, shelter and energy needs.

FIGURE 2



TABLE 1

SELECTED EXAMPLES OF BARRIERS AND OPPORTUNITIES FOR CIRCULAR ECONOMY IN AFRICA

Sector	Barriers	Example Opportunities
Water and Sanitation Systems	Low stakeholder engagement in the water and sanitation sectors. Lack of centralised infrastructure. Low willingness to pay for treated waste-water.	Entrepreneurship for rainwater harvesting (e.g. smartphone apps, low-cost catchment materials in Mozambique) and deployment of decentralized solutions such as grey water treatment at the building level (e.g. Campus of the American University of Cairo, Egypt). Innovative public-private partnerships such as irrigating golf courses (Marrakech) or activated sludge for phosphates (Khouribga, Morocco).
Waste Systems	Inadequate legislation and regulations to support cradle-to-cradle business models. Informal labor vulnerable to health and safety hazards. No minimum wage or job stability. High uncertainty of materials quality, difficulty in sorting materials at scale.	Industrial symbiosis, valuing organic waste and agricultural by-products, processing them for energy and farm inputs (eg. sugar cane by-products source 25 per cent of Mauritius' energy demand, producing animal feed and organic fertilizer). Incentivizing waste collection, efficient sorting facilities, and formalizing waste collection systems to provide worker protections, higher wages and job stability while also improving waste sorting for circular processes. Artificial intelligence, apps, databases, and networks to identify hazards, recyclability, and markets for materials.
Food Systems	Limited funding to support entrepreneurs and small-scale farmers in developing and adopting new technologies. Misaligned incentives. Traditional practices over-looked in favour of imported crops and synthetic fertilisers.	Digital agriculture can help increase productivity, reduce waste, empower women and secure payments. Platforms like Nigerian FarmCrowdy offer extension advice and access to credit directly from investors, who in return earn a share of the post-harvest profit. So far it has raised \$15 million for 25,000 farmers cultivating 6,900 hectares.
Energy Systems	Inadequate technical, financial and human resources to promote reliable energy generation in rural areas.	Anaerobic digestion produces biogas (energy and improved post digestate soil). Solar energy is an opportunity for decentralization, income, and gender equity innovative building materials (e.g. solar tiles in Kenya); collaborative economy (e.g. Jaza solar community hub in Tanzania); or women entrepreneurs (e.g. 5,000 Solar Sister Entrepreneurs reaching 1.7 million people in Africa with clean energy).
Buildings and Construction Systems	Lack of relevant legislation and finance to support the upcycling and recycling of building materials. Lack of green construction practices/ regulation. Lack of Public Procurement support.	Traditional (passively cooled) architecture can avoid emissions. Recycling waste plastic and transforming it into building material (plastic lumber) may help avoid deforestation, reduce greenhouse gas emissions and create jobs. In Kenya, Ecopost plastic lumber have mitigated 160 million kg of carbon dioxide emissions, avoided the deforestation of 345 hectares of forest, saved 2,400 tons of timber and have taken over 3 million kg of plastic from landfill.
Industrial Systems	Inadequate technical expertise and lack of platforms or incentives connecting companies to share materials, energy, water and logistical arrangements.	Locally recycled materials, industrial symbiosis and material exchange programmes such as the South African Western Cape Industrial Symbiosis Programme (WISP) are key to facilitate the CE transition, generate jobs and avoid 309,200 tons of greenhouse gas emissions.

FIGURE 3

CIRCULAR ECONOMY BARRIERS & SOLUTIONS

BARRIERS TO ENTERING CIRCULAR MARKETS

SOLUTIONS THAT REVEAL BENEFITS

Uncertainty of consumer awareness, interest, demand

Public or co-op education campaigns, presence at festivals, trade-events

High upfront investment costs

Tax incentives or municipal credits

Incompatibility with existing (linear) operations /infrastructure/supply chain

Subsidized loans to retro-fit infrastructure & operations, training and skill-shares

BARRIERS TO MAINTAINING A CE COURSE

SOLUTIONS THAT REDUCE RISK

Low virgin material prices

Technologies to trace/certify/reward CE sourced/recycled materials

Conflicts with existing business culture and lack of internal cooperation

Data on profitability, resiliency, and demand for circular products

Hesitant company culture, i.e. risk aversion

Co-ops or bridge loans

Uncertainty on unintended consequences on other production processes

Production process evaluations for cost reductions and savings over time

Fluctuating profitability

Micro and bridge loans or co-op capital

BARRIERS TO SCALING UP

SOLUTIONS THAT INTEGRATE

Lack of technologies and technical skills related to CE

Networks, knowledge exchange hubs, University course materials in CE

Low familiarity with circular business models

Case study databases and teaching materials

Silo thinking

Workshops that facilitate professional exchange/collaboration

Lack of network support/partners

Networks and knowledge exchange hubs

Limited willingness to collaborate in the value chain

Materials exchange networks and hubs (like ebay for used materials)

Heavy organizational hierarchy and lack of management support

Outreach to all levels: executives, managers, implementers

Sources: Uusitalo et al. (2020); GRID-Arendal.

BARRIERS OF CONTEXT / CONDITIONS

SOLUTIONS THAT ENABLE

Lack of market mechanisms for materials recovery

Incentivized recovery systems

Unclear supply chain management

New technologies to source, trace, and market responsible materials

Lack of circular design in products

Regulation requiring end-of-life-cycle be addressed in production

Limited circular procurement by governments

Public policies for circular procurement

Lack of CE know-how of political decision makers

CE Training programs for young civil servants

BARRIERS OF NATIONAL, & MUNICIPAL COORDINATION

SOLUTIONS THAT RAISE POLICY AWARENESS & MANDATE

Lack of governmental support

Quantified CE analysis tying outcomes to government goals/indicators

Lack of clear incentives or policies in support of CE transition

Reporting on enabling conditions and public-private CE partnerships

Lack of CE know-how within governing bodies

Policy review and public sector training

Unclear responsibility in governance

Networking/collaboration programs among civil servants

Unidentified gaps in policy

Regulatory frameworks compared and checked for consistency

Gaps in National regulation

Gap analysis of policy, policy transfer feasibility studies

Absence of circularity in global trade agreements and conventions

Global forums that address circular North-South issues

BARRIERS TO IDENTIFYING CAUSALITY / SUCCESS

SOLUTIONS THAT CREATE RELIABLE METRICS

Lack of standardization, information and knowledge e.g. on impacts

Strong, quantitative, time-based success metrics for every CE investment

Lack of tools and methods to measure (long term) benefits of CE projects

Pilot projects with controls, detailed records, analysis

Lack of large scale demonstration projects

Stimulus grants to up-scale, communications to feature success stories

Unclear metrics of sustainability

Lifecycle economic/social/environmental impact studies to establish causal links

Sources: Uusitalo et al. (2020); GRID-Arendal.

