Circular Economy in Africa-EU Cooperation

Country Report for Kenya

Written by Trinomics
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Trinomics

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AFRICAN CIRCULAR ECONOMY NETWORK

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Abbreviations

AFD	French Development Agency
AMCEN	African Ministerial Conference on the Environment
DFI	Development Finance Institution
EPA	Economic Partnership Agreement
EAC	East African Community
EC	European Commission
EEE	Electronics and electrical Equipment
EIB	European Investment Bank
FMO	Financierings Maatschappij Ontwikkelingslanden (Dutch Development Bank)
FRAMES	Framework for Modelling Economies and Sustainability
GESIP	Green Economy Strategy and Implementation Plan
GGEP	Green Growth and Employment Programme
KAM	Kenya Association of Manufacturers
KCFP	The Kenya Commercial Forestry Programme
KEPSA	Kenya Private Sector Alliance
KfW	Kreditanstalt für Wiederaufbau
KGBS	The Kenya Green Building Society
KOEE	Kenyan Organization for Environmental Education
LDC	Least Developed Countries
MLPP	Ministry of Lands & Physical Planning
MTIHUD	Ministry of Transport, Infrastructure, Housing & Urban Development
MEA	Multilateral Environmental Agreement
NAIP	National Agriculture Investment Plan
NAMA	Nationally Appropriate Mitigation Action
NCA	National Construction Authority
NECS	National Economic and Social Council of Kenya
NEMA	National Environment Management Authority
NPEK	New Plastics Economy in Kenya
OECD	Organisation for Economic Co-operation and Development
PE/PET	Polyethylene
TVET	Technical and Vocational Education and Training
TVETA	Technical and Vocational Education and Training Authority
SCP	Sustainable Consumption and Production
SDG	Sustainable Development Goal
WEEE	Waste of Electronics and electrical Equipment

Executive Summary

Circular economy trends in Kenya

Within Africa, Kenya can be seen as **one of the frontrunners** in furthering a transition to circular economy (CE). At the same time, the country still has important steps to make to mainstream it further in its broader economic policy framework. In Kenya, CE-related developments are mostly driven by the national government, which has been very active during the last five years in introducing policies to address waste-related problems and lately it is starting to develop a CE policy approach that goes beyond waste.

Kenya's economy is still strongly dependent on its agriculture sector, which accounts for 34% of the country's GDP. Tourism is also an important contributor to the country's economy. Even though the share of manufacturing in Kenya's economy is still rather limited, the government is actively supporting its development as one of its four key economic priorities. Kenya ranks as the 6th African country in the latest edition of the World Competitiveness index, ranking 95th of the 141 countries assessed. From a circular economy perspective, the aforementioned sectors also hold substantial potential for further implementation of CE-related principles. Next to these sectors, there is significant potential for CE measures in the construction sector, which stands for the challenging task of addressing the current housing deficit of 2 million houses. Lastly, as in all countries, the waste sector will play a key enabling role for a further shift to a CE. Although this sector is limited in terms of its economic size, the CE transition can strengthen the links with the manufacturing sectors and strengthen the position of informal waste workers, both from an economic as well as from a social perspective.

Kenya's **agriculture sector**, which is still mostly dominated by small-scale farmers and subsistence farming, holds substantial potential for circular economy measures. First of all, organic waste is the largest waste stream in the country and increased use of this waste stream for the production of animal feed and fodder, food supplements or organic fertilizers can contribute to the recovery of some of the value contained in this waste stream. **Local production of organic fertilizers can bring multiple benefits, including a reliable supply of affordable soil improvement, products for farmers, reduced reliance on imported fertilizer products and improvements in soil carbon content**. Next to this, a significant amount of food is lost along the food production value chain. Most of these losses occur due to poor packaging materials, storage facilities and the lack of adequate logistics. We estimate that within Kenya's agri-food sector, post-harvest food losses could amount to a total value of € 644 M lost on an annual basis. Investments in improving the aforementioned parts of the value chain could help the agri-food sector to reduce the food losses, thereby substantially increasing productivity levels. **EU and bilateral cooperation projects in Kenya, but also the EIB and EU Member States DFIs could play a role in investing in food loss reduction measures**.

The growing volume of **packaging** waste is a growing concern in Kenya. Addressing this problem will require a two-pronged approach, which on the one hand focuses on traditional practices that prevent packaging waste and on the other hand measures to properly manage the packaging waste that is generated. In Kenya, various throw-away packaging free distribution system exist for a wide variety of products (e.g. milk ATMs and dispensers of vegetable oils in supermarkets). Such existing practices should be protected and actively promoted. Next to this, improved waste collection and recycling of packaging materials, especially plastics, would be a second important step to address the growing waste problem. **When combining plastics recycling with domestic production of packaging products, Kenya can also reduce its dependence on imported primary plastics and packaging products.**

In the **construction sector**, CE-related activities are still very rare. At the same time the country faces a massive demand for construction due to economic and population growth. A CE approach could help Kenya's construction sector to reduce the material footprint associated with the large hunger for new construction projects. Furthermore, it could contribute to making new construction projects more affordable. Promising directions for furthering CE principles in the sector include:

- **Revisions to existing building regulations and the establishment of standards** so that second-hand components and secondary materials can be sustainably and safely used as construction materials.

- **Stimulation and recognition of innovative circular building materials** such as Interlocking Stabilised Soil Blocks should be promoted.
- **Capacity building measures for professionals in the sector**, including architects and designers, but also manufacturers of building materials, how they can apply CE principles in their work.

During the last decades, Kenya has shown solid economic growth figures and fundamentally, the country's economic outlook also look positive. However, with the **hit of the COVID-19 pandemic**, this outlook has become uncertain. This year, the country's economy is expected to contract by 0.3% (Kemboi, 2020) as opposed to an original growth outlook of +6%. This means that like many other African countries, Kenya will need financial support to make sure it can recover from the economic impacts of the pandemic at a relatively rapid pace. Although, the pandemic has had severe impacts on Kenya's economy, the need for economic recovery support and response plans also represents an opportunity to give a more prominent role to circular economy in Kenya's economic development.

Policy framework supporting circular economy activities

CE models and concepts are relatively novel in Kenya, although many new CE-relevant policies have been introduced in the last few years. Key policy and regulations include:

- **The ban on single-use plastic bags (2015)** made Kenya the second African country to completely ban the use of single-use plastic carrier bags. The effectiveness and the implementation of the ban have been controversial, as an adequate plan for alternative for the plastic bags was lacking. Next to that, enforcement is inadequate to completely stop illegal flows of single-use plastic carrier bags entering the country from abroad;
- **The ban on the use of single-use plastics in parcs and nature areas (2020)** is the second step in the fight against single-use plastics. The tourism sector has been the primary driver behind this ban, as government officials saw the growing plastic pollution in nature areas as a risk for negative impacts on tourism in those areas.
- **The Sustainable Waste Management Bill (2020)**, which is currently under review by the parliament, reforms the waste management sector but does so through the lense of CE principles. The bill also includes provisions for the development of a new **Extended Producer Responsibility (EPR)** policy. In the current design of the EPR policy, private sector associations will be involved in the development, implementation and enforcement of the new policy as the Ministry of Environment lacks the required enforcement capacity.

Most of these policies have been primarily driven by the Ministry of Environment and Forestry, which is one of the weaknesses of Kenya's CE policy up to now. Circular economy is an inherently **horizontal and cross-cutting concept** that touches upon many aspects of the economy and society. Therefore, **for CE policy to be successful it is important that a holistic CE policy is developed**, that has an integrated approach across economic sectors and that is supported by all relevant national ministries and appropriate intergovernmental structures. Setting up a national circular economy action plan could be a valuable step to give direction to CE development in Kenya.

Existing awareness and capacities on circular economy in Kenya

Although the concept of the CE is gaining traction and getting more well-known in Kenya, there is still a **large lack of awareness among many stakeholders**. Especially, the economic value associated with improved use of the materials present in waste streams is often overlooked by private companies, as the waste sector is seen as a non-lucrative sector. Therefore, there is a need to grow the awareness about the benefits that the CE can bring in terms of value creation and business opportunities. However, the CE transition **needs to build on existing cultural CE knowledge and existing business practices**. The introduction of an integral inter-ministerial CE action plan could also contribute to increased awareness about the CE concept and its potential benefits for Kenya's economy.

Trade and investments in the circular economy in Kenya

Compared to other African countries, Kenya has a relatively low trade intensity. As the country is not a large producer of raw materials and its manufacturing sector is also relatively small, Kenya has a substantial trade deficit amounting to € 10.2 bn in 2018 (UN Comtrade, 2020). Improving the overall

trade and investment climate in Kenya will be an important **prerequisite** to also unlock investments in circular business activities and trade in CE-related goods and services.

In its **trade with the EU**, Kenya had a trade deficit of around € 754 M in 2018, where **machinery and transport** equipment accounted for the largest part of the **imports**, followed by chemicals and manufactured materials. In its **exports** to the EU, **food products** account for 54% of the exports, followed by **raw materials** (mostly crude vegetable and animal materials -predominantly cut flowers) which account for the following 40%. Although the link with CE is limited, the trends in **trade in environmental goods and services** between the EU and Kenya show that the trade in these categories is growing, indicating a demand for environment-related technologies and services. In 2010, the environmental goods and services sectors accounted for 3% of the total trade volume and over the years this share increased steadily to 6% in 2016. When looking at the trade balance, we see that imports dominate trade in environmental goods and services, where renewable energy technologies, water treatment technologies, heat and energy management technologies and 'cleaner/more resource efficient products' account for the largest part of the imports. In exports, 'environmentally preferable products', renewable energy technology and water management and treatment technologies are the most important product groups.

Currently no African country is part of the ongoing negotiations on the WTO Environmental goods agreement. As the agreement has significant potential to promote green growth and sustainable development, knowledge transfer and even the diversification of exports, an active involvement of Kenya and other African countries offers great opportunities to support trade and investments in environmental goods and services. A public-private dialogue on introducing product standards in Kenya, including standards relating to the environmental performance of products, could promote the development of more circular products, reduce negative environmental side-effects of trade and stimulate competition in Kenya's private sector.

Existing and future economic, environmental and social impacts

Existing CE-related activities in Kenya's private sector are concentrated in **agriculture and waste management**. Most of these initiatives make use of local waste streams, such as organic waste or packaging waste and turn these flows into valuable products. **Positive impacts** of existing CE initiatives include the creation of local economic development, employment creation (also in rural areas), training and capacity building for employees and a wide range of environmental benefits ranging from reduced pollution to mitigation of greenhouse gas emissions and protection of local natural areas and habitats. These existing initiatives showcase the potential for doing circular business in Kenya, but they need to be further scaled-up, which can be promoted through a robust CE policy framework, access to finance and an enabling framework for investment.

In this study we have also done a **forward-looking assessment** analysing the impacts of implementing a (limited) set of circular economy actions between now and 2030. A macro-economic model was used to estimate the impact of implementing a set of circular economy measures in the identified priority sectors Agri-food, plastics, construction, EEE products and E-waste and general waste. Overall, the circular measures assessed could lead to **an increase in economic activity and create additional jobs**. The key findings are the following (for more details see section 3.2.3):

- **Economic benefits:**
    - A **0.5% increase of GDP** (+ €619 M) compared to business as usual;
    - An **improvement of the trade balance**, through a reduction in imports worth € 284 M and an increase in exports+ €34 M;
    - Food loss reduction across the agricultural value chain and associated investments are the largest driver of the impacts found in our modelling assessment.
- **Social benefits:**
    - **46,000 additional jobs** would be created compared to business as usual, which is equivalent to an increase of 0.15%;
    - If done in the right way, increased activities in waste collection and recycling could strengthen the economic position of (informal) waste workers, and attention for capacity building and training can ensure that these people will benefit from the CE transition as well.
    - The largest **employment increases** are found to occur in **agriculture** and the **construction** sector, whereas some minor job losses occur in the sector petroleum, chemicals and non-metallic mineral products.

CE-related cooperation activities between the EU and Kenya

Policy dialogues and development cooperation

Within the EU-Kenya cooperation programs, the **activities in areas related to circular economy** have been **limited up to now**. There have been notably some projects focusing on forestry and climate adaptation supported by the EU delegation in Kenya and implemented in cooperation with the Ministry of Environment and Forestry as well as the Ministry of Treasury. However, in the next funding period, the focus areas of the EU delegation in Kenya is likely include a **flagship program on the Green Deal/Green transition**. Within this flagship, there would be potential to develop some initiatives and cooperation activities that are specifically focused at promoting the shift to a (more) circular economy and these could be rolled out in existing focus sectors such as agriculture and manufacturing.

EU **policy dialogues and development cooperation programs** related to CE could build further upon existing focus areas such as agriculture, water and forestry. CE-cooperation could be further scaled up based on the activities of existing programs such as SWITCH Africa Green and the ongoing P4G projects and policy dialogue on CE should ensure it is **connected to Kenya's national policy priorities**, so that it is easier to find the political will to support CE-relevant projects from the side of the national government. Even though some existing programs such as SWITCH Africa green already paid attention to sustainable consumption and production, but the focus on tangible CE measures in the focus sector (e.g. food loss reduction in the agri-food chain) could be further strengthened in future development cooperation programs.

Next to centralized EU-Kenya cooperation, there are also many cooperation activities between Kenya and individual **EU Member States**. Within the area of circular economy, the **Netherlands, Denmark and Sweden are especially active**. Development of a more coherent and coordinated approach between Member States to support a CE transition in Kenya could improve the effectiveness and efficiency of the interventions undertaken. Furthermore, given the relevant CE knowledge in the aforementioned as well as other EU Member States, they can play a role in supporting national and county governments in the development of effective CE policies.

Financing the CE transition - Activities by EIB and other DFIs

The **External Investment Plan (EIP)**, aims to encourage investment in partner countries in Africa. The EIP aims to mobilise private capital investment towards development-orientated investment; many of instruments (guarantees) put at disposal of African countries (Kenya included) have green economy, digital innovation focus. Another relevant aspect is that the EIB has recently published guidelines for investment in companies with circular business models. In this context, it will be important that these guidelines are translated into the African context. Most Kenyan businesses would not use or recognise yet the term "Circular Economy" as part of describing their business model but might well be aligned with such principles regardless. Therefore, local insurance and financing institutions must recognize the CE-relevance of the activities of these emerging companies and potential game changers in order to make them eligible for accessing grants, micro loans and credit/banking facilities to expand their businesses further.

According to interviewees the focus must be "on increasing the availability of affordable capital, training local investment bankers on merchant banking, mezzanine financing, and long-term (5yrs +) financial tools for scientific R&D, train innovators on how to link innovation activities to manufacturing balance sheets, and develop contract innovation research labs that build capacity for local CE production".

Research and technical cooperation

In Kenya's research and education programs the role of CE is rather limited. There are several research institutes that do research in CE-related topics, but this knowledge is often not transferred to the private sector so that it can be translated into circular business models on the ground. Therefore, it is important that cooperation and knowledge exchange between knowledge institutes and the private sector is enhanced. Applied research projects, such as the GECKO project which is

supported by the Danish embassy, could also help in this respect. Another promising direction to enhance CE-related knowledge in Kenya is to promote collaboration with EU-based universities and research institutes active in the field of CE. Such cooperation activities could involve exchange programs for students and professors, but also joint research projects.

1 Introduction

1.1 This report

This report is one of a series of eight 'country reports' to be produced as part of the study 'Circular Economy in the Africa-EU Cooperation'. The general focus of this study is to provide a better understanding of the potential of the circular economy in Africa. The study should also facilitate a better understanding as to the EU's influence and impact on Africa, via the EU's circular economy transition and highlight the role of EU-Africa cooperation and aid mechanisms in circular economy development in both continents. This report analyses the state of play concerning current and potential uptake of implementing circular economy in Kenya. It explains the potential impact of the transition to the circular economy in Kenya in terms of opportunities as well as trade-offs and identifies policies and strategies to maximise the former and mitigate the latter.

1.1.1 Scope of circular economy activities

Circular Economy (CE) in this report is understood as an economic system which ultimately produces neither waste nor pollution by keeping products longer in use and by circulating materials at a high quality within the production system and, if possible, feeding them back into the biosphere to restore natural capital at the end of life. As such, the circular economy covers both economic aspects (e.g. value addition, job creation, GDP growth) as well as environmental aspects (focusing on materials and resources). In addition, it takes a full lifecycle perspective, including raw material extraction and processing, design & manufacturing, use & consumption, as well as end-of-use management to look at the potential for circularity throughout the value chain. Although we acknowledge that the transition to a zero-emission energy system is related to the circular economy concept, this study addresses only material resources and not renewable energy deployment.

This report is developed in the context of the implementation of the European Green Deal agenda (EC, 2019), and notably of its international dimension. Elements developed in the Circular Economy Action Plan (EC, 2020[A]), but also in other EU strategies such as the Farm to Fork Strategy (EC, 2020[B]) or in EU Waste prevention and management policies are taken as guiding principles. For instance, priority sectors or policy instruments have been taken as inspiration while not neglecting the local contexts and dynamics of the selected African countries. Connections between the Kenyan and European policy agendas are shown throughout the report and potential future links are discussed in the recommendations chapter.

1.1.2 Methodology

The report has been prepared by Trinomics B.V., adelphi and Cambridge Econometrics in close cooperation with **Africa Circular Economy Network (ACEN) Kenyan expert(s), Mr. Kariuki Waweru and Mr. Wekesa Zablon**, who have contributed local knowledge to the analysis across all sections of the report. In addition, the EU delegation in Kenya has been consulted. Desk research has been the basis for Chapter 1,2 and 4. In addition, several international and national datasets have been analysed to be able to understand the status of the circular economy in Kenya (Chapter 2). The desk research by the country expert was complemented by interviews with relevant expert (for full stakeholder list see Annex A).
The modelling of impacts and benefits on Chapter 3 has been carried out using Framework for Modelling Economies and Sustainability (FRAMES). The modelling has followed three steps: 1) collecting the required data for each country; 2) build the model (i.e., developing a model solution for each country); and 3) designing and implementing the scenarios.

1.1.3 Reading guide

This report has been structured as follows:

- **Chapter 2** provides an overview of the status of the CE in Kenya analysing CE trends, the policy framework supporting CE activities, the enabling environment for trade and investments in the circular economy as well as existing awareness and capacity in relation to the CE;
- **Chapter 3** sheds light on the economic, social and environmental impacts and benefits of the Circular economy in Kenya at present and for the future;
- **Chapter 4** studies cooperation between the EU and Kenya, by mapping CE-related cooperation activities between the two, and exploring opportunities for expanding such;
- **Chapter 5** provides recommendations for a more effective and integrated EU approach to promoting the CE transition in Kenya, connecting all levels of the engagement including policy dialogues, development cooperation, trade and investments, innovation & research.
- **Chapter 6** summarises the main findings from the earlier chapters.

1.2 Kenya at a glance

Kenya is located in East Africa and with its population of over 47 million people, it is the 7th largest country in Africa in terms of population, and it is the 6th largest economy in Africa based on GDP. In the 2018th edition of the human development index, Kenya ranked 19th within the African continent. Kenya ranks 10th when it comes to EU Africa trade, whereas the EU accounts for almost a quarter of Kenya's exports and 12% of Kenya's imports originate from the EU. Overall, Kenya has a substantial trade deficit, which amounted to € 5-10 bn between 2010 and 2018.

Kenya's economy is still strongly dependent on agriculture, accounting for more than a third of the economic output of the country, and over half of the employment. Products related to agriculture and the food value chain also represent around half of Kenya's exports. Tourism is usually the number-one source of income after agriculture for those in rural areas, especially on the coast and in places rich with wildlife. Tourism accounts for 9% of Kenya's GDP and provides a living to approximately 10% of Kenyans, while acting as an important source of foreign exchange.

Although Kenya's has seen many positive developments over the last few decades, as reflected in its human development index, which grew from 0.467 in 1990 to 0.579 in 2019, the country is still facing significant societal challenges as well. The country is faced with a youth unemployment rate of almost 40%, a housing deficit of 2 million houses, over a third of the population still lives below the poverty line and the country is faced with increased environmental pressures, including a growing waste problem.

The Kenyan government is aware that the development of a green economy is the only viable path to sustainable economic growth, as outlined in its Green Economy Strategy and Implementation Plan (GESIP) 2016-2030 (NEMA, 2017). At the same time, Kenya's nature is under extreme pressure from conflicting economic interests and rising demand (e.g., due to rapid population growth) for both natural and material resources. Between 2009 and 2019, Kenya's population grew from 38 million to 47 (KNBS, 2019). Although the circular economy concept itself is rather new in Kenya, it already plays a more prominent role in the country's policy framework including the new National Sustainable Waste Management Bill (Parliament of Kenya, 2019).

Interview findings with government officials show that they consider Kenya as a leader in Africa on matters of green economy citing that the president has on numerous occasions reiterated the country's

willingness to collaborate with other nations, not just in Africa but across Europe and elsewhere in the world to foster the green agenda.

Economic partnership agreements between the EU and Kenya are currently aligned with the Africa-Europe Alliance for Sustainable Investment and Jobs as well as Kenya's Big Four Action Plan. The EU's development funding is focused on key sectors, particularly agriculture, with linkages to manufacturing in a bid to spur job creation and increase food production as way to address hunger and reduce poverty.

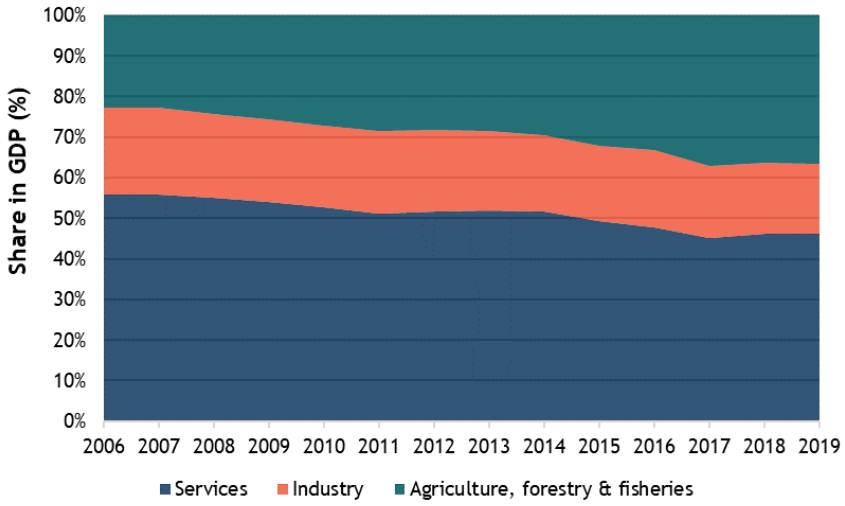
2 Status of the circular economy in Kenya

2.1 Economic analysis of CE trends in Kenya

2.1.1 Economic structure

In contrast to the trend in most countries the share of agriculture in Kenya's economy is growing at the expense of the contribution of the services sector. Between 2006 and 2019, the share of agriculture in GDP has increased from 27% to 36%, whereas the share of services declined from 53% to 46%, (Figure 2-1) and the share of industry remained relatively constant. Compared to other economies in Africa, the share of agriculture in the Kenyan economy is relatively large. This is even more strongly so when compared to the average economic structure at the global level (Figure B-1, Appendix B).

Figure 2-1 Contribution of the primary sector, industry and services to Kenya's economy.



Source: World Bank – World Development Indicators.

2.1.2 Circular economy-related trends by lifecycle stage

Even though the circular economy (CE) is often understood as the new word for resource efficiency or waste policy 2.0, it is a radically different model for structuring the *entire* economy. As such, the shift to a CE which is *'restorative and regenerative by design'*, requires a far-reaching transformation of the economy, affecting entire supply chains, from resource extraction, through production and eventually waste treatment and material recovery after a product's useful life. For this reason, the lifecycle perspective is a very useful angle to study the CE, as it does look at all the lifecycle stages of products and also pays attention to the consumption phase. The latter aspect is key, since changing consumption patterns and models can make a very important contribution to a shift to a (more) circular economy. Because the lifecycle perspective is a central feature of CE thinking, we have also structured this chapter along these lines, looking at the following aspects of the value chain:

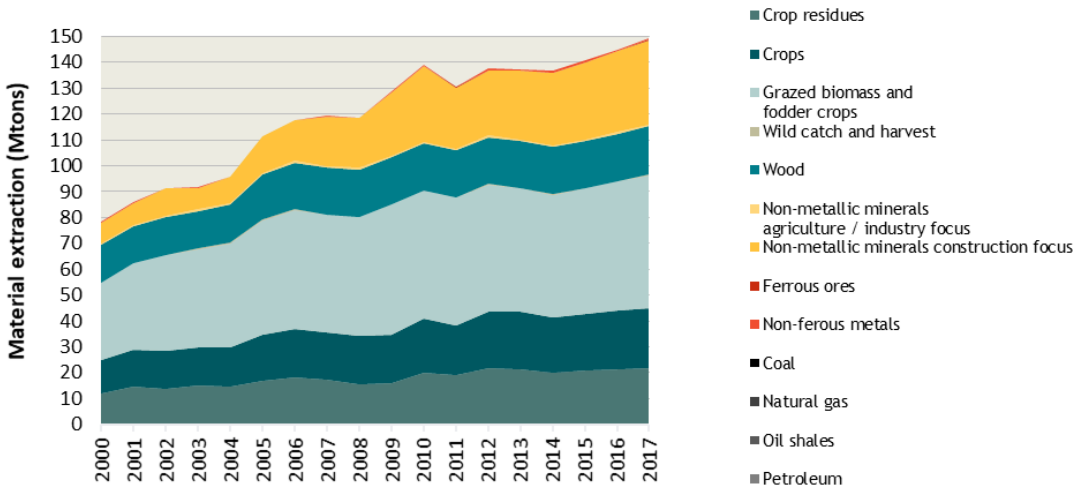
- Resource extraction;
- Manufacturing and services (mainly focusing on the production phase);
- Trends in consumption
  - On a natural resource level;
  - On a product level/ from the consumer perspective.
- Trends in the end-of-life stage: waste generation and management.

As such the sectors belonging to the aforementioned parts of the value chain will be discussed in the following sections to illustrate the broader context of CE developments in Kenya. Within some of these parts of the value chain, significant potential for circular activities exists. The sector-specific recommendations in chapter 5 focus on a specific subset of sectors, based on a combination of economic importance and CE potential.

2.1.3 Trends in resource extraction

When looking at the first stage of the value chain, the phase of resource extraction, we see that Kenya's resource extraction has been steadily increasing over the last two decades. The largest part of the resource extraction in Kenya relates to the extraction of biomass (Figure 2-2), with grazed biomass and fodder crops accounting for the largest part of Kenya's resource extraction. In 2017, biomass for 77% of the country's resource extraction, and non-metallic minerals being the second most important material type accounting for a further 22% of the total resource extraction. When looking at volumes, the most important non-metallic mineral product produced in Kenya is cement.

Figure 2-2 Resource extraction in Kenya by type for the period 2000-2017



Source: UN SDG Indicator 12.2 Domestic Resource Extraction

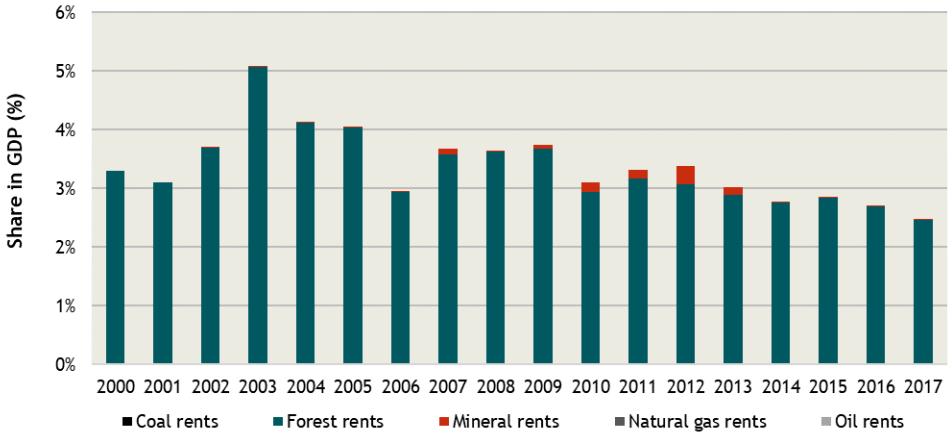
The extraction and trade in natural material resources[1] is a relatively small source of income for Kenya's economy, accounting on average for around 3% of the GDP during the last two decades. In this respect the resource rents[2] in Kenya are close to the global average (figure B-2, Appendix B), but still considerably higher than in the EU (0.4%) or the average of OECD countries (1%). However, within the African context resource rents in Kenya are very low, as resource rents in sub-Saharan Africa averaged at 12% in the period 2000-2017.

When zooming in a bit more on the resource rents in Kenya, one can see that the lion's share of the income derives from forestry (figure 2-3). During the period 2000-2017, resource rents from this sector accounted on average for 98% of the resource rents generated in the country. Kenya's forestry sector is important to the country's social and economic advancement, noting that the economic sectors heavily

[1] Here natural resources refer to minerals, metals, fossil resources and timber.
[2] 'The difference between the price of a commodity and the average cost of producing it. This is done by estimating the world price of units of specific commodities and subtracting estimates of average unit costs of extraction or harvesting costs (including a normal return on capital). These unit rents are then multiplied by the physical quantities countries extract or harvest to determine the rents for each commodity as a share of gross domestic product (GDP).' World Bank (2020)

depends on the preservation of natural resources to keep going. The sector contributes about Kenya Shillings 7 billion (€ 54.5 M) to the economy annually and has 50,000 people employed directly and another 300,000 indirectly (Ministry of Environment and Forestry, 2018).