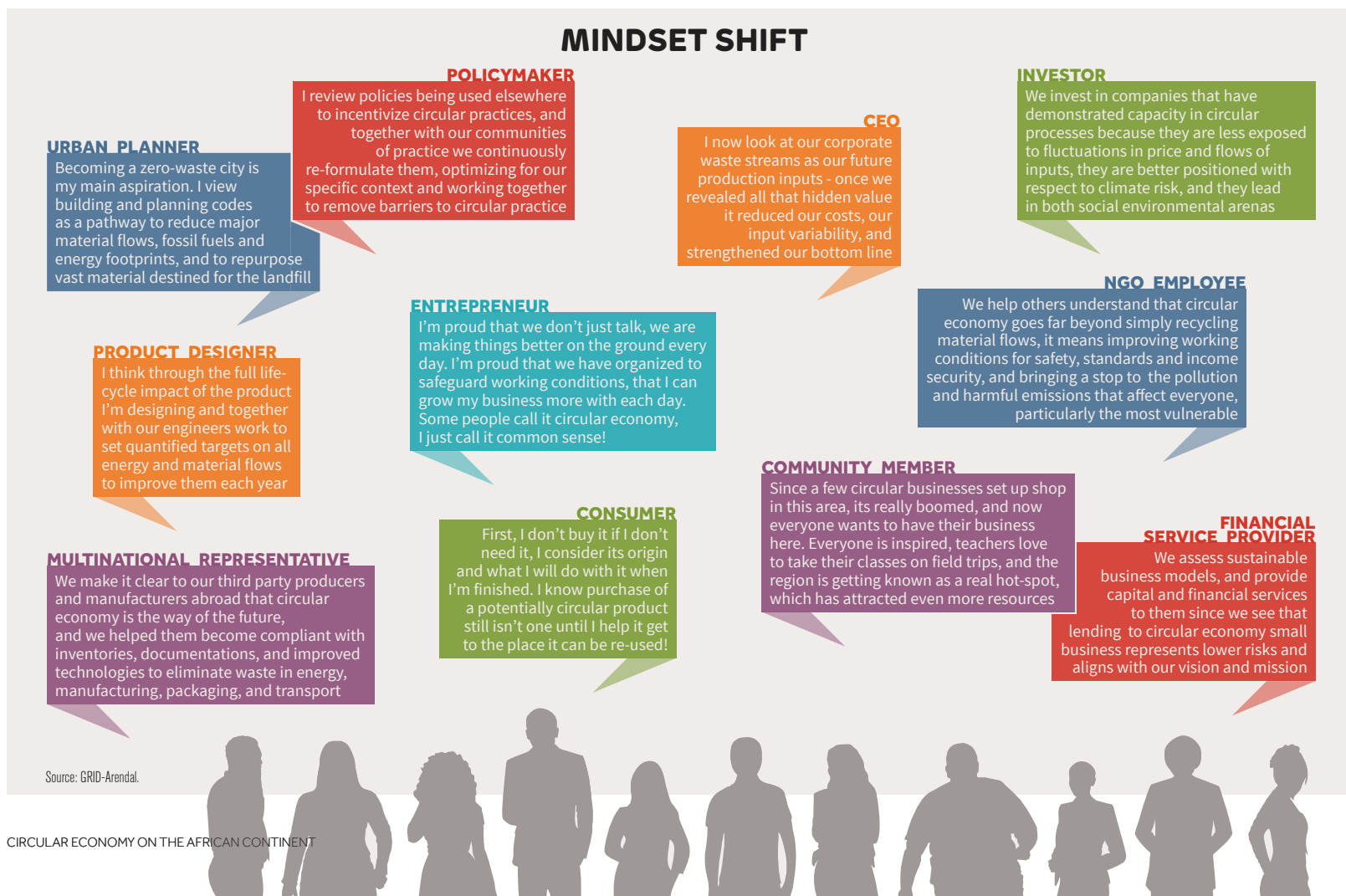
Multiple actors are driving the transformation to a circular economy in Africa

New mindsets and extensive collaboration between the various CE actors are required to accelerate the transition from a linear to a circular economy and overcome the identified barriers. Some of the new mindsets are presented

in Figure 4, underlining that shifting towards CE involves not only the commitment of producers and consumers, but also the collaboration of a range of actors - each of them with a particular role – contributing together to create a more

sustainable future for the continent. These actors include individuals but also donors, development agencies, government associations like the African Circular Economy Alliance (ACEA) and professional networks such as ACEN.

FIGURE 4



Circular economy policies have different objectives and are complemented by suitable incentives

The institutional environment includes legislation as well as norms and cultural aspects promoting societal support in the transformation towards CE. Policies may promote, inter alia, production, consumption, innovation, investment and market development. This may include supporting eco-design to incorporate durability, reparability and recyclability; adopting pricing instruments and consumer protection rules (guarantee periods); enforcing responsible production rules; and supporting and funding research and innovation. Taxes and levies can disincentivize less desirable practice, while exemptions, tax credits and other incentives can promote desirable CE practices.

In most cases, CE policies include diverse types of incentives including:

- market conditions (to create markets for secondary raw materials, repaired, reused and remanufactured products),
- fiscal (such as taxation, subsidies, financing and internalizing the cost of externalities),
- regulatory (includes regulations related to implementation of CE),
- institutional (includes policy measures, strategies and road maps that aim to promote CE implementation),
- technological (to speed up the development of different technological solutions and innovations),
- educational (to increase knowledge and awareness on resource efficiency and CE),
- social (to engage consumers and the society at large in CE),
- industrial arrangements (activities aimed to facilitate collaboration and partnerships in circular business) (Uusitalo et al. 2020).



© iStock/natgrass



© iStock/Petri Oeschger

Overview of national policies in Africa

CE efforts and policies* across Africa reflect a great diversity in approaches based on differences in current levels of development, national priorities, socioeconomic and environmental contexts and existing legislation. The diversity of policies also reflects the priorities of countries for "quick wins" (such as increased resource savings or waste reduction) or "long-run strategies" (such as structural transformation and digital solutions).

The [circulareconomy.earth](#) database maps 191 circular economy policies for 52 African countries grouped under five broad categories: national CE policy, product policy, extended producer responsibility policy, waste management and recycling policy, and fiscal policy. The definition of each category is presented in Box 1.

At the national level, almost every African country has prepared at least one type of policy that will help pave the way for CE (Figure 4). While no country has policies in place in all five of these categories, seven countries already have national policies with explicit references to CE principles (yellow dots): Algeria, Egypt, Gabon, Kenya, Madagascar, Rwanda and Tunisia. Other governments like Morocco (Diaci et al. 2020), Senegal (Bonnaire et al. 2020) and South

Africa (Godfrey 2020) are currently working on national CE road maps which are expected to lay out a clearer and stronger national agenda. These recent policy developments reflect the new mindset and strategic vision of African policymakers and the progress and

commitment of African countries regarding sustainability. For instance, the 2016 National Action Plan for Sustainable Consumption and Production supports Egypt's development efforts in circularity and sustainability in multiple sectors including energy, agriculture, water and waste (Partnership for Action on Green Economy 2016).

All studied countries (except Eritrea, Lesotho and Zimbabwe) have strategies, policies and/or legislation designed to incentivize the recovery and recycling of waste products (blue dots). This suggests that CE development in Africa is shifting from being mostly driven by private sector entrepreneurs to being increasingly supported by policymaking. For instance, Rwanda adopted the national e-waste management policy (Rwanda 2016) engaging producers and retailers in strategic partnerships including financing e-waste collection, transportation and treatment, and using extended producer responsibility to advance recycling fees.

Thirty-two African countries have "product policies" (green dots) in place covering a wide range of strategies that incentivize circularity in design, manufacture, distribution or import; although many of these policies only apply to narrowly specific product types or materials. For instance, Togo and Niger have passed decrees and laws establishing the management methods for plastic bags and packaging (Togo, Secretary-General of the Republic 2011) as well as the production, importation, usage