Figure 2-3 Resource rents as share of GDP (%) by type of resource



Source: World Bank - World Development Indicators.

In Kenya around 6.2% of all land is forested and of this 20% is classified as primary forest, the most biodiverse form of forest. Kenya's limited forest resources and low rates of reforestation provide an upstream challenge to the timber users by creating a deficit in raw materials (Morrisson, 2009). Until recently, deforestation led to an annual loss of 50,000 hectares of forest (Ministry of environment & Forestry, 2020). Lately, the government suspended logging in public forests to boost regeneration of forests after years of mass deforestation that threatened the country's biodiversity and water catchment areas. The forests cover in Kenya increased by six thousand hectares in 2019 after the governments' ban on logging in public forests in 2018 (Okutoyi, 2020). Furthermore, Kenyas's legal framework aims to maintain tree cover by requiring all farmland to have a 10% tree cover but enforcement of this requirement is not evident. Sustainable forestry policies are key to a successful circular economy transition in Kenya, as the timber resources coming from forests can only be exploited sustainably when the natural capital is protected and the resource base is maintained.

The Kenya Commercial Forestry Programme (KCFP), which was established in 2016 by Gatby Africa is an example of an effective intervention that can be emulated for commercial forestry opportunities (Gatsby, n.d.). The sustainable forestry program is based on a variety of interventions along the value chain thereby partnering with different public and private sector players. The program includes measures to develop alternative technologies to reduce demand for biomass, such as clean cooking, briquetting, and efficient charcoal production. Currently, wood-based cooking is still prevalent in Kenya.

2.1.4 Circular economy trends in production and manufacturing

Kenya's largest producer of goods is the agriculture sector, accounting for more than a third of the country's GDP. The manufacturing sector in Kenya is relatively small, accounting for less than 10% of GDP (KAM, 2018). Therefore, this section only covers the packaging sector as this manufacturing sector is most relevant from a circular economy point of view and strongly related to Kenya's recent policies on plastics. Interview findings point out that the EU is currently funding KCIC to implement the AgriBiz programme which will see the rollout of business incubation hubs across the country to empower women and youth

with the right tools, knowledge, skills, technologies and business support that can enable them to engage in productive agribusiness activities.

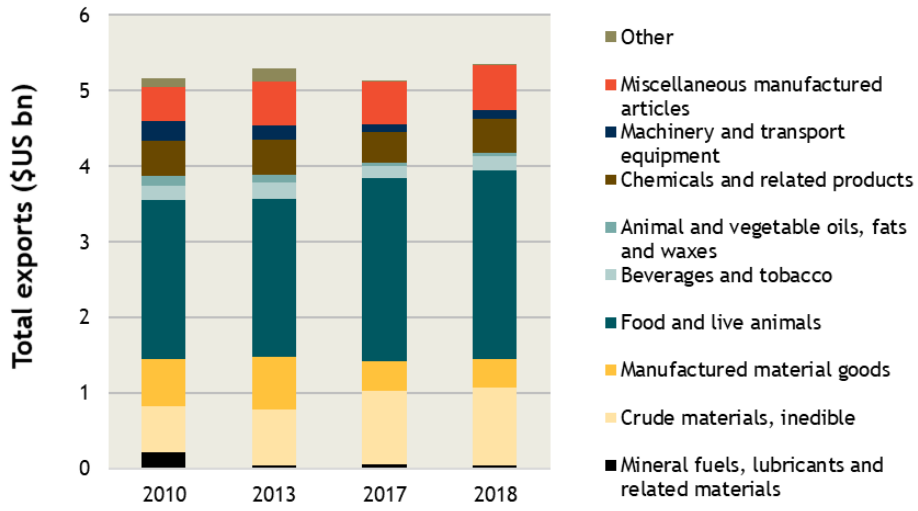
By stimulating manufacturing, various activities in the agribusiness value chain offer linkages to circular economy- for example, the use of organic fertilizer made from food waste; making shoes from pineapple waste; organic tanning of discarded hides and skins using dyes made from vegetables and plant extracts- to name a few.

Developments in the agri-food sector in the light of circular economy

Agriculture plays a critical role in Kenya's social economic mix by accounting for around a third of the total Gross Domestic Product (GDP) of Kenya. In 2017, the sector provided employment to approximately nine million Kenyans, which is equivalent to 56% of the country's total employment (World Bank, 2019[A]). Agriculture is also responsible for most of the country's exports, accounting for up to 65% of merchandise exports in 2017.

When looking at Kenya's exports (Figure 2-4) one can see that food products, mostly valuable agricultural products such as coffee, tea and spices, but also fruits and vegetables, dominate, followed by crude raw materials. The large share of food products in Kenya's exports reflects the importance of agriculture in the country's economy.

Figure 2-4 The share of different products in total Kenyan exports in the period 2010-2018.



Source: UN Comtrade

In line with the objective of 'food security' from the big four agenda, Kenya's government has extensive investment plans for the agriculture sector as laid out in the "The National Agriculture Investment Plan 2019 – 2024 (NAIP)". The NAIP outcomes are aiming at an increase in:

- Small-scale farmer incomes from various agricultural activities;
- The number of farmers benefiting from the strategy;
- Agricultural value added;

At the same time the NAIP focusses on strategies that can achieve a reduction in the share of the population faced with food insecurity and the cost of food. The plan also mentions that two of its flagship implementation plans contribute to the reduction of post-harvest food losses. As part of the data gathering and analysis for the modelling of the impact of circular economy measures in agriculture, we estimated the size of post-harvest losses in Kenya, which amount to a total value of approximately € 570

M on an annual basis. Fruits are the products with the highest losses in Kenya's agri-food sector, most notably mangoes and bananas (Mujuka *et al.*, 2019; FAO, 2014).

Environmental impacts of Kenya's agriculture sector

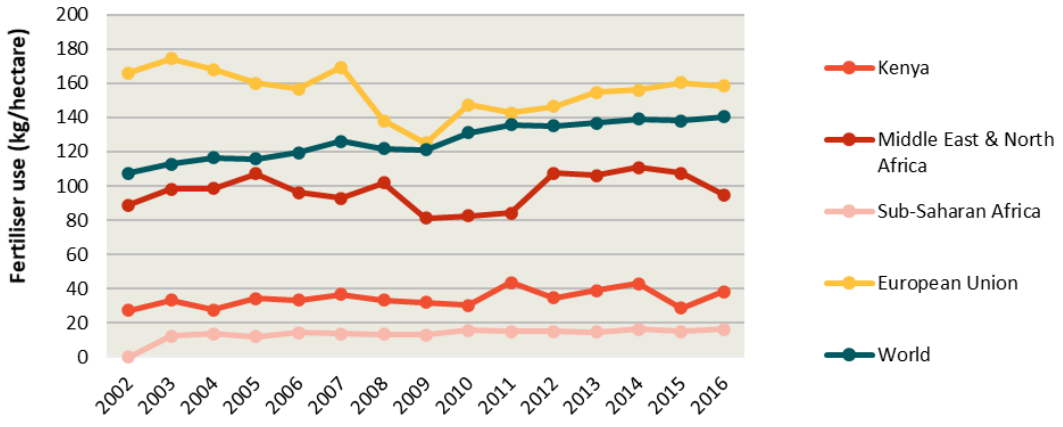
With the rise in population, more acreage is being deforested and converted into agricultural land with the intention to spur monoculture and optimize crop yield geared at mass production as a short-term solution to address food security concerns. Land use change driven by agricultural expansion has been a major source of greenhouse gas emissions in Kenya.

In 2015, the Land use, land-use change, and forestry sector was responsible for one third of the countries GHG emissions (Government of Kenya, 2015). Before this, traditional and much older agricultural production systems in Kenyan communities had their roots in crop biodiversity and were often directly mimicking ecological processes. Typically, most of these local low-impact production practices are now in stark contrast and increasing conflict with the traditional (intensive) industrial agriculture practices (Food & Business knowledge platform, 2019).

Rising large scale introduction of "modern" agricultural practices signified by attempts to optimize crop yields through hybridization, genetic modification and the liberal use of both artificial fertilisers and crop protection chemicals (pesticides and insecticides) replace indigenous small-scale farming practices at a rapid pace, which is of concern as it increases risks relating to soil degradation and biodiversity loss. The Rural communities still rely on small-scale subsistence farming with fertilizer use still low, averaging 13 kilograms of nutrients per hectare of cropland in sub-Saharan African.
Today, Kenya can decide to take a different path to increase yields by building soils using alternative farming methods and using organic fertilizers, so that nutrient loops are closed and the need for mineral fertilisers is reduced. This is an opportunity for the country to find an ecological balance while feeding its rising population.

Figure 2-5 illustrates the fertilizer use intensity in Kenya compared to regional averages. It clearly demonstrates that fertiliser use is still very low compared to the world average and the European Union. Kenya might be able to increase yields by building soils using alternative farming methods as well as organic fertilizers, so that nutrient loops are closed and the need for mineral fertilisers is reduced.

Figure 2-5 Fertilizer use intensity in Kenya compared to regional averages



Source: World Bank – World Development Indicators.

The Switch Africa Green forum via the Green to Grow project which has a focus on MSMEs involved in the food value chain of mainly coffee, dairy and mangoes disseminates sustainable consumption and production practices. A "farm to fork" value chain approach for products that are grown using environmentally friendly (organic) practices and cut out any middleman ensures both costs and resulting food wastes (food loss through spoilage (e.g. from lack of a functional cold chain) are reduced, while farmers can maximise their profits.

Regarding improved agricultural practices a joint development project between the Government of Kenya and the International Fund for Agricultural Development aims to increase the incomes of poor rural households that depend substantially on production and trade of dairy products for their livelihoods.

Construction Sector

The CE can provide new approaches to creating resource efficient growth in the construction industry. While the main innovation potential lies within the private sector, the approach of "use optimization" further discussed below should be supported by the relevant government authorities such as Competition Authority of Kenya as a driver and enabler of business development for various stakeholders across the value chain. In Kenya, the CE has yet to be entrenched as a widespread business driver in the construction industry through policy instruments such as the Building Code and greening standards recently introduced (World Bank, 2019[B]).

Fortunately, the National Building Regulations 2020 (Government of Kenya,2020) are progressive in as far as circular economy inclusion is concerned. Notably, a few pointers stand out.

Firstly, A fundamental differentiation between the draft **National Building Regulations 2020** and the former **Building Code (Local Government Building Order,1968)**, is that the former is **performance based** versus the latter which were prescriptive, **materials based**. Materials that can perform a certain function can be used so long as they meet the approved criteria for that purpose; subject to being tested by the relevant standards body and achieving a known Kenya Standard ('KS') or its equivalent. There is therefore room to utilize other innovative materials and/or reuse them to attain the same or similar function, subject to a performance test. Any material salvaged or recovered from a construction site can be reused if it remains sound and fit for purpose. Material that may be considered as unusable debris may also be reconstituted into a different product and be reused.

Interview findings from the National Construction Authority (NCA), the government organization which regulates, streamlines and builds capacity in the construction industry, suggests that there is need for sector-specific policy dialogues, cognizant of the fact that the construction industry is a prodigious polluter with a large environmental footprint. The construction sector has been the forgotten culprit in many policy discussions and targeted action on mainstreaming environmental sustainability through circular economy.

Various interviewees equally highlighted that there are significant knowledge gaps in the Kenyan construction sector as well as in knowledge institutions on how CE principles can be applied in the country's construction sector. The NCA is currently working on strategies to use carbon footprinting evaluations for recycled materials and possibly regulate pricing of recycled materials, which is one of the areas in which knowledge exchange from private sector based local construction industries and EU firm expertise and technology skill sharing is highly welcome.

The NCA notes that institutions (public and private) affiliated to the construction industry and requiring further engagement regarding CE-related research and technical cooperation include:

- National Construction Authority-Construction Research and Business Development Department
- Kenya Industrial Research and Development Institute (KIRDI)
- Kenya Building Research Centre
- University of Nairobi
- Nairobi Institute of Technology
- Kenya Green Building Society
- Jomo Kenyatta University of Agriculture and Technology

To date there is a significant amount of waste generated from the construction, refurbishment and demolition of buildings. In recent years, a couple of buildings have been demolished for various reasons such as new developments being constructed on road reserves, riparian land (Avey, 2018; NEMA, n.d.) and on grabbed public land reserved for public spaces (KARA, n.d.) such as playgrounds, schools, fire brigade services amongst others. Incentives towards a more circular based business approach towards the reuse and recycling of materials from construction and demolition waste have unfortunately not visibly been put in place, possibly because such an approach is not (yet) considered financially viable in most building projects.

Economic partnerships especially in large-scale projects have required environmental sound practices to be embraced as a requirement for funding of development projects. Nonetheless, there are no existing partnerships (non-project related) on advancing CE in the broad construction industry despite the reality that Kenya currently barely supplies 50,000 housing units annually against an annual growing demand of 200,000 units (World Bank, 2017). The current housing deficit is 2,000,000 units (*ibid.*). The government made an ambitious pledge to supply 500,000 units by the year 2022 under the Big 4 Agenda through the Affordable Housing Program (Government of Kenya, 2019) as one of its key pillars to drive the economy to double digit growth through BomaYangu portal. In order to achieve this goal, the Kenyan government has introduced several tax incentives to promote and speed up the construction of new houses. Facilitating the use of innovative circular construction materials such as Interlocking Stabilised Soil Blocks (see paragraph below) could lower the construction costs and thus contribute to tackling the challenge of realising the affordable housing challenge.

Fortunately, some construction-related circular economy products and related services are already emerging on the free market. One of such products is the Interlocking Stabilised Soil Block (ISSB) where Kenya's small-scale builders have found ways to work both crushed glass, shredded plastic waste as well as agricultural residues into bricks that are otherwise made mostly from soil and therefore provide an attractive alternative to conventional building materials (Rhono *et al.*, 2015). These building blocks have the advantage that they are cheaper than many conventional construction materials and simultaneously create local employment for companies involved in the processing of waste materials and manufacturing of the ISSBs. What seems to prevent a rapid uptake of ISSBs (apart from lack of policy support) is that the machines required to manufacture them are quite expensive.

A key private sector stakeholder to promote the wider green building agenda is "The Kenya Green Building Society" (KGBS), which is an independent, non-profit membership-based society registered with the World Green Building Council. KGBS is mandated to certify the built environment, advocate for green buildings and train green building professionals. KGBS is the leading Green Building movement in the Kenyan market that ensures buildings are designed and built sustainably. KGBS comprises of a dedicated

team of professionals, keen to work in collaboration with local and EU based industry experts, leaders, government departments to develop modern day building best practices crafted to suit the Kenyan dynamic property industry.

Case Study for Circular Design in Construction - BuildX Studio (BuildXstudio.com, n.d.)

BuildX Studio have inaugurated an (internationally) award-winning human-centred Circular Economy project for Affordable Housing. The project is still in its research phase regarding the optimal use of modular prefabricated housing as an approach for smaller, smarter and more affordable homes. The project being in its initial stages already shows potential for change if it receives the required policy support on affordable housing, building code and planning regulations. A way to influence the efforts of this organisation and the larger built environment sector is to bring together professionals in the built environment to engage together to push for policy changes in a largely fragmented profession.

Kenya's Building Research Centre has been empowered to coordinate the national government in shaping the implementation of its green building agenda. As such, the centre is active in 'the development of green building policy, regulations and guidelines, mainstreaming green building principles in building design and construction and it is conducting research in the area of ecologically sustainable and climate resilient construction materials' (UNDP, 2014).

Packaging General

Value chain stakeholders discussing any aspect of optimising "packaging" need to understand that merely trying to improve on new (apparently more environmental benign) designs and materials will not really address the real impact of rapid resource depletion linked to manufacturing packaging (WEF, 2016) and the pollution of the resulting "packaging waste" when packaging has reached its useful end of life. Instead, a real "innovation approach" asks to apply one's mind rather on how to optimise and expand possibilities linked to new "product delivery solutions" along the entire value chain. If the current strong growth of plastics usage continues as expected, the plastics sector will account for 20% of total oil consumption and 15% of the global annual carbon budget by 2050 (*ibid.*).

Promising (and highly CE relevant) alternative "product delivery solutions" have historically emerged in Kenya as part of its "Kadogo economy". Since the late 1990s, the concept and practice of the kadogo economy has gained systematically prominence in Kenya. The key idea of the kadogo economy is to sell conventional bulk products in smaller (typically single -use units). In those years, as a reaction to growing poverty in Kenya, manufacturers and sellers started selling smaller units of a product not to lose that market.

"Kadogo economy" (another local word for "informal economy") is based on providing certain products in sufficiently small amounts, so they are affordable for the many low-income earning households yielding in Kenya a vast number of poverty-stricken consumers with very little individual spending power. Despite the economic fact that buying in smaller portions is not financially beneficial (but works out typically much more expensive), the kadogo economy has been playing a fundamental role in the life of poor Kenyans to secure principal access to essential consumer products. Kadogo economy is still dominating the retail sector as about 70 % of fast-moving consumer goods come from this sector (Onyango, 2019).

Long before international brands entered these African markets Kenya had already developed waste-free dispensing solutions for milk, oil, household cleaning chemicals etc. based on the premises of a small

traditional retailer and as part of a distinctively "African" approach to make basic food items and other essential cleaning and individual care products affordable and securely accessible. Only later did global corporations such as Unilever, Nestle, PepsiCo etc. cotton onto this alternative business model but subsequently gained very fast market access to this "development country" typical consumer segment which continues to remain depended on having the choice to buy small individual product portions supplied in single-use packaging units.

Sadly, the original traditionally packaging-free product distribution solutions are now increasingly displaced by introducing more and more non-circular single-use packaged products. Essentially, this constitutes an increasing danger of globalized "linear lock-in" of unsustainable packaging practices.
This is particularly the case for packaging types such as laminated plastic pouches, metallic foils used for snack packings etc. that offer very little intrinsic material value on their own and have therefore typically no end-use market (due to lack of demand) and/or local technology solution in place- now or in the foreseen future. Almost anywhere in the developing world are many consumer convenience products now readily packed in single use sachets made from non-recyclable laminated plastics. While convenient and affordable to use they do create a massive and increasingly very visible land and water pollution problem wherever they are sold making them prime candidates to identify more circular product distribution strategies.

It has to be said though that that examples exist (e.g., see Chapter 3.1) where multi-national businesses are voluntarily supporting local small-scale entrepreneurial waste projects. However, often this support is limited to finance waste separation and environmental clean-up initiatives and does therefore not tackle the source of the problem -overlooking the negative impact their products create with so much (unsustainable types of) packaging materials required.

Financial drivers (e.g., in form of EPR regulation) are therefore increasingly important to motivate both product manufacturer and packaging producers to continuously investigate any viable circular packaging solution opportunities. The introduction of end-consumer based financial "reward systems" e.g., in form of a deposit to create (where required) an artificial monetary value on any "otherwise value-less" packaging to incentivise its ultimate return for reuse and recycling as a "technical nutrient" would then cover all types of packaging rather than following a piece-meal approach with which most types of plastic packaging would be excluded from the outset.

According to interview findings with National Government officials 18 different types of packaging items have been identified and are under observation for future EPR schemes. Currently the EPR draft considerations underwent the consultation with KAM and KEPSA, it is receiving feedback from international and final feedback is due by December 2020.

Plastics Packaging

In Kenya, the use as well as the restriction and even ban of certain plastics has opened up both potential opportunities as well as challenges in the way business is conducted. Cutting out unnecessary packaging, especially plastics (and avoiding plastic bags altogether) is a priority for businesses in Kenya to stay both competitive as well as legally compliant but in really it is not always easy to achieve e.g., for street food vendors due to the lack of viable and financially feasible packaging material alternatives.

As of March 15, 2017, the Kenyan government approved a **law** which **banned the use, manufacturing and import of single use plastic carrier bags in the country**. Kenya became the second African country to outlaw single-use plastic carrier bags, following Rwanda, which outlawed them in 2008 with drastic fines allowing for up to four years jail or a fine of 1M Kenyan Shillings (roughly € 7,470). The national plastic bag ban has accelerated Kenya's conversation on political and civil level around both environmentally safe and Circular Economy compliant designs for plastic packaging where possible (to be used as a technical nutrient) as well as the introduction of **sustainable alternatives** to plastic, which need to be equally affordable and re-usable. The default reaction from fresh food vendors and supermarket chains has been to employ paper bags or non-woven textile bags as an alternative. But the true opportunity lies in completely rethinking packaging, in terms of materials, design and delivery systems (Zablon Wanyama, 2019). Beyond the plastic bag ban and as an even more pro-active pollution prevention measure for particularly vulnerable areas Kenya recently introduced the ban on the use of single-use plastics in parks and protected nature areas (UNEP, 2020).

However, very recent media reports suggest that this plastic ban as a pro-active stance to fight plastic waste pollution "at source" is now under siege (Guardian, 2020). Evidence has surfaced that major oil companies including the American Chemistry Council have been secretly lobbying the US to pressurise Kenya on their behalf to drop such legislation as part of what would be the first US bilateral trade deal with a Sub-Saharan African country. Instead, the US would like to be assured that Kenya could serve as the future hub to receive and then supply US chemicals and plastics to countries elsewhere in Africa. This is likely to include plastic waste too given that China has now ceased to be a "recycling" destination of choice for US born plastic waste-especially since the US is not (like 190 other countries) a signatory to the Basel Convention. The status quo in Kenya is however that apart from very limited plastic types and related products such as PET bottles, and PE containers with least some intrinsic economic value, most other types of plastic waste already pile up in Kenya's rubbish dumps and find their way into the countries oceans and rivers- some of them creating very hazardous emission when burnt (e.g. PVC) This US industrialist move to weaken Kenya's current plastic legislation is also very critically followed and commented on by UNEP in Kenya .

Following a mass balance approach (defining the consumption as the difference between the combined import and local production of plastics minus exports) Kenya utilises a total of 517,000 tonnes of plastics alone for packaging per year and produces 1.3 kton of waste daily of which only 10% of this waste is collected (Eunomia, 2018).It needs to be noted though that plastic production does not directly correlate to the plastic waste generation, as the waste generation is shaped by the polymer type, the utilisation purpose and the lifetime of the end product. Apart from packaging and conventional plastic product purposes plastic is also present in most of Kenya's everyday electronic and electrical products, although exact volumes are yet to be established.

"A Partnership for the New Plastics Economy in Kenya" (NPEK) is said to be a circular economy inspired initiative developed by the Kenya Private Sector Alliance (KEPSA) to devise solution approaches that allow the plastics industry to thrive in the manufacturing and trade of plastic products and packaging while preventing them to become a waste liability at the end of their useful life (P4G, n.d.). The objective is to reduce the overall waste volumes by increasing collection rates and transforming them as technical nutrients in form of "recycled content" into new commercial products spurring thus further reaching design innovation in the Circular Economy space.

The programme is backed and actively supported by heavy-weight industrial partners along the entire value chain including the Kenya PET Recycling Company, Retail Traders Association of Kenya (RETRAK), brand owner Coca-Cola, BESIC Group Ltd, Discovery Brands, Ital 3D solutions but also linked to key governmental/organisational institutions and their policies and projects such as the County Government of Kiambu, Kenya Climate Change Innovation Centre (KCIC), the Centre for Clean Air Policy (CCAP), and The Danish Environmental Protection Agency (EPA). NPEK is developing a business model and spurring domestic market development for recycled polyethylene terephthalate (PET) bottles. It has piloted sorting of waste at source at Nyayo Estate, a take-back scheme through a voucher system in Githurai Kiambu County and is exploring the recycling of PET waste using 3D technology.

Case Study: Design Innovation

In February 2020 Unilever launched its first plastic packaging (for its "Sunlight" product) made from 100% recycled flexible materials in Nairobi, Kenya. They will be marketed in Kenya and the rest of the East African sub-region. This initiative is part of the wider "U-Turn[3] Waste Management project" run by this corporation since 2018 (Unilever, 2020).

Through Sustainable Inclusive Business, a project funded by the Government of the Netherlands, KEPSA is also supporting the Kenya Association of Manufacturers (KAM) to set up a business model for Extended producer responsibility for other streams of plastics apart from PET. Many enterprises start to get involved in plastic waste recycling in order to generate jobs. In the process of developing business models Sustainable Inclusive Business Kenya, looked at a number of aspects, this included: the value proposition, targeted customers, products and services, pricing as well as the organizational structure. During the initial phase in assessing the need to establish the Producer Responsibility Organisation, 70 companies indicated their interest to become members. This is positive feedback indicating the level of interest to be part of the EPR scheme. Nonetheless, with the transition from a voluntary a mandatory requirement by the government as well as the need to ensure sustainability the organization would require support on two levels, namely institutional strengthening and capacity development of the staff (SIB, 2020).

In addition to all of the above initiatives the Kenya Plastics Pact is currently developed and seemingly following the strategic trajectory of the first African Plastic Pact in South Africa. It is hoped that such a Pact can achieve the objective of environmental protection, while not needing full bans of entire economic value chains e.g., as around the plastic bag. The future Kenya Plastics Pact needs to deliver on the key objectives of setting up collection and take-back schemes preventing plastics to end up as waste and subsequently pollute the environment through finding both design and use optimisation solutions for plastic to be circulated in tightly controlled closed-loop systems.

2.1.5 Trends in consumption patterns

Overall consumption trends

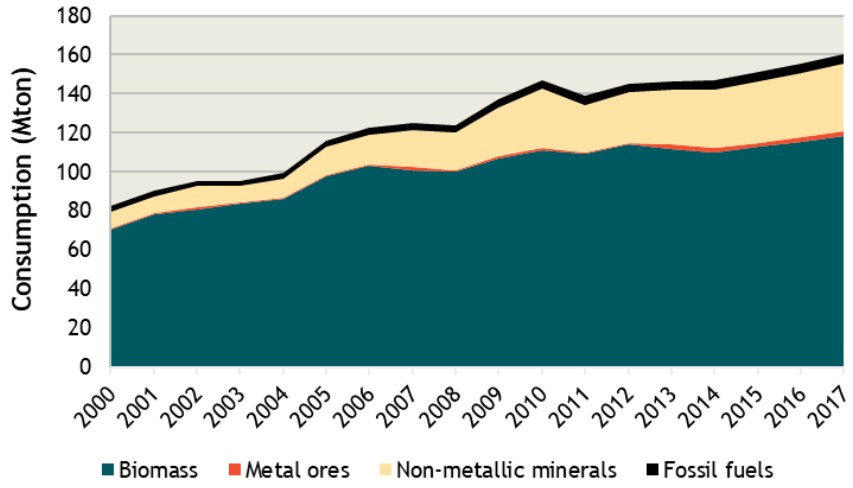
Generally, consumption levels in Kenya are still modest, but are growing steadily. The overall consumption levels have been more or less continuously growing in Kenya, with 140% in the period 2000-2018. During the same period, per capita household expenditures increased by 48%, which is exactly on par with the growth in GDP per capita which increased with 47% in the same period. The strongest growth in per capita household expenditures took place in the period 2010-2018 (Figure B-4, Appendix B). The per capita household expenditures in Kenya grew at the same pace as sub-Sahara Africa as a whole. Still Kenya's per capita household expenditures are around 8% below the sub-Saharan average and even 85% below the world average (figure B-3, Appendix B), but this is without correction for purchasing power.

Overall consumption trends are also reflected in Kenya's resource consumption trends. The relative resource consumption levels in Kenya are still very low compared to the global average, but steadily increasing. With sustained growth of the economy and the population, this trend is expected to continue or even accelerate. Since resource consumption levels to date are still low, the country has the opportunity to grow the standard of living of its citizens without increasing the resource consumption levels to the levels seen in the global north today. The key question is how this increasing materials and product demand can be met in an ecologically sustainable and climate resilient manner.

Trends in material consumption

Along with the growth of the population and the economy, Kenya's domestic material consumption has grown as well. In the period 2000-2017, domestic material consumption doubled from almost 83 Mton to over 160 Mton (figure 2-6). Biomass-type resources account for the largest part of domestic material consumption in Kenya. Overall, Kenya is responsible for 3% of the total domestic material consumption in Africa, making it the 9th largest consumer in the continent (Annex B, figure B-5).

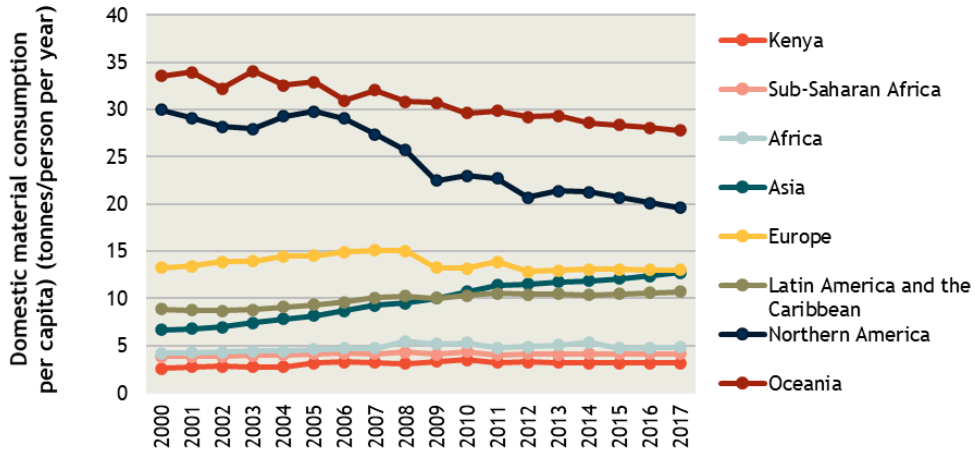
Figure 2-6 Overview of domestic material consumption by type in Kenya for the period 2000-2017.