Box 1. Circular economy policy categories

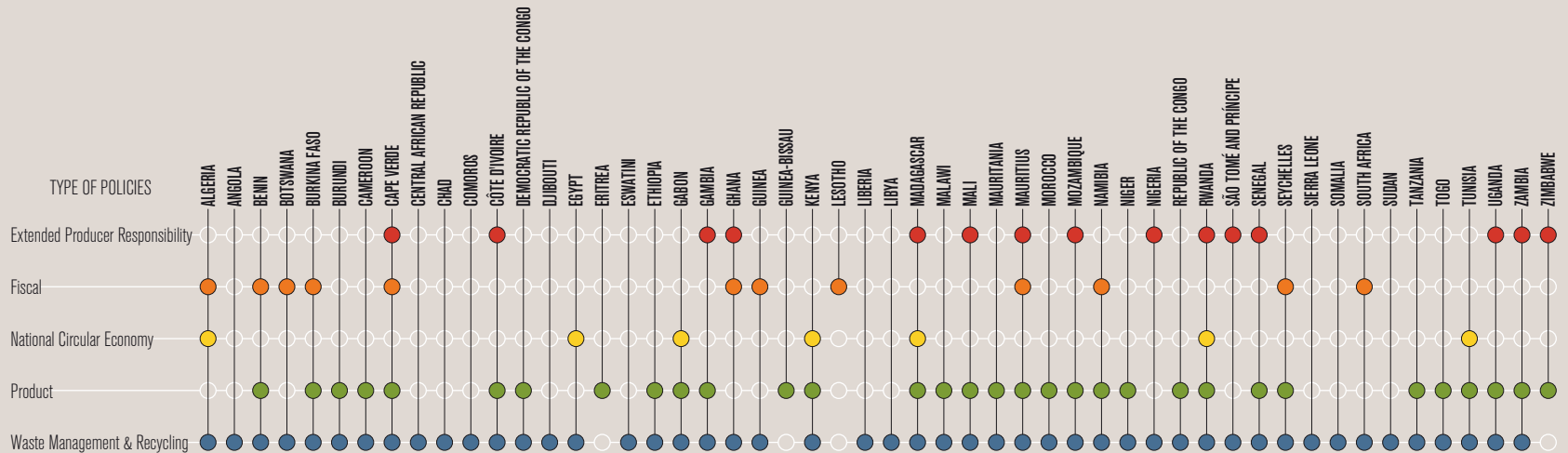
1. National CE policies include any national CE policies already in place as well as national green growth or sustainable development strategies which integrate CE principles.
2. Product policies are any policies that support circular practices relating to the design, manufacture, distribution or import of specific products and materials (mostly plastic bans or levies).
3. Extended producer responsibility policies place the responsibility for the environmental impacts of products throughout the product life cycle on producers and is often applied to the collection, processing and reuse of waste.
4. Waste management and recycling policies encourage circular practices relating to the management of waste covering generation, segregation, transfer, sorting, treatment, recovery and disposal.
5. Fiscal policies include government tax and spending policies that incentivize circular practices.

Source: Chatham House 2021

*For the purposes of this review, the term "policy" encompasses a wide range of meanings from legal documents to statements of goals to legislation and official government documents that include policy goals, commitments, or guidance relevant to the development of a circular economy within a nation.

FIGURE 5

TYPES OF EXISTING CIRCULAR ECONOMY POLICIES IN AFRICA PER COUNTRY, 2020



Source: Chatham House, <https://circulareconomy.earth> (2020)

and stockage of low-density smooth plastic (aNiamey.com 2014).

However, just 23 per cent of the studied countries have the required fiscal policies in place to assist circular practices. These fiscal policies are skewed heavily towards managing end-of-pipeline material flows (waste management and recycling), with far fewer policies incentivizing circularity at the stages of design, manufacture, transport or financial investments. For instance, in Benin, the Interministerial Decree 2004 No. 077 authorized the collection of environmental taxes and fines for pollution. This Decree

involves collaboration between the Ministry of the Environment, Habitat and Urbanism and the Ministry of Finance and Economy.

One third of African countries have implemented extended producer responsibility policies. They mostly regulate plastic and non-biodegradable packaging, for example, the 2001 Malian Extended Producer Responsibility regulation (UNEP 2018), but more modern legislation such as the 2018 Extended Producer Responsibility Regulations, Statutory instrument No. 65 of the Government of Zambia, also includes waste oils, pesticides or chemical containers, used tyres, electrical

and electronic equipment (Government of Zambia 2018).

A major limitation to the advancement of CE is that in most African countries the responsibility for CE policies generally falls only within the remit of the environment ministries - a clear indication that circular economy is still falling into an "environmental policy niche". Approaches recognizing CE as a joint task for all government ministries and departments would substantially broaden, deepen, and extend the policy potential.

Regional circular economy policy and collaborative efforts

In recent years, international efforts have emerged to support CE policy development in Africa. In 2017, Rwanda, South Africa and Nigeria jointly launched the African Circular Economy Alliance (ACEA) pledging to share information and best practices, raise awareness of the CE and build partnerships. In November 2019, African environment ministers at the African Ministerial Conference on the Environment (AMCEN) agreed on the Durban Declaration on taking action for environmental sustainability and prosperity in Africa which, among other things, sets out ambitions for a CE. Currently, the work of the ACEA in the policy arena is also supported by organizations such as the African Union (AU) and multilateral financial agencies such as the African Development Bank (AfDB 2020b).

Other programmes, such as SWITCH Africa Green, which is funded by the European Union and implemented by the United Nations Environment Programme in partnership with the African Roundtable on Sustainable Consumption and Production, are supporting CE activity in Burkina Faso, Ethiopia, Ghana, Kenya, Mauritius, South Africa and Uganda, sharing lessons, improving regional harmonization of policies, and increasing national level impact in biogas, e-waste management, organic agriculture (which can include reuse of organic materials), green manufacturing, eco-industrial parks and standards in labelling. The programme enhances access to green financing and innovative solutions as well

as enables the development of policies and standards. It also contributes to awareness-raising and facilitates networking.

Some countries are uniting to develop regional policies to advance CE. For instance, in 2015, the East African Community (EAC) announced a ban on imported second-hand clothes from 2019 onwards. The low-priced imports hinder local markets and regional development. However, after complaints from international exporters, who argued that this decision would harm international trade agreements, the proposal is now only for an indirect ban. This compromise includes increasing tariffs which are intended to disincentivize imports of second-hand clothing, while incentivizing locally produced products and industries. CE policy challenges include untangling policy signals and instruments which may overlap and even contradict one another.

At the individual country level, Uganda increased its environment levy on used clothes from 15 per cent to 20 per cent in 2016. Two years later, Rwanda imposed a \$4 tax per kg of imported used clothes, which is due to rise to \$5 per kg (two years before that the tax was \$0.20 per kg). Kenya introduced an import rate of \$5 or 35 per cent per unit, whichever is higher (Kuwonu, 2017). This example shows the common tension between different political levels and outside powers and thus the necessity of collaboration and cooperation to find the golden middle without compromising local potential.

Another initiative tackled by the EAC is a regional Polyethylene Materials Control Bill announced in 2017 and originally planned to be adopted in 2020. It sets out a series of restrictions and controls upon the continued introduction of polyethylene into the EAC with the aim to remove the usage of polyethylene from trade within and between EAC members.

CE efforts are supported by cross-regional collaboration strategies for waste management, though substantial gaps remain. The collaboration strategies enhance political dialogue and stimulate innovative policy amendments and novelties related to the CE in the long run. A sector meeting was held in June 2019 in Accra, Ghana on the theme of integrated waste management. Micro, small and medium-sized enterprises and government officials from countries including, among others, Burkina Faso, Ghana, Ethiopia, Kenya, Mauritius, South Africa, Uganda, Nigeria and China were brought together. Participants included regional economic communities such as the Economic Community of West African States (ECOWAS) and the Southern African Development Community, as well as the European Union financial institutions, United Nations agencies, and experts and stakeholders in the waste sector. Sector based synthesis efforts such as the chapter on Circular Economy in the Sanitation and Wastewater Atlas of Africa (AfDB, UNEP and GRID-Arendal, 2020) are likewise increasing exchange of effective policies and best practices among nations.



© Alan

© iStock/Petri Deschinger

Circularity and the Importance of Engaging Africa's Media

Soren Bauer, Austria

How can societies move from a linear economy of scarcity to a circular economy of abundance without going through a consumer society? What do Africa's decision-makers need to learn about circularity and how can they be convinced to support a circular industrial economy respecting nature and its limited absorption capacity? What are "externalities"? Will a circular economy help overcome social and environmental injustices in Africa? How? African journalists rarely have the opportunity to learn about alternative socio-economic models and the destructive nature of the linear economy. These are the questions they ask after we brief them in our media seminars.

CIRCULAR ECONOMY EXPERIENCES IN AFRICA

Circular economy is widespread across Africa

There is a proliferation of CE initiatives and successful case studies of CE application across the African continent, and great interest in learning from the successes. Catalyzing knowledge transference across networks, practitioners, entrepreneurs and students therefore represents an area of particularly high return on investment.

Footprints Africa has summarized over 70 cases with in-depth coverage provided for over 30 cases in a report which presented 6 themes and 7 strategies (key elements) as a strategy to propagating knowledge in a manner that can inspire local initiatives (Warner et al 2020). The diversity of examples underlines the fact that, for many actors, CE responds to a design problem, is intuitive to Africans and consistent with African cultures and environmental and livelihood objectives.

Footprints Africa and GRID-Arendal have mapped these case studies from across the continent, aiming to provide a comprehensive database of 500 initiatives by the end of 2021. The cases are presented with filters for sectors and strategies of circular economy intervention. The database and map is used in workshops and skills-building programs for emerging circular economy practitioners across the continent (Figure 6).

These CE initiatives might differ in size and economic returns, but all of them contribute to building a restorative African economy that generates well-being and prosperity for all. However, economies of scale still exist. For instance, CE experience in South Africa suggests that there is a “strong correlation” between impact and returns. A commercially profitable and growing enterprise tends to have more impact (Pohjanpalo 2020).



NovFeed

Tanzania

NovFeed produces fish feed from black soldier fly larvae fed on market waste. They are able to cycle nutrients from food waste and reduce the burden on landfill and municipal waste. Additionally, they provide an alternative, high quality protein source for low-income fish farmers, thereby improving their yields.

Closing the Loop

Pan-Africa/Netherland

For each new device their customers buy or lease in Europe, Closing the Loop collects and recycles an equivalent amount of electronic waste in Africa. They work with a network of agents across the continent and recyclers across the globe. It allows companies to offset the impact of their electronic devices and finances the clean-up effort of harmful e-waste dumping.

FIGURE 6

INTERACTIVE CASE-STUDY DATABASE DEVELOPED BY FOOTPRINTS AFRICA AND GRID-ARENDAI

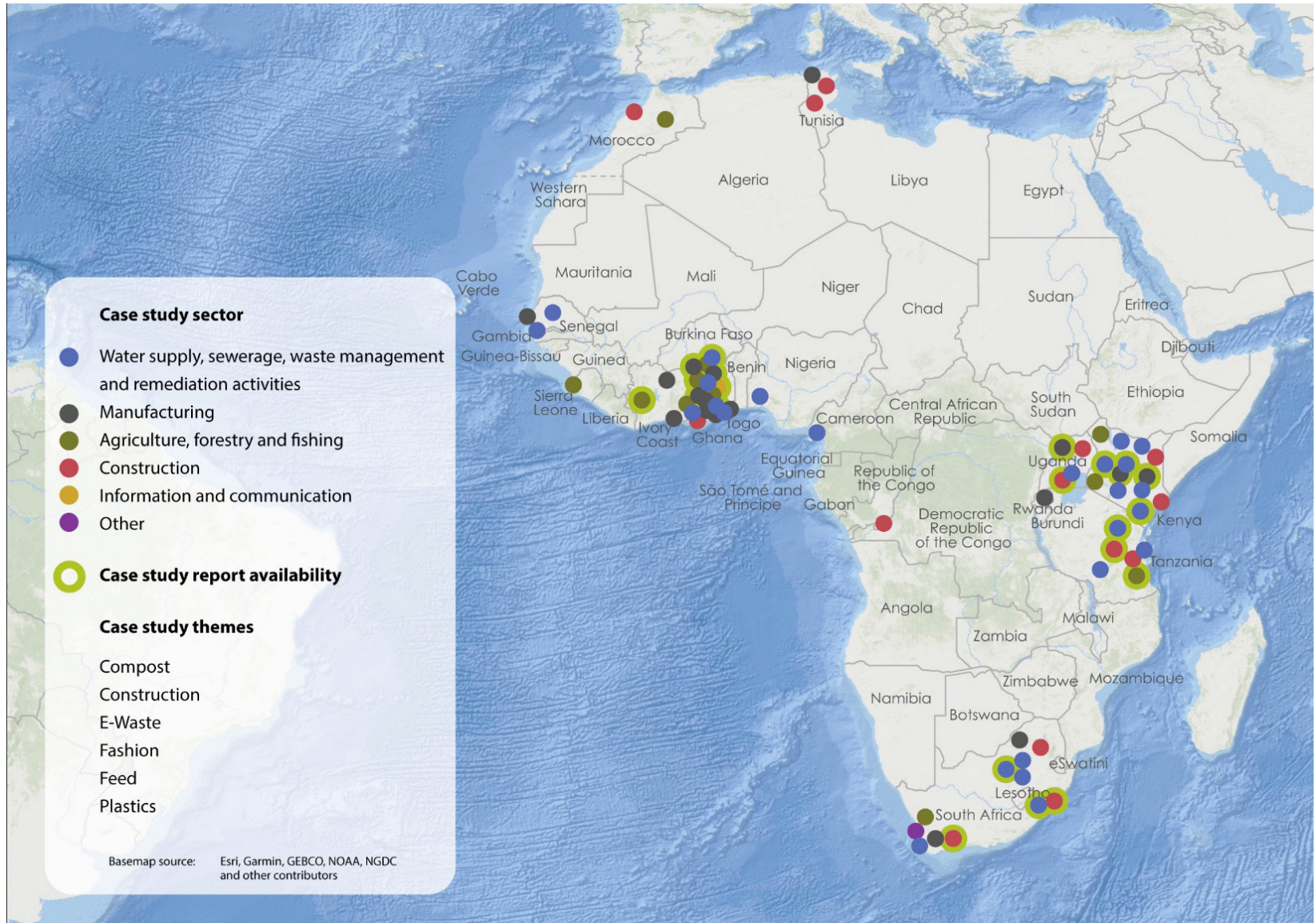
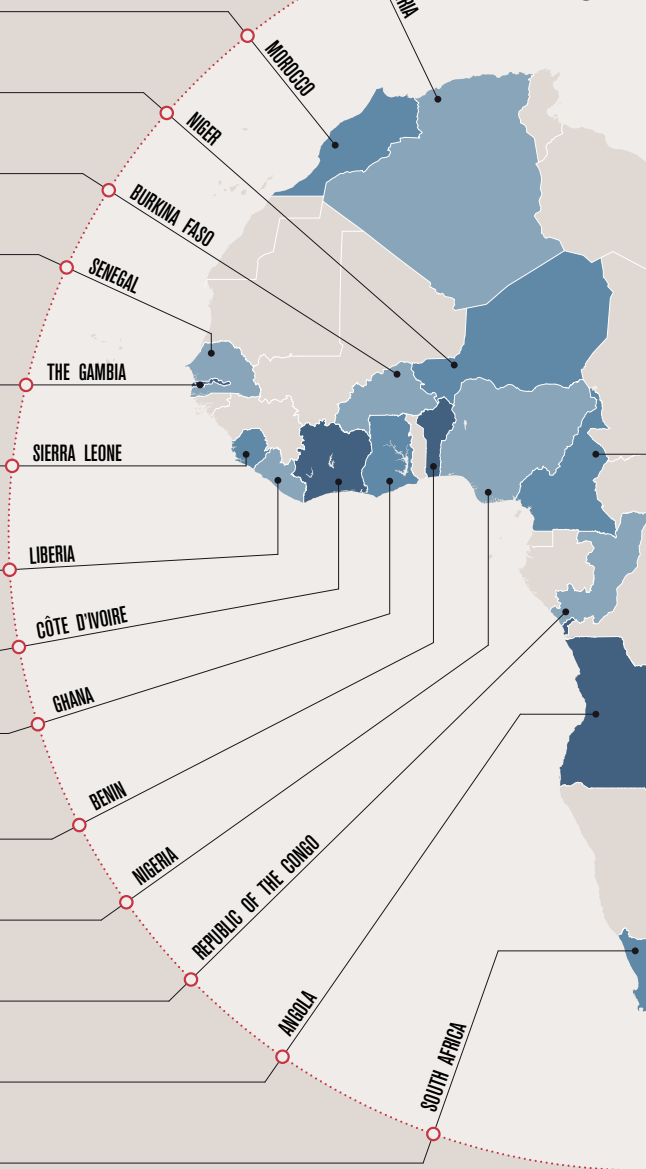