Source: SDG Indicators - Indicator 12.2.1 Domestic Material Consumption by type.

Resource consumption per capita in Kenya grew with 23% in the period 2000-2017 but compared to other regions per capita material consumption in Kenya is still very low. The average inhabitant of Kenya consumes only a quarter of the materials in a year than the average European (figure 2-7). Material consumption per person in Kenya is also still over 20% below the sub-Saharan average.

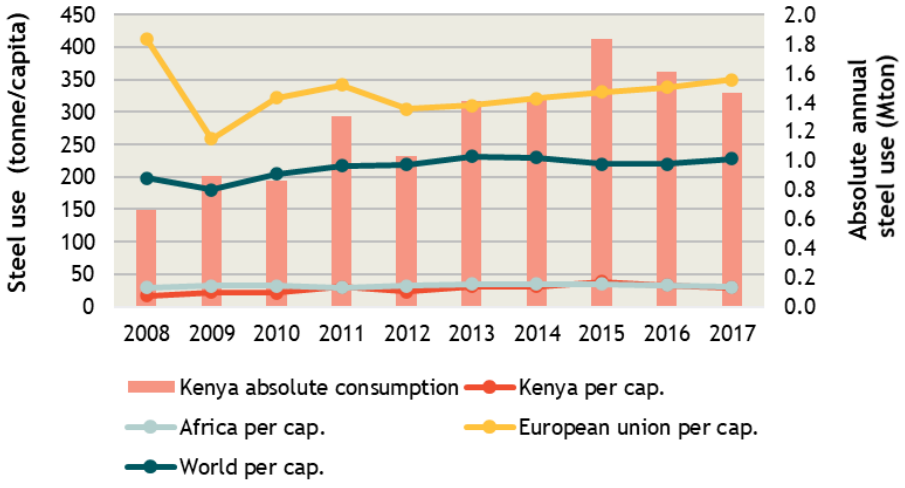
Figure 2-7 Material consumption per capita in Kenya compared to regional average



Source: SDG Indicators - Indicator 12.2.1 Domestic Material Consumption per capita.

Globally, cement, steel and plastics account for almost 70% of the direct global GHG emissions from industry and therefore, it is relevant to look at the trends in the consumption footprint for these materials. Cement consumption in Kenya is growing, although with a relative consumption of only 0.14 tons/capita in 2018 (Global Cement, 2019), Kenya's cement consumption is a quarter of the world average. When we look at steel, we see that consumption is growing steadily in absolute terms, and per capita steel consumption has grown strongly as well from 17 tonnes/capita in 2008 to almost 30 tonnes/capita in 2017 (Figure 2-8). In 2017, 0.4-0.52 Mtons of plastics were consumed in Kenya (KAM, 2019), which is equivalent to 4.1-5.4 kg/capita, compared to 95.5kg/capita in the European Union (+Norway and Switzerland) and a global average of 44.9kg/capita (Plastics Europe 2017, UN, 2019).

Figure 2-8 Consumption of finished steel products per capita in Kenya compared to regional averages.



Source: World Steel Association (2019) World steel in figures 2019

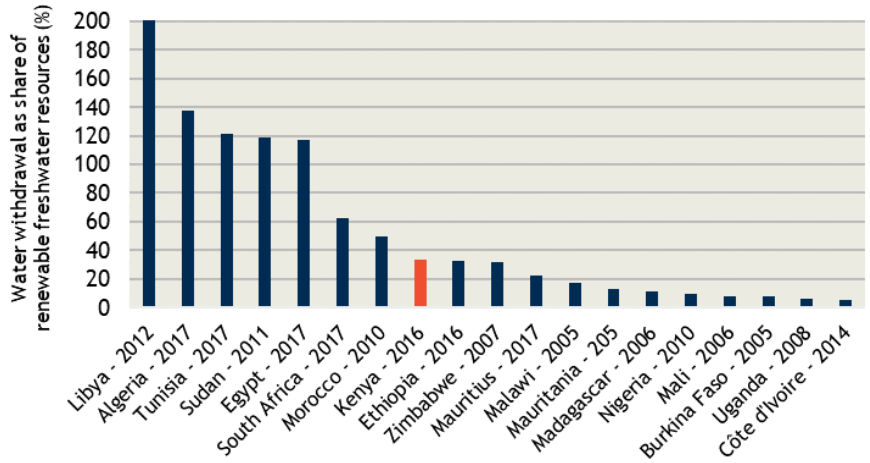
Water is a scarce resource in Africa and in this respect, Kenya is not an exception. Kenya's renewable freshwater supply amounts to 647 m^3/capita/year, which classifies the country as water scarce (World Bank, 2006). However, even though the water consumption of Kenyans is rather low, water shortages are still a challenge in some areas of the country. On average water stress in Kenya is limited, as on average

Kenya consumes around a third of its available renewable water resources (figure 2-9). Still, there are certain years when water stress becomes a more serious issue.

Designing with circularity in mind is one of the ways in which water scarcity can be reduced. Conventional building designs for potable water in and grey and black water out straight into the sewer system. Although the treatment of wastewater is well-regulated in Kenya, there is limited attention for the reuse of treated/purified water. CE approaches could transition these methods to ensure that the design or retrofit of the building considers the local conditions and attempts to:

- Capture rainwater and store it on site for reuse;
- Treat and reuse wastewater on site or sell it to other users.

Figure 2-9 Freshwater withdrawal as a proportion of the available freshwater resources for Kenya and other African countries (with recent data).



Source: FAO Aquastat – SDG Indicator 6.4.2.

Trends in consumption of final products by consumers

Transport

Kenya's motorisation rate of 30 vehicles (including motorised vehicles other than cars) per 1,000 inhabitants is lower than the Sub-Saharan Africa average of 42 but is the highest in East Africa. While about 70% of Kenyans intend to purchase a vehicle, 15% say they will not be able to afford a vehicle, while the remaining 15% do not believe that they will need one in the future (Deloitte, 2018). Most cars on the road in Kenya are imported second-had cars, but the national government did impose a maximum age for the import of used cars of eight years (UNEP, 2020). As a result, Kenya has a relatively modern car fleet, especially when compared to other East-African countries. In addition to the maximum age for imported cars, Kenya also has also implemented emission standards (EURO IV norm) and a pre-import roadworthiness check, to ensure sufficient environmental performance and safety, respectively.

Multi-modal transport is very common in Kenya with matatus (mini-bus taxis) being the most common mode of motorised transport. Just over 70% of all commuters use matatus (mini-bus taxis) as part of their daily commute (*ibid.*). Interviews noted that "public sector transportation policies are either missing or that the Kenya Government even allows stakeholders in the mobility sector such as the automotive industry to form powerful cartels. The latter are then protecting their own interest to keep people dependent on means of personal transport rather than public/shareable facilities services required for any needed long-distance bus-hailing and ride sharing network expansion".

Kenya's existing road infrastructure, particularly in its metropoles (where any pavements are often entirely absent) does not allow for personal mobility alternatives (bicycle riding, walking) or advanced traffic direction means such as Bus Rapid Transit lanes. Vested interest from the automotive industry was cited as a "huge hindrance" to unlock any sizeable CE opportunities in the mobility sector that would also have positive effect on SDG 11. Furthermore, the 'dumping' of used cars into Kenya contributes to more pollution from emissions, to which no regulatory protection exists as air quality policies are lacking.

Ride-sharing solutions in Kenya have been initiated by various local players such as Saafiri, Safe Boda and others and are gradually gaining traction. Also, the known brands, Bolt, Taxify, Little Cab and Uber have their commercial business models working for them especially in Nairobi and other major towns. There is a notable rise in E-mobility solutions with Wetu, Nopia rides, e-mobility African and Opibus venturing this space. In the Lake Victoria region, water transport is also being invested in with the Water bus and Wetu's E-boat solutions. Pilot bicycle sharing programs, bicycle taxis and hand carts services are available in select communities throughout the region.

One of the notable carpooling websites in Kenya is www.carpooling.co.ke, which has partnered with UNEP to promote carpooling as an effective tool to stimulate the development of a sharing economy, which can be considered an integral part of the circular economy. Other platforms such as Twende and carrambee.com incorporate services that allow long-distance travelers to share rides (Madegwa, 2019). The platform is free of charge, but they depend on advertising space for revenue. Prospective travelers and service providers handle their transactions independently.

2.1.6 The end-of-life stage: reverse logistics, reuse, waste generation and management

Like in many African countries, improper waste management is still a major problem in Kenya. However, the political will to address the daunting waste problems and foster circularity in Kenya exists at the national level. The Ministry of Environment and Forestry is currently spearheading the formulation of the Sustainable Waste Management Bill and the National Sustainable Waste Management Policy. The draft documents recognize the value of waste as a resource that needs to be properly managed in order for the country to derive economic, social and environmental benefits.

At present, illegal dumping and uncontrolled dumpsites are ongoing challenges as a result of strong population growth combined with increased use of single-use packaging materials and the inability of government to respond with the establishment of the required waste management facilities on the ground. There are various waste streams generated in Kenya, including domestic, municipal, industrial and hazardous wastes as well as other emerging waste streams, such as e-waste and waste tyres (NEMA, 2015). Organic waste is by far the largest contributor to Kenya's waste stream and a 2013 waste characterisation study in Kenya's capital Nairobi found it to be around 60% of the total waste stream while plastics and paper together (mostly as a result from packaging waste) contribute for roughly another 25%[3] (Khamala & Alex, 2013). Non-recyclable packaging waste is prolific presenting in form of laminated/single use sachet plastics, as a result of Kenya importing an increasingly wider range of global consumer convenience-type product brands. This further contributes to pollution on land, water and air (open burning of waste dumps). Although plastic consumption is very low in Africa, African countries contribute disproportionately to the amount of plastic pollution ending up in the oceans due to high shares of inadequately managed plastic waste. According to estimates, 83% of the plastic waste in Kenya is inadequately managed (Ritchie & Roser, 2018).

[3] depending on where the samples were taken in Nairobi and strongly linked to population density

In Kenya, rapid urbanisation has exacerbated the problem and plastic waste primarily ends up in landfills. There, solid waste is a precursor to several environmental and health challenges, ranging from clogged drainage and sewers, waterborne diseases like typhoid, cholera and diarrhea, increased upper respiratory diseases from open burning of the garbage, to malaria (Ochieng, 2016).

The amount of waste generated per day is estimated at 22,000 tons, assuming an average per capita waste generation of 0.5 kilograms for the current population of 45 million both rural and urban translating to 8 million tonnes annually (Ministry of Environment, 2019[A]). It is estimated that 40% of the waste is generated in urban areas. Given that urbanization is expected to increase by 10% by 2030, the waste problems in Kenya's cities are expected to get aggravated (*ibid.*).

The waste collection rate is low in all the 47 counties, although waste management policies differ significantly across counties. On average, 30 to 40 % of all solid waste generated in urban areas is uncollected and less than 50 %of the population is covered by waste collection services (Gakungu & Gitau, 2012). In urban areas, private waste management companies cover 45-73 % of the total urban households, 32 % of the corporate institutions, 50 % of the industries and 17 % of the commercial enterprises (Ochieng, 2016). About 81 % of the households served by private companies live in the high and middle-income areas of the city.

It was mentioned in several stakeholder interviews, that the shift in the responsibility for waste management from the national government to the county level introduced in 2010, has created significant challenges as the county governments have inadequate frameworks for managing waste including a lack of infrastructure, county laws, and inadequate capacity and technologies to support sustainable waste management. Consequently, unmanaged waste generation is escalating almost everywhere in the country with prolific littering going on anywhere close to living areas and new illegal dumpsites are springing up wherever sprawling settlements begin to grow. This calls for an immediate intervention to avert adverse negative effects on public health and the biodiversity, which can also negatively affect employment in the tourism sector amongst others. Retention of the attractiveness of nature areas for tourism has also been an important driver for the implementation of a ban on the use of single-use plastics in parks and protected areas (UNEP, 2020).

As a matter of fact (and this can be observed on a continental scale) countries such as China are often very pro-active (Xinhua, 2019) to provide emergency measures to countries such as Kenya which struggle to solve their own waste management challenges. Infrastructure and collection services are offered and although this helps solving urgent waste problems it is also an entry point for the creation of new financial dependencies, which often have to be addressed by supplying China in return with rare resources or by granting lucrative construction and road building contracts that further stifle the employment opportunities for local businesses (TheAfricaReport, 2019).

An effective waste management system in Kenya is critical to delivering on Kenya's constitutional right to a clean and healthy environment. Adherence to this constitutional right can be realised through improved waste collection combined with CE approaches to waste management where waste is turned into a resource. This can help the Kenyan government in realizing the sustainable development goals that the country ascribes to and in achieving some of the goals from the Big Four Agenda (Parliamentary Budget Office, 2018), especially the objective of universal Health. The Sustainable Waste Management Bill (Ministry of Environment and Forestry, 2019) creates the necessary regulatory environment that can

enable Kenya to effectively deal with the waste challenge Improved waste management in Kenya does not only contribute to solving an urgent environmental problem, but it also contributes to the creation of new economic opportunities and social benefits. Particularly organic waste has notably a very good potential to e.g., recover biogas (through anaerobic digestion) and/or produce soil conditioner. The versatility of utilising organic waste as a "biological nutrient" can be demonstrated through CE inspired business models around new product development based on complimentary waste beneficiation measures as shown in the case study below.

Potential role of a biogas plant in a circular waste system

Private sector business initiatives such as Biogas International Limited have a very advanced vision (entirely based on local technologies and related existing stakeholders) on how a "zero waste to landfill" model needs to be designed from a systems-thinking perspective.

Source: *Biogas International, 2015.*

The importance of the informal sector in Kenya's waste management chain

It is worth noting that next to the formally developing waste management structures there are and have always been much more significant stakeholders to handle and mitigate aspects of the rapidly growing waste streams in Kenya - the informal waste collectors. They are deemed informal because they are neither registered as a service provider with the Waste Management Unit of National Environment Management Authority (NEMA) nor the Department of Environment in Nairobi City Council (NCC) (Hiltunen, 2010). Informal waste collectors fill the waste management service gap between rich and poor households providing basic waste removal services to middle income households and small businesses (restaurants and shops). Typically, all waste collected by the informal sector undergoes source separation of any valuables (e.g. certain plastics (PET), metal etc.) but not always is waste disposed off at a landfill site when dumping it a few streets from the client is faster.