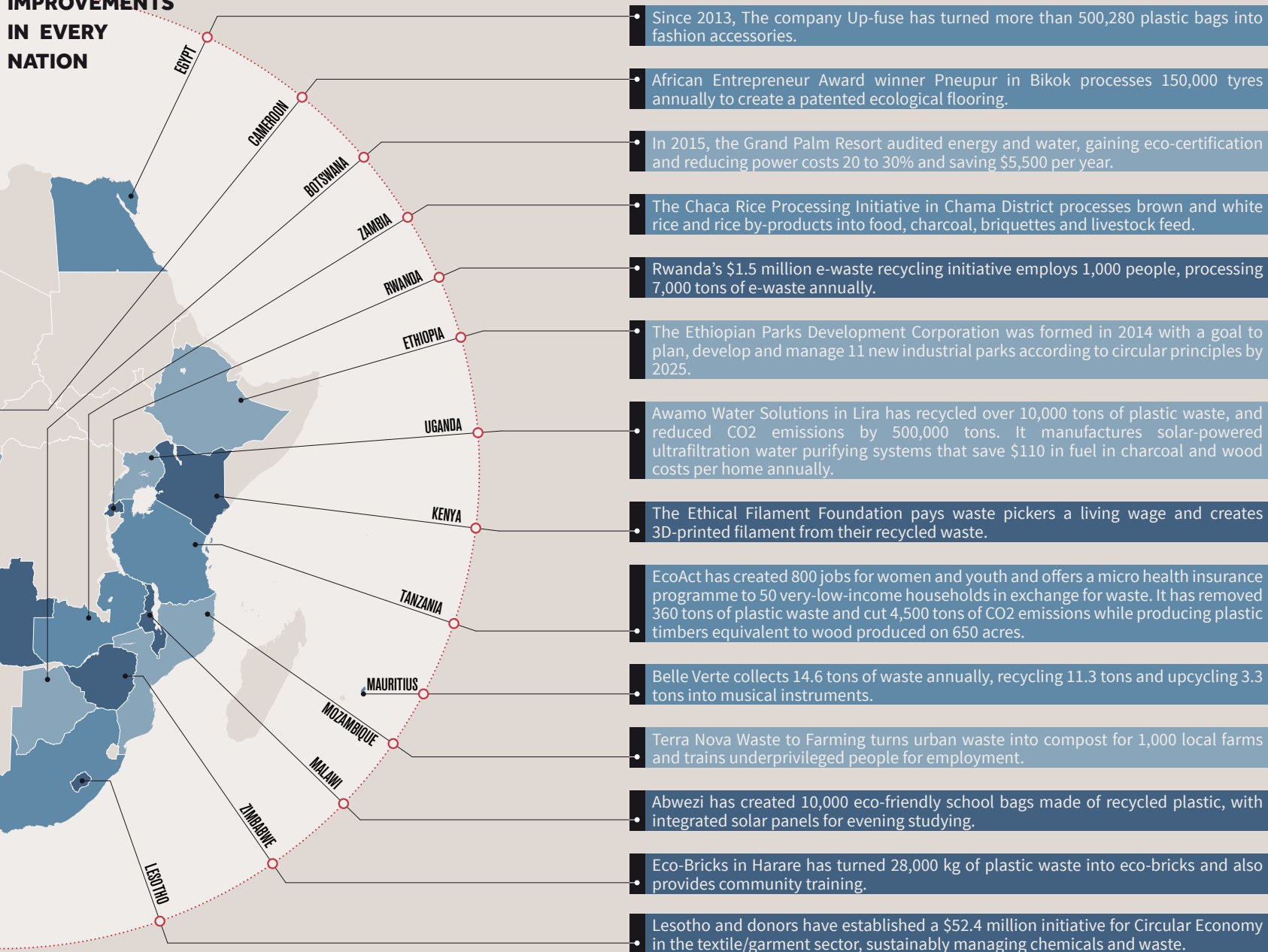
FIGURE 7

**CIRCULAR ACTIVITIES
ECONOMIC
& BENEFITS
AFRICAN**

- Atelier Le Printemps in Bejaia upcycles clothing into quilts and handbags. Seed CE funding from EU SwitchMed increased recycling 70% and revenues by 30%.
- The cooperative At-Tawafouk hired 150 former trash pickers to staff a recycling facility, where salaries are formally negotiated, including health benefits and safety equipment.
- ALMODO pays community members for solid waste which they convert into school slate, paving stones, bricks, latrines, organic fertilizers and combustibles.
- Lagazel (Ouagadougou) makes, repairs and recycles solar lamps for off-grid households and evening homework, saving 92 kg of CO2 emissions per lamp, annually.
- Poor households with the financial, technical and training from public and private sector collect and transform Waste Charcoal into Biochar, creating jobs, reducing deforestation and improving in-home air quality and health, especially for women and children.
- GreenTech has fuel-efficient stoves and produces fuel briquettes from groundnut shells, reducing fuel costs by 66%.
- Farming sites have received intercountry technology transfer from the Benin Songhai Regional Centre of Excellence for Africa for organic and circular reuse of farm waste.
- Green Cities (Liberia) and Fair Recycling (Switzerland) partner on sustainable waste management initiatives in Monrovia, for products, jobs and income opportunities.
- Coliba has a mobile application for municipalities to identify the value of waste and monetize it.
- 21st Century Initiatives LLC converts plastic into eco-friendly pillows and paving bricks, creating 1,000 jobs along the value chain.
- Songhai Farm (in Porto-Novo) techniques are now used in 15 African countries. Traditional, organic, sustainable permaculture and zero-waste techniques link crop, livestock and fish production.
- At Hello Tractor, small-scale farmers use an Internet of Things platform to request and pay for shared tractor services via SMS and using mobile money.
- Republic of the Congo is one of 15 countries to replicate the Songhai organic permaculture, reusing crop waste for animals and animal waste for fish production.
- AmbiReciclo recycles tyres and vegetable oils, producing 1,000 bars of soap per day which are used by low-income families for COVID-19 control.
- Barloworld remanufactures Caterpillar machine parts for resale with the same warranty as an unused product.



ARE MOBILIZING IMPROVEMENTS IN EVERY NATION



Selected examples of circular economy initiatives in Africa

East Africa: Rwanda

Rwanda co-founded the African Circular Economy Alliance in 2017, and since has mainstreamed environment and climate change initiatives into its national and sectoral policies to promote green growth and increase resilience.

Rwandan policies such as the Organic Law on Environmental Protection, Conservation & Management No. 04/2005, the Rwanda National Environment and Climate Change Policy of 2019, and Rwanda's Law No. 17/2019 explicitly promote CE to:

- advance sustainable consumption and production patterns,
- establish the correct procedures for disposal of solid, liquid, hazardous, toxic and electronic waste,
- prohibit the manufacturing, importation, use and sale of plastic carry bags and single-use plastic in the country.

Based on this policy framework, Rwanda has implemented diverse CE initiatives, some of them trialing innovative approaches in the building and construction sector, in agricultural and food sectors, and in information technologies, increasing efficiency and supporting the country's transformation from a resource-based to a service and digital economy.

These CE initiatives have the potential to help support livelihoods and advance key indicators. For instance, applying CE practices in the agriculture and food systems could

increase food security by 33 per cent and reduce greenhouse gas emissions by 16 per cent by cutting down food loss and wastage along the value chain. In the construction sector, the Green City Kigali project integrates efficient and renewable energy, e-mobility infrastructure, sustainable waste management and urban forests using local resources. With estimated costs between \$4 billion and \$5 billion, the project is expected to provide 30,000 housing units with 10 per cent of them dedicated to low-income residents from first to second Ubudehe Categories (socioeconomic classifications) in alignment with promoting urban inclusivity.

Overall, in Rwanda, the adoption of CE practices in priority sectors including agrifood, plastics, construction, electrical and electronic equipment products, e-waste, and general waste might create 17,300 new jobs (mostly in agriculture), increase the gross domestic product (GDP) by 0.6 per cent (\$182 million) compared to business as usual and improve the trade balance (through reducing imports worth by \$48 million and increasing exports by \$12 million) (Whyte et al. 2020).

West Africa: Senegal

Senegal's economic growth has been among the highest in Africa, remaining above 6 per cent annually until 2019, with the service sector being the largest contributor to GDP. However, since early 2020 growth has slowed to 1.3 per cent, with the service sector being very strongly affected.

In July 2019, the Republic of Senegal, the United Nations Industrial Development Organization, the European Commission and ECOWAS organized a High-Level Regional Conference on "Circular Economy, Green Industries and Jobs in West Africa" in Dakar, Senegal. At that event, Senegal and the other parties reaffirmed their commitment to:

- strengthening engagement in CE and green industries, including through regional, continental and multilateral frameworks and through the promotion of quality infrastructure, norms and standards,
- facilitating business-to-business and value chain collaboration in the areas of product design; resource efficiency and cleaner production methods; sustainable materials; and water, energy and waste management systems and technologies,
- promoting collaboration for the uptake of circular business practices in economic sectors, for the development of dedicated industrial parks and economic zones to support new sector development and to promote the development of sustainable cities and sustainable infrastructure.

Via the Plastics Prohibition Law No. 2020-04 (extending producer responsibility on plastics producers) and the Environment Code 2001 Law No. 2001-01 (ensuring the appropriate recycling and disposal of all types of waste), and Article R30 (conditions for reuse of water), the country has implemented a diverse and large number of CE initiatives particularly in agriculture and waste management.



These CE initiatives contribute to multiple objectives such as the Bio Bissap environmental, gender and economic objectives, promoting organic crops, empowering women and using microfinance to create new and sustainable sources of income. The women's groups sought net profits of at least \$1,017 allowing them to increase their incomes, strengthen their financial stability through diversification and promote their own independence by gaining access to land. In the energy sector, Bonergie Irrigation produce and install solar-powered irrigation systems across rural Senegal, reducing emissions from fossil fuel pumps, increasing yields and promoting food security. Bonergie uses a hire purchase agreement with farmers,

under which each farmer pays for an irrigation system over a period of 18 months, becoming energy autonomous and increasing rice production by three to six times in comparison with rain-fed agriculture. In coordination with the National Sanitation Utility, Senegal has more than 14 wastewater treatment plants that support circularity via conversion of faecal sludge to safe, organic fertilizer (AfDB, UNEP and GRID-Arendal 2020).

Overall, in Senegal, the adoption of CE practices in priority sectors including agrifood, plastics, construction, electrical and electronic equipment products, e-waste, and general waste might create 8,200 new jobs in diverse

fields including agriculture, education, health, construction, financial intermediation and business activities, increasing GDP by 0.6 per cent (\$375 million) and improving the trade balance through a \$120 million reduction in imports (Bonnaire et al 2020).

North Africa: Egypt

In Egypt, the disruptions caused by the pandemic interrupted a period of macroeconomic stability and development successes. The scale, monetary and energy sector reforms implemented in recent years, along with the government response to COVID-19, are helping Egypt maintain economic goals and manage its foreign reserves.

Responding to the impact of the COVID-19 pandemic, the European Bank for Reconstruction and Development (EBRD), the European Union and the Green Climate Fund are working with local

partner banks to offer \$264 million to businesses for green investments in energy, water and resource-efficient solutions. These initiatives are aligned with existing policies, for example, the National

Action Plan for Sustainable Consumption and Production, supporting Egypt's development efforts in circularity and sustainability in multiple sectors including energy, agriculture, water and waste.

Manshiyat Naser

Cairo

Manshiyat Naser, a neighborhood that recycles 85% of Cairo's waste, reflects the delicate balance between informal labor that often provides circular services and formalized policies needed to improve working conditions, pay, and job security. The Association for the Protection of the Environment is an NGO providing literacy and vocational training on recycling waste for local women, educational programs for children and health support services in the community.

These initiatives are expected to address barriers to increased deployment of innovative, higher performing technologies to enhance water and energy efficiency and to promote the adoption of renewable energies. The country has a track record of implementing large CE initiatives in the energy sector, e.g. the EBRD's \$836 million investments in 15 projects supporting the Green Economy Transition mandate. Egyptian Codes (Decree 171/2005) and Laws (48/1982) define conditions for use of treated waste in agriculture and water quality for discharge. 358 plants treat 3,650 Mm³ of wastewater per year, which is mainly used to irrigate 4,478 ha of public forests (AfDB, UNEP and GRID-Arendal 2020).

The private sector is highly active in exploiting emerging business opportunities and improving its own processes to enhance sustainability, increase revenues and contribute to national goals. For instance, 20 Egyptian companies have applied for the construction of two 100 peak kilowatts (kWp) solar photovoltaic systems on the roofs of public buildings in the port of Damietta in the Nile Delta. Other private actors, e.g. Suez Cement Group's Kattameya plant, also contribute to the 20 per cent renewable energy target of the Egyptian Government, substituting 10 per cent of its fossil fuel requirements with 75,000 tons per year of agricultural waste-derived fuels, reducing greenhouse gas emissions.

Overall, in Egypt, the adoption of CE practices in priority sectors might create 100,000 new

jobs, increase GDP by 1 per cent and improve the trade balance by reducing imports by \$824 million compared with a \$255 million increase in exports.

Southern Africa: Republic of South Africa

South Africa was one of the three founders of ACEA in 2017, pledging to share information and best practices, raise awareness of the CE and build partnerships.

Currently, the economy of South Africa is facing several challenges due to the COVID-19 pandemic, including a 312 billion shortfall of ZAR in expected budget revenue, a 7.8 per cent fall in GDP and an unemployment rate of 32 per cent (7.5 million people). The Government is subscribing to a green recovery as the blueprint for rebuilding and growing the economy with sustainability, resilience and inclusion as key priorities, aligned with the National Development Plan 2030, the National Waste Management Strategy, the Low-Emission Development Strategy and the National Energy Efficiency Strategy.

The potential impact of green recovery is massive. In the renewable energy sector alone, more than 100,000 jobs might be created over the next 10 years, responding to the urgent need of tackling unemployment and urban poverty by supporting energy transition and decarbonization.

As the most industrialized African country with the highest per capita car ownership, South Africa has emblematic CE experiences

in both manufacture, recycling and waste management. For instance, the Western Cape Industrial Symbiosis Programme (WISP) stimulates industrial cooperation, connecting companies so that they can identify and realize the business opportunities enabled by using under-utilized or residual resources (materials, expertise, logistics, capacity, energy and water). During the first year, 108 member companies were recruited to the network. Over 520 under-utilized resources were identified, creating over 1,200 potential new business opportunities or "synergies" that led to substantial waste reduction, financial savings and additional profits. Over five years, WISP has created 143 jobs and diverted almost 27,500 tons of waste.

Since 2012, the Recycling and Economic Development Initiative of South Africa's government-backed national waste tyre project has diverted more than 125,000 tons of used tyres from landfill into new supply chains by subsidizing the collection and recycling process. The initiative supports 190 small and medium enterprises. It has increased the tyre recycling rate from 4 to 19 per cent and has created 2,505 new jobs, 37 per cent of which were filled by women and 41 per cent by youth.



The success of circular economy ambitions at the global, continental, national, and local level are deeply interlinked. Great reform is needed in cultures of high-consumption, and in policies which fail to account/manage social & environmental consequences of resource extraction and international waste trades (legal, via policy gap, or illicit). Operationalizing sustainable, local-to-global circularity requires international attention, and vibrant engagement from each one of us.

CONCLUSIONS AND RECOMMENDATIONS

Circular Economy has strong potential to help countries advance the SDGs, fulfil their international climate commitments and promote a fast and sustainable post COVID-19 recovery. Circular activities

creating space for new services; new energy, material and process efficiencies; lower-cost, locally- available and more reliably-sourced inputs; new markets for by-products; reduced emissions; and new savings via lowered fossil fuel and waste management costs.

Africa is one of the most “ready-for-circularity” continents. The chances of moving into a circular business model are higher than in other continents where most infrastructure has already been built without its next life cycles in mind. One of the biggest opportunities for Africa is remanufacturing and refurbishment. Remanufacturing hubs can be created in many African countries, restoring products back to their original state to send back to their markets or to resell to Europe and the Middle East. This would generate countless jobs.