Numbers either for informal waste collectors or waste pickers (e.g., retrieving valuables from dumpsites directly) are not found to be documented in any literature. It is important to note that there is a lack of acknowledgement of the importance of the informal waste sector as a source of income for many Kenyan communities, as their activities have neither been quantified nor documented (Muniafu & Otiato, 2010). Data is scarce as most actors do not have a central data repository, but if the Kenyan scenario is at all

comparable to South Africa the informal waste sector could be responsible for up to 90% of all waste that gets collected for recycling in Kenya (ENCA, 2019).

Any hoped-for improvement of the formal waste collection and management system are going to have direct impacts on the waste pickers value chain position and recognition. To best continue to secure their livelihoods it is essential to discuss how their work could be (while probably not ever fully formalised) at least integrated as part of the upgraded system. The recommendations given in Chapter 5 address e.g., the need to form cooperatives that can secure contracts to sell materials collectively in order to obtain higher prices, e.g. for separate collection and recycling of plastics and other materials or add value in niche markets by providing basic collection services in informal settlements that are difficult to serve with formal waste collection systems.

An effective sustainable waste management system can improve landfill operations and management including capturing and utilizing landfill thereby mitigating negative climate change impacts. The revised National Sustainable Waste Management Policy 2019 outlines several proposed waste collection policy statements for both National and County governments.

Waste collection and subsequent sorting and recovery can be accelerated through the engagement of youth groups and community-based organizations affiliated to waste management. The opportunities and challenges among groups and community-based organisations in the waste management sector are common but slightly differentiated. An illustration of such a waste management initiative from the Trans Nzoia county is given in the case study table below. This case study is merely an illustration of how an inclusive community waste management initiative can tackle environmental and urban waste challenges from a socio-economic perspective. Even though rooting business models in circular economy principles is a promising way forward, it will be important not to entirely disrupt livelihoods of people who already earn a living from current waste streams unless proper alternatives are provided. These organized waste support activities not only benefit waste pickers as a group; they also generate significant economic benefits for the society as a whole, through lowering the costs of recycling for counties, contributing to national industrial competitiveness and by benefitting the environment (Medina, 2008). Besides the social good, they keep the youth out of crime, drugs and other societal burdens.

Case Study: Dajopen Waste Management (World Habitat Awards, 2012)

Name of Organization and Location	Nature of Organization	Activities	Stakeholders	Equipment
Dajopen Waste Management Kitale, Trans Nzoia County	Community Based Organisation (CBO)	• Collect, and produce recycled items • Making products using solid waste from households, hotels, slaughterhouses and maize storks from farms	CBO Members Street families are assigned to collect waste	• Shovels • Hired Tractors
Impacts		**Value added products**		**Challenges**

• Trained more than 35,000 people in solid waste management and organic farming since 2009. • Over 420 students from local and international institutions have learned about solid waste recycling through internships	• Organic fertilizer made from biodegradable waste • Biological insect repellents made from weeds • Briquettes made from pulp papers and dry leaves, • Water filters made from sawdust mixed with clay. • Necklaces and earrings made from old calendars • Floor & roofing tiles • Fencing posts	• Technical challenges in scaling to modern equipment • Patenting of products • Limited access to finance.

A Zero Waste Case Study: Kilifi Moringa Estate - Kilifi Moringa has an innovative 360 degrees approach enshrined in its production process (Kilifi Morenga, 2020). The company grows moringa trees and produces a variety of products such as moringa powder, tea, cosmetic products from the leaves and seeds. Moringa produces seed cake from pressing oil which is currently being tested for the production of biogas. The cake can be used as organic fertiliser as it is rich in nitrogen and phosphorus for improving soil fertility. Once the moringa oil has settled, the by-product is a sludge or mud that is used to make facial masks for the beauty industry.

WEEE, Access to EEE Products

E-waste is the fastest growing waste stream in the world and is also becoming an increasing problem in Kenya. While it is potentially considered a very valuable resource stream, there are many challenges in tapping into this potential:

- Usually, only a very small share of the materials (the most valuable ones) is recovered from the E-waste. The rest is left untreated leaving enormous volumes of waste that create local health and pollution problems.
- In order to recover a much larger share of the materials from E-waste, investments in complex expensive machines are needed.

There are also some good initiatives e.g. Close the Gap, where refurbished computers are offered to local communities (Close-the-Gap.org, n.d.). Also, the waste of these computers at the end-of-life is exported back to Europe. In the past, refurbished computers used to be imported, but now the computers are refurbished locally e.g. via the WEEE Centre, creating local employment where Siemens Foundation already assists to build relationships between collectors at this facility.

Potential knowledge sharing platforms for circular economy related programs in the EEE product and product access space are according to the Siemens Stiftung Foundation: the AHK round table working in collaboration with the Kenya Association of Manufacturers.

Also, the Lake Hub in Kisumu is working as an incubation platform for Circular Economy Projects funded by Siemens Stiftung thereby providing access to technology information, research and sharing of relevant data.

2.2 Policy framework supporting circular economy activities

2.2.1 Overview of the policy framework in the context of circular economy

In Kenya, there is no holistic circular economy framework, as now exists in the EU. However, during the last decade Kenya has implemented several relevant pieces of legislation that promote the transition to a more circular economy. Another important fact to note is that the circular economy topic in Kenya is mainly brought forward by the Ministry of Environment and Forestry, Water and Natural Resources, but it is not horizontally prioritised across the different parts of the Kenyan national government. The aims of Kenya's economic policy, which are laid out in the Vision 2030, have potential synergies with circular economy principles, but up to now the mainstreaming of circular economy aspects in Kenya's overall economic policy has been very limited, although some progress has been seen since the adoption of the Green Economy Strategy and Implementation Plan.

In the broader context of Kenya's environmental policy, the Environmental Management and Coordination Act (EMCA) that was adopted in 1999 serves as the legal framework for environmental management in Kenya. Furthermore, it led to the establishment of several environmental institutions, all striving for improved environmental sustainability within the country. The most important organisations include the National Environment Management Authority (NEMA), the Public Complaints Committee, the National Environment Tribunal, the National Environment Action Plan Committees, and the County Environment Committees.

As stated above, the Kenyan approach towards the promotion of circular economy activities has been rather fragmented up to now, but still relevant pieces of legislation have been adopted across a number of different sectors. Recent pieces of legislation with circular economy relevance include:

- The Solid Waste Management bill (2019), which includes:
  - The development of an Extended Producer Responsibility policy.
- The ban on single-use plastic carrier bags (2017);
- Ban on the use of single-use plastics in protected areas (2020).
- The revision of the building code;

Solid Waste Management Bill

The bill for the Sustainable Waste Management, which was drafted in 2019, and is currently being considered by Parliament opts for a more circular economy approach to waste where waste is recognized as a secondary resource and Zero Waste Principles are applied. The Bill and the Policy intend to formalize the waste sector to expand employment opportunities through waste collection, recycling and waste to energy activities. It also addresses Extended Producer Responsibility (EPR) as a key pillar for policy development and implementation by the National and County governments in order to prevent causing waste and to enable re-use initiatives (KAM, 2019). Industrial associations will play an important role in the development, roll-out and enforcement of the EPR programme that is to be implemented. The new SWM bill builds upon the National Solid Waste Management Strategy that was published in 2015 (NEMA, 2015). The strategy aims to build a so-called 7R society focusing on the 7R strategies to reduce and prevent waste generation, namely Reducing, Rethinking, Refusing, Recycling, Reusing, Repairing and Refilling.

The ban on single-use plastic carrier bags

In the face of an increasing problem of plastic waste and severe littering, the Kenyan government adopted a ban on the use of single-use plastic carrier bags in March 2017. In this way, Kenya became the second

African country to outlaw plastics, following Rwanda, which outlawed them in 2008. Even though the ban has been largely effective in the use of single-use plastic carrier bags, the effectiveness and the implementation of the ban have been controversial, as an adequate plan for finding alternatives for the plastic bags was lacking. It has also been mentioned by several organisations that the alternatives for the plastics bags that are now being used are sometimes more environmentally harmful and more difficult to recycle than the plastic carrier bags. However, the ban greatly reduced the volume of plastic waste that is generated in the country.

Ban on the use of single-use plastics in natural areas

In addition to the general ban on the use of single-use plastic carrier bags, the use of all single-use plastic products will be banned from natural areas such as national Parks, beaches, forests and conservation areas, as of 5 June 2020. Through this policy the Kenyan government hopes to reduce plastic pollution in the country's most vulnerable areas, which are also a valuable source of income for the country's tourism sector (UNEP, 2020).

Revised National Building Regulations

A set of new strategic components forming part of a building code was effected since *the revision* efforts started in 2009 and after a broad participatory process led by the Ministry of Transport, Infrastructure, Housing & Urban Development (MTIHUD) and the Ministry of Lands & Physical Planning (MLPP). The new code represents a considerable improvement to the previous building code of 1968. For instance, the previous building code clearly prohibited use of second hand building material as indicated in Part III – Building Materials, section 33: "**u**nless the council otherwise agrees, no second-hand material shall be used on work to which these By-laws refer" (Government of Kenya, 1968). While launching the new building code, the Cabinet Minister, Ministry of Transport, Infrastructure, Housing & Urban Development remarked, "these Regulations are expected to replace the archaic building code which dates back to 1968 and which is largely inconsistent with emerging trends, materials and technologies" (Oxford Business Group, 2017). However, the most recent National Building Regulations 2020 (Government of Kenya, 2020), Part XX Disaster Risk Management Section 23, sub-section (3) states, "While carrying out demolition, priority shall be given to reduce, reuse wastage, recycle materials salvaged from demolition." This article illustrated a progressive development towards the application of CE principles in the construction sector.

2.3 Enabling environment on trade and investments

Kenya has relatively low levels of international trade when compared to other countries in Sub-Saharan Africa. Since 2011, the trade volume has been declining and in the last few years trade volumes were equivalent to a bit less than 40% of the country's GDP, whereas this percentage was above 50% on average in Sub-Sahara Africa. This has been mostly due to the fact that GDP grew faster than the total trade volume. Although the export levels have remained virtually stable during the last decade, import levels increased substantially, leading to a growing trade deficit. Foreign Direct Investments in Kenya have also been declining during the last decade and in 2018 FDI inflows increased again to an equivalent of 1.8% of the GDP (World Bank, 2020), which is close to the average in Sub-Sahara Africa. However, due to several policy reforms and the introduction of special economic zones, the FDI increased again. For more information on the trends in trade and Foreign Direct Investment in Kenya see section C1 in Annex C.

Overall, Kenya has a strong economic growth outlook, which should favour trade with and investments in the country. However, the COVID-19 pandemic has made this bright outlook uncertain. Kenya's economy

has taken a strong hit from the COVID-19 situation and especially informal workers and poor households are affected disproportionately by the policy measures to spread the virus. In the meantime, the estimate is that the Kenyan economy will contract by 0.3% in 2020 (Kemboi, 2020). Even though, the economic situation on the short term is precarious, the country's economic outlook for the long term looks good (for more information see Annex C3).

Kenya's push for green growth, may further stimulate the trade in environmental goods and services. Furthermore, the potential for circular economy activities that exists across many sectors in Kenya creates trade and investment opportunities for European businesses. The EU can help solving the vast waste problems in Kenya, through investments in recycling facilities. Also, in the area of construction large investments are needed in Kenya, as there is a housing deficit of 2 million houses. This represents an investment opportunity for European companies to help Kenya develop affordable housing projects, that are constructed in a sustainable way. Here, it will also be important that a big construction wave does not put further pressure on the need for timber, which would worsen the deforestation trends that Kenya is facing. Lastly, the special economic zones that have recently been set up in Kenya, will generate new investment opportunities for international businesses, including European ones.

2.4 Existing awareness and capacities on CE in Kenya

2.4.1 National awareness on CE

As one of the more developed economies in Africa, Kenya is increasingly aware of its responsibilities on circular economy related aspects such as waste management and resource efficiency. This development is among other things reflected in several legislation and legal frameworks that aim to enhance a sustainable implementation of circular economy strategies (Gall *et al.*,2020; Ghosh, 2020). A major milestone in this regard was the development and implementation of the Environmental Management and Coordination Act of 1999, which serves as the legal framework for environmental management and conservation in Kenya and has, among other things, led to the establishment of various environmental institutions.

In 2007, Kenya's government further published a blueprint (Vision 2030) that described the pathway towards developing the country into a middle-income industrial nation by the year 2030. This so-called Vision 2030 recognizes the need for a sustainable waste management system in order to handle industrialization in line with an equitable social development in a clean and secure environment (Government of Kenya, 2016). In 2017, Vison 2030 was complemented with a medium-term strategy called the Big Four Agenda. Although not specifically mentioned in the Big Four Agenda, the need for sustainable waste management and recycling and CE approaches is implied by aiming to achieve nutrition, health, production and housing related targets set in the long-term vision (KAM, 2019).

Despite the mentioned legislative efforts, national awareness is still one of the key hurdles on the way to a truly circular economy in Kenya. Especially in the education sector, sustainable waste management and CE-technology lack a clear base in school curricula (see section 2.5.5). Additional awareness raising and educational efforts are therefore required (KAM, 2019).

2.4.2 Businesses/industries awareness

According to a consumer study by the Kenya Climate Innovation Centre (KCIC), 57% of Kenyans state that they prefer to spend more on sustainably-made products rather than spending less on unsustainable ones

(KCIC, 2020). However, the industry is still lacking sufficient knowledge and awareness of CE-related approaches. This is among other things reflected in a second survey conducted by KCIC, which shows that over 24% of Kenyan CEOs are still unaware of Sustainable Development and the related Goals. In order to meet the demand for sustainable products, Kenyan companies therefore need to further develop their expertise and awareness of sustainability and CE-related techniques, which, for instance, could be achieved through targeted consulting on sustainability (*ibid.*). Based on the relatively low industry awareness, amongst other issues, CE-related technologies e.g., in the field of waste treatment and recycling have also not yet been fully embraced in Kenya. However, as recyclable materials comprise roughly 50 – 80% of the general waste stream, Kenyan enterprises are increasingly getting involved in collecting, recovering and recycling materials such as paper, polythene, plastics, glass, scrap metals, used oil, e-waste and waste tyres. An exemplary selection of CE-related enterprises and industry initiatives in Kenya is presented in table B1, Annex B.

2.4.3 Consumer awareness of CE

Despite the increasing national focus on CE, the majority of Kenyan consumer still show a significant lack of awareness and knowledge, especially with regard to the importance of a clean and healthy environment. As a result, there is often very poor handling of household waste management including a limited application of adequate waste segregation, reuse, reduce and recycling. The negative attitude towards waste management among Kenyan consumers also contributes to poor practices such as littering, illegal dumping and open burning (NEMA, 2015). According to the Kenyan Association of Manufacturers, low levels of consumer awareness are mostly due to a lack of comprehensive strategies on building consumer awareness through e.g., campaigns or integration into curricula. The association therefore recommends that awareness campaigns amongst citizens need to be further developed. This will ensure that consumers, regardless of their social and economic status, are able to incorporate better waste management and recycling practices as well as to adapt their personal behaviour (KAM, 2019).