African countries have vast cultural, demographic and economic differences which influence their economic development trajectories and their capacity to adopt circularity. Advancing towards CE, in a manner that will most quickly advance SDGs in African nations requires developing and propagating successful African case studies, rather than simply attempting to adapt best practices from other continents. There are no “one-size-

fits-all” Africa solutions. It is also important to recognize the diversity of mindsets among actors, which helps create a more sustainable future for the continent.

Multiple actors are driving the transformation to a CE in Africa. There is very active policy development and a large number of CE initiatives across Africa. Circular Economy policies and projects in Africa reflect the countries’ diversity in development stages, national priorities, socioeconomic and environmental contexts and existing legislation. Multiple actors are committed to African circular transformation, including donors, development agencies, government associations like ACEA and professional networks such as ACEN. However, progress for African circularity must also be reflected in policies from all other global regions which prevent exploitative mining, labor and waste trade practices. Elevating African circular economy entrepreneurs, cases, and inspiration in international policy forums can increase inclusive policy discussion.

Additional upfront investments for a CE transition may be considerable, but so is the potential reward. Evidence from a range of CE assessments demonstrate that a transition towards an inclusive CE in Africa represents an opportunity to address poverty, create employment and improve overall well-being across the continent. With investment and coordination, the overall economic performance of key sectors such as manufacturing, building,

fashion and plastics is also expected to improve. Circular investments reduce waste, toxins and pollution, and preserve natural capital and the ecosystem services, which support the lives and livelihoods of millions of people in Africa.

The time for CE investment is now. Policy and implementation can both focus on a development path that eases pressure on valuable natural assets, while better managing environmental, social and economic risks.

This synthesis provides examples and insights for countries transitioning to a CE. Through specific and relevant examples, it builds on documents and reports that contribute to an ever-increasing body of knowledge about CE. Using illustrations from recent studies, it aims to enhance understanding about the implications of the CE paradigm for Africa’s transformation. This portfolio of active, effective and diverse efforts and insights from networks from across the continent can help communities of practice build on existing experience, as well as lay important groundwork for urgently needed policy improvements.

REFERENCES

- Adu, G., Dramani, J.B. and Oteng-Abayie, E. (2018). The economic impacts of investing in rural electrification in Ghana, 1 August. <https://www.theigc.org/blog/economic-impacts-investing-rural-electrification-ghana/>. Accessed 29 March 2021.
- African Development Bank (2020a). African economic outlook 2020: developing Africa's workforce. Abidjan. <https://www.afdb.org/en/documents/african-economic-outlook-2020>.
- African Development Bank (2020b). African Development Bank takes steps to accelerate the circular economy in Africa, 23 December. <https://www.afdb.org/en/news-and-events/african-development-bank-takes-steps-accelerate-circular-economy-africa-40033>. Accessed 29 March 2021.
- African Development Bank, UNEP and GRID-Arendal. (2020). Sanitation and Wastewater Atlas of Africa. AfDB, UNEP and GRID-Arendal. Abidjan, Nairobi and Arendal.
- Alliance Disposal (2020). Water pollution statistics, 13 August. <https://www.alliancedsp.com/trash-talks-blog/water-pollution-statistics/>. Accessed 29 March 2021.
- aNiamy.com (2014). Le Niger interdit la production, l'importation, la commercialisation, l'utilisation et le stockage des sachets et des emballages en plastique souple à basse densité, 29 October. <http://news.aniamy.com/h/22750.html>. Accessed 29 March 2021.
- Ashraf, N., Knaepen, H., van Seters, J. and Mackie, J. (2020). The integration of climate change and circular economy in foreign policies. Maastricht: The European Centre for Development Policy Management [ECDPM]. <https://ecdpm.org/wp-content/uploads/Integration-Climate-Change-Circular-Economy-Foreign-Policies-Discussion-Paper-274-June-2020-ECDPM.pdf>.
- Barloworld Equipment (2021). Cat remanufactured parts. <https://www.barloworld-equipment.com/products/new/parts/cat-remanufactured-parts/>. Accessed 29 March 2021.
- Bassi, A. M., Bianchi, M., Guzzetti, M., Pallaske, G., & Tapia, C. (2020). Improving the understanding of Circular Economy potential at territorial level using Systems Thinking. *Sustainable Production and Consumption*, 27, 128-140.
- Bonnaire, S.M., Jagot, J. and Spinazzé, C. (2020). Circular economy in Africa-EU cooperation – country report Senegal. Luxembourg: Publications Office of the European Union. doi:10.2779/042060.
- Chatham House (2021). Circulareconomy.earth. <https://circulareconomy.earth/>. Accessed 29 March 2021.
- Dalberg, ACEA and World Economic Forum (2021) - Five Big Bets for the Circular Economy in Africa. African Circular Economy Market Research
- De Jesus, A. and Mendonça, S. (2018). Lost in transition? Drivers and barriers in the eco-innovation road to the circular economy. *Ecological Economics* 145, 75-89. doi.org/10.1016/j.ecolecon.2017.08.001.
- Desmond, P. and Asamba, M. (2019). Accelerating the transition to a circular economy in Africa. In *The Circular Economy and the Global South*. Schröder, P., Anantharaman, M., Anggraeni, K. and Foxon, T.J. (eds.). Routledge. Chapter 9. 152-172. <https://www.routledge.com/The-Circular-Economy-and-the-Global-South-Sustainable-Lifestyles-and-Green/Schroder-Anantharaman-Anggraeni-Foxon/p/book/9781138358935>.
- Diao, M., Alami Merrouni, M. and Bougarrani, S. (2020). Circular economy in the Africa-EU cooperation – country report for Morocco. Luxembourg: Publications Office of the European Union. Doi:10.2779/211421.
- Ellen MacArthur Foundation (2019). Completing the picture: how the circular economy tackles Climate Change. Isle of Wight. https://www.ellenmacarthurfoundation.org/assets/downloads/Completing_The_Picture_How_The_Circular_Economy_Tackles_Climate_Change_V3_26_September.pdf.
- Ellen MacArthur Foundation (2020). Circular economy and the Covid-19 recovery: how policymakers can pave the way to a low-carbon and prosperous future. Isle of Wight. <https://circulareconomy.europa.eu/platform/sites/default/files/circular-economy-and-the-covid-19-recovery.pdf>.
- Godfrey, L. (2020). Interview by Ozunimi, I., United Nations Industrial Development Organization. 11 February. <https://www.unido.org/stories/green-industrialization-create-opportunities-and-women-will-step-and-run-them>.
- Government of Zambia (2018). Issuance of Statutory Instrument no. 65 on Extended Producer Responsibility Regulations. Ministry of Water Development, Sanitation and Environmental Protection.
- ICLEI Africa and African Circular Economy Network (2020). Circular cities in Africa: a reflection piece by Africans about Africa. Cape Town. <https://cdn.website-editor.net/1d19b3c8e4ec4cea997a5b973b37c28c/files/uploaded/Synthesis%2520Paper-CircularAfricanCities-ICLEI-ACEN.pdf>
- Kirchherr, J., Piscicelli, L., Bour, R., Kostense-Smit, E., Muller, J., Huibrechtse-Truijens, A. et al. (2018). Barriers to the circular economy: evidence from the European Union (EU). *Ecological Economics* 150, 264–272. doi: 10.1016/j.ecolecon.2018.04.028.
- Kuwonu, F. (2017). Protectionist ban on imported used clothing, Africa Renewal December 2017 – March 2018. <https://www.un.org/africarenewal/magazine/>

december-2017-march-2018/protectionist-ban-imported-used-clothing. Accessed 29 March 2021.

O'Callaghan, B.J. and Murdock, E.M. (2021). Are we building back better? Evidence from 2020 and pathways for inclusive green recovery spending. Nairobi: United Nations Environment Programme. <https://www.unep.org/resources/publication/are-we-building-back-better-evidence-2020-and-pathways-inclusive-green>.

Partnership for Action on Green Economy (2016). May – Egypt launches a national strategy for green economy at AMCEN. <https://www.un-page.org/may-egypt-launches-national-strategy-green-economy-amcen>. Accessed 29 March 2021.