Over the recent years a number of awareness creation initiatives for CE related measures were launched in Kenya. In addition to state-organised donor- and state-funded initiatives, social entrepreneurs in Kenya are also increasingly involved in awareness-raising efforts for CE. Some of the most relevant awareness initiatives are listed in table B-2, Annex B.

2.4.4 Education and skills gaps

The Kenyan government is increasingly committed to implement environmental and sustainability aspects at all educational levels (Karanya, 2010). As one important step towards a more sustainability focused education system the Kenyan Ministry of Education, in 2012, established a national Education for Sustainable Development coordination desk and initiated an ongoing collaboration with the Ministry of Environment and forestry and the National Environment Management Authority (NEMA), which aims to promote ESD activities in Kenya. In order to foster the effective implementation of ESD approaches the MoE has further engaged in various partnerships and networks with organizations such as the Ministry of Health, Ministry of Environment and Natural Resources, UNESCO, UNEP, WFP, UNICEF and MASHAV (Ministry of Education, 2017). As a first result of this collaboration, UNEP in cooperation with NEMA and the Commission for University Education (CUE) launched the Kenya Green University Network (KGUN). The network brings together over 70 universities that aim to incorporate environmental and sustainability practices into the curricula, campus designs and research projects of Kenyan universities (UNESCO, 2016).

Next to formal approaches, Kenya has also experienced a rise in NGO activities that focus on environmental- and sustainable development education. One of those NGOs is the Kenyan Organization for Environmental Education (KOEE). KOEE is the Kenyan chapter of the international Foundation for Environmental Education and aims to promote sustainable development through national and regional education efforts such as the Eco Schools Programme or the Natural Resources and Governance Programme. Other initiatives include A Rocha Kenya, which seeks to promote environmental education and implement practical conservation initiatives through collaboration with schools, environmental groups, communities and churches. A Rocha also focuses on teacher training to better integrate renewable energy into existing national curriculum-based education. The aim is to expand this to include environmental skills and awareness in curricula in a structured way (A Rocha Kenya, n.d.).

Despite the ongoing efforts, most educational institutions are, however, still lack a comprehensive strategy on awareness creation for the benefits of a green economy and CE concepts (KAM, 2019). To this regard, especially teachers are often not sufficiently prepared to teach environmental education classes, as they have not received any training themselves. Therefore, educational efforts often fail to develop environmental literacy of students (Karanya, 2010).

2.4.5 Vocational training capacities

Kenya, like many African countries, suffers from a particularly high youth unemployment rate. A national household survey, conducted in 2005, found that approximately 21% of the population between 15-29 years were unemployed, with an additional 25% neither attending school nor working. In an effort to tackle the challenge of high unemployment rates, the Kenyan education system offers a range of options for vocational and technical education for graduates from secondary and post-secondary levels, providing students with the skills needed for employment, even without obtaining a secondary school diploma (International Growth centre, 2011). In order to promote vocational training activities in the country, Kenya adopted the Technical and Vocational Education and Training Act (TVET) No 29 in 2013. Under the act, the Technical and Vocational Education and Training Authority (TVETA) was established. TVETA is a public body responsible for regulating and coordinating vocational education and training in Kenya through licensing, registration and accreditation of vocational training programmes, institutions and trainers (TVETA, n.d.). TVETA has already accredited over 290 technical training institutes, 11 national polytechnics and 1450 vocational training colleges (KEPSA, n.d.). With a view to Kenya's Vision 2030, vocational training institutions are increasingly focused on re-orienting their curricula towards sustainable development and to some extent also circularity approaches (*ibid.*). However, case studies from TVET activities in Kenya show that many trainers and instructors are still unclear about the concept of sustainable development. Further most of them still rely on traditional teacher-centred methods of teaching, such as lecturing, which may not be ideal for conveying the relevant knowledge about sustainable development (Dubois *et al*. 2020).

3 Impacts and benefits of the CE in Kenya

3.1 Existing impacts and benefits

The policy framework elements that support Kenya's transition to the circular economy are included within the Vision 2030. The short and mid-term goals are adjusted in accordance with the SDG's and Climate change adaptation strategies set out for Kenya thus providing a cascading policy design for stakeholder engagement. Circular Economy frameworks as per sector consideration propagate triple-bottom-line impacts and benefit from setting a stage for accelerated growth. These include, creation of new business opportunities, increasing international competitiveness of some sectors and increase of exports, transforming waste into more valuable projects creating revenues and mobilizing funds for new projects. The following tables summarize some positive economic, social and environmental impacts resulting from the adoption/implementation of national policies and initiatives as further outlined in Chapter 4.

Table 3-1 Case studies of companies currently working within the Social Economic spectrum

Farming Practices	
Hydroponics Kenya	• Hydroponics Kenya is a pioneer initiator of hydroponic farming technology in East and Central Africa and specializes in the manufacturing, installation and marketing of customized hydroponic fodder and vegetable systems to help small and medium holder farmers have access to a high quality, cost-effective and sustainable way of farming (Hydroponics Kenya, N.D.). • Hydroponics Kenya constructs greenhouses with water circulation system meaning that the water usage is lower than conventional solutions and an innovative temperature regulation system without any thermostat or electricity needed (Hydroponics Kenya, N.D.)
Logistics and Markets in Agriculture	
Twiga Foods **(Twiga, n.d.)**	• Twiga Foods is a fast-growing Kenya based enterprise using mobile technology and logistics to enhance food supply chains by more effectively and rapidly consolidating highly fragmented, informal market supply & demand (thereby reducing food loss and food prices) • The company's clients include both farmers, to whom it provides a guaranteed off take (currently 5,600 farmers with 600+ percent year-on-year growth), and small-scale vendors (for example, street sellers, kiosks) to whom it provides distributed wholesale services (currently 4,300). (World Bank Group, 2019)
Closing the loop with organic Agricultural waste	
TakaTaka Solutions	• Taka taka solution recycles 95% of the waste it collects reducing the amount of landfilled waste. They work with one of the numerous recyclers and converters that feed sorted and pre-treated into more than 45 fractions from TakaTaka into their production processes within their two sorting sites in Nairobi. • The company makes composts out of their separated organic waste, which is sold to farmers.
Extended producer Responsibility and Producer Responsibility Organization	
The PET Recycling Company (PETCO	• PETCO aims to create value for post-consumer PET and encourage a change in consumer and industry behaviour towards recycling PET beverage bottles which is supposed to help in creating more employment possibilities in the recycling industry through self-regulation mechanisms for the industry.

Kenya, N.d.)	• PETCO targets stakeholders which can bring maximum returns to the consumer awareness programs to raise awareness and promote consumer education. Some initiatives aim to couple media coverage with school recycling initiatives.
Clean Green Kenya (CGK)	• CGK is an NGO and operates as a voluntary system with the goal of developing a circular economy, bringing awareness of proper waste management to all sectors and becoming a hub of information in the recycling sector. The organization collects monthly funds through an 'EPR fee' which are invested in enhancing the waste management capacities (KAM, 2019).
Rainforest Alliance & Kenya Tea Develop-ment Association	• Local manufacture of carbonised briquettes made from farm waste materials (e.g. sawdust and corn husks, sugarcane bagasse, macadamia shells and coffee husks) supplied to homes and tea processors (Rainforest Alliance, 2018). The project has already enabled thousands of Kenyan households to switch to cleaner, safer and more affordable cooking. By partnering with Kenya Tea Development Association (KTDA), the project has established tree nurseries in 12 factories aiming to have over 1,000,000 trees within a year. Since the program started over 13,000 households who have switched to briquettes, solar energy and use of efficient cook stoves (Green Times, 2020).
Other Private Sector Initiatives	
Ekotech Kenyan Ltd (Ekotech, n.d.)	• Ekotech is a waste collection company engaged in collection, transport and supply of waste for recycling purposes. • They collect various types of wastes from dump sites, hotels, restaurants, residential buildings, schools and shopping malls which they use to make eko-boards, which are laminated boards that are heat resistant, water resistant and termite resistant. • Ekotech is the contracted waste recycler for Tetra Pak cartons in the East Africa region. The partnership is in tandem with Tetra Pak's goal of recycling 40% of all leaving their factory.
Ocean Sole Africa Ltd.	• Ocean Sole Africa is a leading Kenyan social enterprise whose mission is to turn the earth's flip-flop pollution into inspiring art to promote marine conservation and create employment opportunities in underdeveloped communities.
Soko Fresh	• SokoFresh is professionalizing the fragmented agri-food value chain that faces resulting in post-harvest loss because of no cold storage and mismatched supply and demand (Enviu, n.d.). • Their rentable cold-storage solution & market platform offers investment free access to the smallholder farmers who are disproportionately affected by the failings of the current chain.
Safi Organics	• Safi Organics is an eco-inclusive enterprise that aims to reverse declining agricultural • yields, improve the income and food security of local farmers, and provide opportunities for local youth. • The area has been used to grow rice continuously for around 70 years, with farmers experiencing slow declines in yield and productivity. • Farmers also face challenges around the disposal of waste rice husk, which is traditionally burned in an uncontrolled manner, and high costs of imported inorganic fertiliser. ○ Safi Organics has connected these problems by creating an agricultural value chain from the local organic waste stream. Using an open-source technology, the enterprise produces valuable agricultural inputs such as fertiliser and soil treatments designed to meet local conditions. • Safi Organics trained 400 local farmers in the use of organic fertiliser

Mr Green Africa (Global Innovation Fund, n.d.)	• A tech-enabled plastics recycling company disrupting the current informal and exploitative plastic recycling sector in Kenya. • Mr Green offers an in-house end-to-end process for recycling, purchasing directly from their sourcing agents; waste pickers who are some of society's most marginalised people. • Mr Green owns and operates a series of trading hubs across Nairobi where they transact with their sourcing agents directly to purchase their collected plastic for onward transfer to the MrGreen manufacturing plant. • The collected plastics are processed and sold as post-consumer recycled plastics to plastics manufacturers for use by large fast-moving consumer goods (FMCG) companies, such as Unilever.
Muliru Farmers (Seed, 2010)	• Muliru Farmers is a community-based initiative that seeks to conserve the Kakamega forest through the promotion of alternative income generating activities and awareness among the local, poor communities. • It is a partnership between several institutions and uses traditional knowledge and modern science to develop products on the basis of wild indigenous medicinal plants. • The core business of the initiative is the commercial cultivation of Ocimum kilimandscharicum, processing the plant materials into essential oil, manufacturing, and subsequently marketing, the finished Naturub®products. • The initiative is committed to meeting the growing global demand for environmentally friendly natural products, offering added value and protecting biodiversity.
Micca pilot project (FAO, n.d.)	• The MICCA pilot project (2011-2014) in Kenya aimed to reduce the overall GHG balance of the livestock production systems by improving animal breeds and their productivity in the Kaptumo Division of Nandy County. • Based on site-specific participatory and expert assessments, the project developed a portfolio of suitable practices for smallholder farmers. • The capacity-building activities were undertaken through the East Africa Dairy Development (EADD) Programme (Heifer International, n.d.) and reached over 4 500 male and female farmers through a gender-sensitive farmer-to-farmer extension approach. In parallel, technical alternatives for reducing the climate change 'footprint' of the dairy industry were also tested, including through the EX-ACT tool (FAO, 2012) • The project resulted in reduced GHG emissions from the farm systems and enhanced sinks, while almost all (97 %) of the adopters of CSA practices perceived benefits, such as increased farm income. • The project improved animal breeds and their productivity, thereby reducing cattle number, supporting on-farm fodder production to improve milk production in a sustainable manner, and better manure and grazing management. • In addition, the project yielded 36 demo plots, 2 biogas digesters as well as 68 tree nurseries with > 300 0000 seedlings

To illustrate the benefits of existing CE initiatives in Kenya, the economic, social and environmental benefits of the aforementioned case study initiatives (Table 3-1) are presented in Table 3-2 below.

Table 3-2 Economic, social and environmental Impacts and benefits from implementing CE in Kenya

Case study	Economic impacts	Social impacts	Environmental impacts
Soko Fresh	• Their rentable cold-storage solution & market platform offers investment free access to the small holder farmers who are disproportionately affected by the failings of the current chain. • Soko Fresh strives to pay smallholder farmers fairly. This enables them to have money required to invest in other areas of their life and in inputs that boost productivity	• Soko Fresh is professionalizing and optimising the agri-food value chain to avoid post-harvest loss as a result of no cold storage and mismatched supply and demand. • Soko Fresh unlocks more income opportunities for small holder farmers in the avocado, mango, and French beans value chains • Soko Fresh works towards a 30% increase in income through preservation of produce that would otherwise go to waste as well as market linkage so that farmers can access a wider choice of buyers	• A staggering 50% of horticultural produce in Kenya never makes it to the market, Soko fresh is drastically cutting these losses and reshaping the market, e.g. by utilizing off grid cold storage technology that is environmentally friendly and preserves produce that would otherwise go to waste thus saving on water related to growing produce as well.
Safi Organics	• Safi Organics has created an innovative value chain in the waste management sector by using technology to produce natural fertiliser. The business model provides a market for farm waste by purchasing discarded rice husks. • Safi Organics subsequently process the waste into valuable farm inputs such as fertilisers and soil conditioners, which are sold back to farmers and used to increase soil productivity. • Safi Organics increases farmers' income streams by purchasing waste from the farmers and allows farmers to scale up their activities through increased yields and decreased spending on agricultural inputs. • Increased farm yields by up to 30%	• Improved livelihood opportunities for farmers. These farmers are now able to earn a decent living wage, fund their children's education and meet their household responsibilities. • Additionally, Safi Organics provides income and training opportunities for local farmers and youth employed in the enterprise's production facility. • Generated 8 full-time positions for youth under 35 year of age. • Has built skills and increased knowledge of 400 local farmers • Improved livelihood opportunities for farmers. These farmers are now able to earn a decent living wage, fund their children's education and meet their household responsibilities.	• Converted 150 tonnes of waste materials to beneficial • Carbon sequestration of 1.5 tonnes of CO2 per acre of product use