Pohjanpalo K. 2020. Africa's Green Revolution Lures New Fund Eyeing 12% Returns. Bloomberg Green, June 17 2020. Available at <https://www.bloomberg.com/news/articles/2020-06-17/africa-s-green-revolution-lures-finnish-fund-eyeing-12-returns>

Ritzén, S. and Sandström, G.Ö. (2017). Barriers to the circular economy – integration of perspectives and domains. *Procedia CIRP* 64, 7-12. Doi:10.1016/j.procir.2017.03.005.

Rwanda (2016). National e-waste management policy for Rwanda. Kigali. <http://www.fonerwa.org/sites/default/files/National%20E-Waste%20Management%20Policy%20for%20Rwanda.pdf>.

Schroeder, P., Anggraeni, K. and Weber, U. (2019). The Relevance of Circular Economy Practices to the Sustainable Development Goals. *Journal of Industrial Ecology*, Yale University, vol. 23(1), pages 77-95,

Togo, Secretary-General of the Presidency (2011). Decret no. 2011-003/PR fixant les modalités de gestion des sachets et emballages plastiques [Decree no 2011-003/PR establishing procedures for the management of plastic bags and packaging]. 5 January. <http://extwprlegs1.fao.org/docs/pdf/tog143632.pdf>.

United Nations Environment Programme (2011). *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication*, Geneva.

United Nations Environment Programme (2018). Legal limits on single-use plastics and microplastics: a global review of national laws and regulations. Nairobi. <https://www.unep.org/resources/report/legal-limits-single-use-plastics-and-microplastics>.

United Nations Environment Programme (2019). UNEP Circularity Platform. www.unenvironment.org/circularity

United Nations Environment Programme (2020). Emissions Gap Report 2020. Nairobi. <https://www.unep.org/emissions-gap-report-2020>.

United Nations World Water Assessment Programme (2018). *The United Nations World Water Development Report 2018: nature-based solutions for water*. Paris: United Nations Educational, Scientific and Cultural Organization. <https://reliefweb.int/sites/reliefweb.int/files/resources/261424e.pdf>.

Uusitalo, T., Huttunen-Saarivirta, E., Hanski, J., Lima-Toivanen, M., Myllyoja, J. and Valkokari, P. (2020). Policy instruments and incentives for circular economy – final report. European Institute of Innovation and Technology RawMaterials. https://www.researchgate.net/publication/343827731_Policy_Instruments_and_Incentives_for_Circular_Economy_-_Final_report.

Warner, H., J. Bingham and D. Ohui Nartey (2020). *The Circular Economy: our journey in Africa so far*. 50 p. Footprints Africa. Accra, Ghana. https://irp-cdn.multiscreensite.com/40a0e554/files/uploaded/CEcasereport_Footprints.pdf

Weetman, C. (2020). *A Circular Economy Handbook: How to Build a More Resilient, Competitive and Sustainable Business*. Kogan Page.

Whyte, C. R.; Irakoze, G.; Katanisa, P.; Desmond, P. et al. (2020) Circular economy in the AfricaEU cooperation - Country Report for Rwanda. Country report under EC Contract ENV.F.2./ETU/2018/004 Project: "Circular Economy in Africa-EU cooperation", Trinomics B.V., ACEN, adelphi Consult GmbH and Cambridge Econometrics Ltd

World Bank (2019). \$4.2 trillion can be saved by investing in more resilient infrastructure, new World Bank report finds. 19 June. <https://www.worldbank.org/en/news/press-release/2019/06/19/42-trillion-can-be-saved-by-investing-in-more-resilient-infrastructure-new-world-bank-report-finds>.

World Health Organization (2021). Water Sanitation Hygiene – Economics. https://www.who.int/water_sanitation_health/monitoring/economics/en/. Accessed 29 March 2021.

Citations for the info in the maps on pages 34–37

Algeria
www.theswitchers.eu/en/switchers/this-is-how-a-pair-is-preserving-the-algerian-heritage-through-recycling-high-quality-fabrics/

Angola
<https://news.un.org/pt/story/2020/07/1720621>.

Benin
www.reseaprojection.org/content/uploads/2019/10/Africa-a-Circular-Continent_ACEN_Alexandre_Lemille.pdf

Botswana
www.grandpalm.bw/Press-Room/Articles/grand-palm-eco-initiatives

Burkina Faso
www.seed.uno/enterprise-profiles/lagazel

Cameroon

<https://www.afrik21.africa/en/cameroon-start-up-pneupur-transforms-non-reusable-tyres-into-eco-friendly-flooring/>

Republic of the Congo

www.reseauprojection.org/content/uploads/2019/10/Africa-a-Circular-Continent_ACEN_Alexandre_Lemille.pdf

Côte d'Ivoire

<https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2019/11/Coliba-Using-mobile-to-create-a-formalised-plastic-recycling-economy-in-Africa.pdf>

Egypt

<https://www.theswitchers.eu/en/switchers/the-story-of-up-fuse-a-brand-that-promotes-eco-conscious-lifestyle-by-designing-and-producing-upcycled-plastic-bags/>

Ethiopia

<https://ramboll.com/projects/re/reppie-in-addis-ababa-ethiopia-first-waste-to-energy-facility-african-continent>

Gambia

www.seed.uno/enterprise-profiles/greentech-environmental-solutions

Ghana

<https://startup.info/21stcenturyinitiatives/>

Kenya

<http://ef.techfortrade.org/>

Lesotho

<https://www.thegef.org/project/promotion-circular-economy-textile-and-garment-sector-through-sustainable-management>

Liberia

<http://www.repic.ch/repic-en/projects/ongoing-projects/resource-efficiency/fair-recycling-liberia/>

Malawi

www.seed.uno/enterprise-profiles/abwezi-school-bags

Mauritius

www.seed.uno/enterprise-profiles/belle-verte-ltee

Morocco

<https://reporterre.net/Organises-en-cooperative-les-recuperateurs-de-dechets-marocains-vivent-mieux>

Mozambique

www.seed.uno/enterprise-profiles/terra-nova-waste-to-farming

Niger

www.seed.uno/enterprise-profiles/almodo

Nigeria

www.seed.uno/enterprise-profiles/waste-sawdust-to-clean-briquettes

Rwanda

<https://www.greengrowth.rw/2017/12/05/rwanda-launches-state-of-the-art-e-waste-recycling-facility-during-green-growth-week/>

Senegal

https://www.doc-developpement-durable.org/file/Energie/biomasse-bois/Carbonisation_biochar/2195_Biocharcoal_Flyer_EN_120315.pdf

Sierra Leone

www.reseauprojection.org/content/uploads/2019/10/Africa-a-Circular-Continent_ACEN_Alexandre_Lemille.pdf

South Africa

<https://www.barloworld-equipment.com/products/new/parts/cat-remanufactured-parts>

Tanzania

<https://seed.uno/enterprise-profiles/ecoact-tanzania>

Uganda

www.seed.uno/enterprise-profiles/awamo-water-solutions
www.seed.uno/enterprise-profiles/adapt

Zambia

www.seed.uno/enterprise-profiles/chaca-rice-processing-initiative

Zimbabwe

<https://www.seed.uno/enterprise-profiles/eco-bricks>

Across Africa, “circular” investments can not only lead to higher economic returns, but also represent a valuable opportunity for the conservation of the natural basis on which its economy and livelihoods depend.

The stage is set for Africa to meet ambitious development and COVID-19 recovery goals, in particular by leveraging momentum and potential in its young and vibrant workforce, in waste reduction, re-using materials, repair/repurposing and technological innovation.

Circular economy is rising in clusters of innovation and collaboration across the continent. Entrepreneurs are discovering opportunity in surprising places, by not only re-examining the concept of ‘waste’ but also connecting with locally abundant materials and new networks, repairing and repurposing, and designing in a wide diversity of opportunities to participate in circular activity.

Each country and region in Africa presents unique social, economic, environmental, traditional, and cultural contexts. Thus, local circular economy applications reflect great diversity in approaches.

Up-front investments for a circular economy transition may be considerable, but so is the potential reward. The time for circular economy investment is now.