	• Significantly lower costs than imported mineral fertilizers • Created 8 full-time jobs and 20 part-time or casual jobs Purchased 150 tonnes of waste husk from local farmers Produced and sold 1,600 bags of agricultural products.	• Additionally, Safi Organics provides income and training opportunities for local farmers and youth employed in the enterprise's production facility.	
Mr. Green Africa	• Transforming waste bottles into valuable RPET pellets to be exported • 110 Direct Jobs created.	• The company works with informal waste collectors (pickers) by integrating them into their value chain. • Mr. Green Africa partnered with the international consumer goods company Unilever on a plastics recycling programme for primary schools. • 2500 waste collectors involved.	• Mr. Green focuses on the collection of plastics, specifically PET bottles, HDPE, PP as well as aluminium and papers like cartons. The recycled plastics are sold as flakes, both locally and internationally this keeps valuable materials in circulation while reducing virgin raw material use. • 3000 tons of plastic waste have been recycled
Micca pilot project (FAO, n.d.)	• Improving animal breeds and their productivity, thereby reducing cattle number, supporting on-farm fodder production to improve milk production in a sustainable manner, and better manure and grazing management. • An average increase in milk production of 3.9 litres per cow per day • 5 Community Extension Service Providers, 22 farmer trainers, 31 farmer groups	• Total of 4700 farmers trained (35% women)	• Leguminous fodder production and fodder crop residues provide cattle with a rich diet and improve the manure quality, which, when added to the soil, increases crop and productivity. • The integration of perennial leguminous trees with dairy livestock production and leguminous cover crops enhance the productivity of the land by increasing the efficiency of nutrient recycling and soil carbon, which can compensate part of the livestock-related emissions.
Muliru Farmers	• Muliru Farmers promotes organic medicinal plant farming as a new and sustainable market opportu-nity for local communities and creates	• Muliru Farmers generate additional income for 360 households impacting approximately 2,500 people and	• Muliru Farmers protects rainforest from logging and unsustainable harvesting by

(SEED, 2010)	sustainable local economic development as beneficiaries' use their additional income to start new micro-businesses.	work with 3 local schools to offer conservation training. • The transfer knowledge and experience to other organisations both nationally and internationally. • The on-farm cultivation of Ocimum kilimandshari-cum has created nearly 900 jobs for smallholder farmers.	providing alternative income opportunities and sources of firewood. • Its estimated 380 plant and 350 bird species have been protected • They increase awareness of biodiversity benefits of the rainforest and the importance of conservation.
Ocean Sole Africa	• In 2018 they hand made over 65,000 products were sold globally – from America to Australia • They have 150 full-time employees and flip-flop suppliers • Sales revenue increase from 2017 to July 2019 of 86 % allowed for the hire more people, open a new workshop that employs over 25 people, and expand to another global location.	• Over 1,200 Kenyans are supported through the employment and collection of flip-flops. • Their growth annually averages over 50% which provides for increased impact by nearly 80% in employment, cleaning beaches and advocacy. • They have an employment welfare program for employees which matches what they save for school fees, purchasing lands or emergencies • They provide healthcare and More than 22,000 hot meals are served to employees every year. • 28 schools participated in their educational program at their Nairobi office in 2018 and have educated more than 10,000 students on conservation • Over 200 children put through school from Ocean Sole wages, payment for flip-flop supplies and scholarships • Narrowing the gender gap from under 10% to the current 45%, they have seen the tangible gains made by integrating women across the entire value chain. • For every bulk product purchase from the Kiwayu women's group, provides the equivalent of two persons income for a year.	• They have recycled over 559 tonnes of flip-flops since the social enterprise started in 2006 with an average cycle between 750,000 and 1,000,000 flip-flops a year. • A minimum of 15% of profits fund their impact coastal community or marine conservation programmes • The business employs and engages over 15 coastal communities along the Kenyan coast to clean beaches

3.2 Future Impacts and benefits

As the Kenyan economy moves away from a traditional linear economy towards a more circular economy, this will be expected to have economic, social and environmental impacts. The following subsections present our modelling results, highlighting the direction and magnitude of potential impacts of the circular economy in Kenya.

3.2.1 Modelling approach and framework

The modelling of the macro-economic impacts of the circular economy transition in Kenya was carried out using Cambridge Econometrics' FRAMES model. This is an advanced input-output model, designed to enable the assessment of socioeconomic and environmental effects of energy, environment, and economy policies (for details see Annex B).

A conventional difference-to-baseline approach is followed. The circular economy (CE) scenario is compared against a baseline[4] in which no explicit assumptions are made about circular economy activity (i.e., 'business-as-usual' scenario), in order to compare outcomes between the two.

We have adopted an 'activities' approach (rather than a 'policies' approach) to modelling the CE scenario. This choice means that the analysis does not assess potential impacts of specific policies but instead looks directly at the links between specific changes in an economy and the direct, indirect and induced effects, without making any explicit assumptions about whether these changes are driven by policies, behavioural change or new technology.

3.2.2 Modelling inputs for the CE scenario

Circular economy narrative

Based on our research on the trends in and opportunities for circular economy activities in the eight case study countries, five priority sectors have been chosen to be covered in the modelling exercise. Those are the waste sector, electronics manufacturing, the plastics sector, the agri-food sector, and the construction sector. It should be noted that some specific circular activities that are currently commonly mentioned within the European policy and industry context were left out as we did not consider them realistic to be implemented within the coming decade, due to a lack of industrial development or circular economy awareness or the fact that the impacts will only materialise on a longer timescale (e.g., building design for de-construction or modular building design).

The sectors that we have focused on are the waste sector, the plastics (packaging) sector, electronics, agriculture and construction. The waste sector is an important enabler of a (more) circular economy and to be effective in this waste collection rates and recycling rates need to increase. Plastic (packaging) waste is a daunting problem in most African countries, a combination of more effective plastic waste collection and the recycling of plastic waste into new plastic packaging can make an important contribution to solving this urgent problem. E-waste is another challenge in several African countries, but with proper and safe treatment practices in place it also represents an opportunity for reusing and remanufacturing, resulting in an increased supply of affordable EEE products as well as an opportunity for recycling of valuable materials present in the E-waste, when high-value CE strategies are not feasible. Agriculture is still a critical part of the economy in many African countries. In this sector, substantial potential resides in the improvement of handling, storage, and distribution of food products to prevent

[4] The baseline is E3ME's standard projection to 2030 for the Kenyan economy, based on official published economic and energy forecasts. See Annex B for more details.

losses and to increase the use of organic fertilizers. Lastly, construction is a booming activity in Africa, but up to now circular practices are virtually absent. Therefore, for the short term there seems to be potential for increasing the use of secondary materials in this sector, either directly or via construction products that incorporate by-products or waste materials.

Modelling assumptions

Where possible the aforementioned sectoral narratives have been translated into modelling assumptions. It should be noted that the aim of the exercise has not been to forecast the future in 2030, but to explore the impacts that more increased circularity could have by that year, were this to become a reality. To this end, we made evidence-based assumptions about the form and scale circular economy activities could take in Kenya by 2030 and used these as inputs into the model. These model inputs are summarised in **Error! Reference source not found.**below.

Table 3-3 Circular economy activities and corresponding modelling inputs

Category	Circular economy activity	Modelling input
Waste management	Improved waste collection rate	Increase in waste sector output
	Improved recycling of valuable materials in e-waste	Investment in recycling sector to improve health & safety standards (50% funded by industry, 50% funded through public/ODA financing)
		Exports of materials recovered from e-waste recycling
	Increased use of recycled materials in electronics production, replacing virgin metals and plastics	Shift in plastics' intermediate demand: reduced purchases from metals and plastics sectors, replaced by purchases from recycling sector
Agriculture	Prevention of food loss in agricultural supply chain through improved storage and logistics	Substitution of agricultural imports by domestic agricultural production
		Investment in storage and logistical capabilities (50% funded by industry, 50% funded through public/ODA financing)
	Increased use of organic fertilisers materials in agriculture, replacing use of mineral fertilisers	Shift in intermediate demand in agriculture: fewer purchases from chemicals, more purchases from agriculture
Plastics packaging	Increased use of recycled feedstock in plastics production, replacing virgin feedstock	Shift in plastics' intermediate demand: reduced purchases from chemicals sector, replaced by purchases from recycling sector
Construction	Increased use of recycled minerals in construction, replacing virgin minerals (glass, cement, sands, ceramics)	Shift in plastics' intermediate demand: reduced purchases from non-metallic minerals sector, replaced by purchases from recycling sector

Modelling limitations

As shown in the table, the circular economy activities and the related modelling assumptions focus on recycling and trade activities as well as on raw material inputs. There are two main reasons for this. First of all, due to the lack of well documented data, other activities ranking higher in the waste hierarchy, such as high-quality refurbishing (e.g., in the EEE sector), had to be neglected. Secondly, the technical construction and set up of the FRAMES model restricted the type of assumptions and inputs that could be used. For instance, in such a demand-driven framework, it is difficult to model an increase in recycling when this is not fully coupled with an increase in demand for recycled materials across sectors. As such, growing activity in the waste sector was limited to increasing waste collection rates. Furthermore, some activities are hard to represent in the modelling as the sectoral aggregation is too coarse to allow for

modelling for changes in production processes within sectors. These limitations are important when interpreting the results presented in the following sections. The impacts that circular economy could potentially bring to the chosen sectors and countries are thus not fully covered in the modelling and could thus differ from the modelling outcomes in reality.

3.2.3 Modelling results

The modelling results presented in this section reflect differences between the CE scenario and the baseline by 2030, rather than the net effect of economic developments occurring between 2020 and 2030. For instance, if the price level in the CE scenario is reported as -1% by 2030, this does not imply that deflation occurred in the CE scenario, but that inflation was slightly lower in this scenario than in the baseline scenario.

Economic impacts and benefits

Our modelling suggests that circular economy activities in Kenya would have a positive impact on the Kenyan economy. By 2030, Kenya's GDP is projected to be around 0.5% higher in 2030 in the circular economy scenario compared to the baseline scenario. In other words, this suggests that the Kenyan economy would be slightly larger because of increased circular economy activity than it would be in a 'business-as-usual' situation. The Table below shows the CE scenario results for each of the components of GDP, as well as for the price level. Results for the CE scenario are presented as differences from the baseline scenario by 2030, in absolute (monetary) and relative (percentage) terms.

Table 3-4 Macro-economic impacts of the CE scenario

Variable	Absolute difference from baseline scenario by 2030 (€2019)	Relative difference from baseline scenario by 2030 (%)
GDP	+ €619m	+ 0.5%
Consumer	+ €77m	+ 0.1%
Investment	+ €226m	+ 1.0%
Exports	+ €34m	+ 0.2%
Imports	- €282m	- 0.8%
Price level	-	- 0.1%

These results suggest that the positive economic impacts would be mostly generated by higher investment and an improvement in the trade balance, with consumption contributing a smaller amount.

Some of these impacts can be attributed to the direct effect of the input assumptions in the circular economy scenario. The projected fall in gross imports relative to the baseline is attributable to an assumed fall in agricultural imports of €309m (see Table F3, Annex F), a consequence of better prevention of food losses in agricultural supply chains. These employment and consumption impacts should be interpreted with caution, however, due to a limitation in the modelling methodology. The agricultural employment impacts observed in the CE scenario reflect an implicit assumption that the additional output in domestic agriculture due to prevention of food losses is as labour-intensive as other forms of agricultural production, when in reality it is likely that this circular economy activity would be much less labour-intensive than most agricultural production. If the employment were not to rise by as much as the results suggest, then it follows that we should not expect as large a consumption impact as the results suggest.

A sizeable portion of the investment impact is also directly driven by scenario assumptions of increased investment in the agricultural and recycling sectors, which account for around €85m of the total €226m investment impact. The remainder of the investment impact would result from the downstream effects of these and other circular economy activities. Rising output in key circular economy sectors, particularly agriculture, would also cause businesses to increase their expenditure on investment and intermediate production inputs. In this way, the economic impact would flow through to other firms in the economy, notably construction (which benefits from higher investment spending) and financial and business services (which is an important supplier for a wide range of sectors). Rising output across all these sectors would also generate higher employment in those sectors (see next section), leading to higher disposable incomes for consumers, which would be recycled through greater consumption spending on sectors such as financial and business services, education and health, and agriculture.

Finally, circular economy activities would have downstream effects on the trade balance. On the one hand, some of the higher demand from consumers and businesses would be spent on imported goods and services. This would dampen the impact of the assumed €309m fall in agricultural imports somewhat, leading on net to a smaller projected reduction in gross imports of around €282m. The increasing competitiveness of the agricultural sector would also allow it to export some of its produce, which along with the scenario assumption of increased exports of recycled materials from e-waste, would contribute positively to the trade balance.

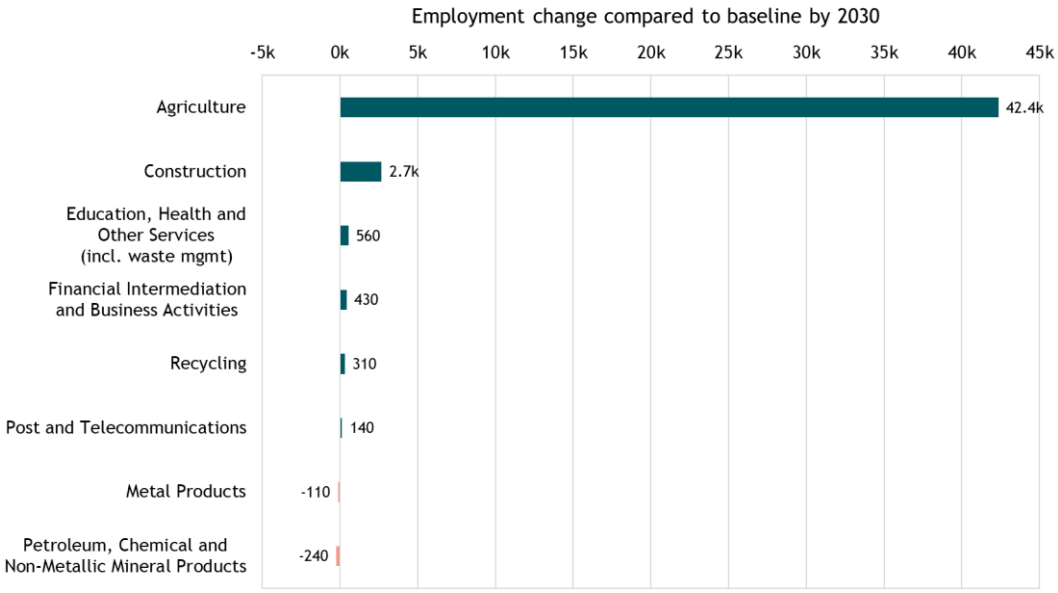
When interpreting these economic results, it is important to note that not all of the projected impacts in the CE scenario would necessarily be sustained beyond 2030. On the one hand, we may expect a permanent impact from circular economy activities such as preventing food losses in the agricultural supply chain, or increasing waste collection rates, assuming efforts are made to maintain these practices in the future. On the other hand, some of the projected GDP impacts are a direct result of time-limited injections of funds into the economy, such as the assumed increase in investment in agriculture. We have assumed that half of this investment stimulus would be funded either through public deficits or official development assistance: if this type of funding were to be discontinued from 2030, then we would expect the GDP impact to be somewhat smaller from 2031 onwards.

Social impacts and benefits

In line with the positive economic effects, the circular economy in Kenya would also have positive employment effects. Overall, a net increase in employment relative to the baseline scenario of around 0.15% is projected, or approximately 46,000 additional jobs compared to the baseline (**Error! Reference source not found.**).

Nearly all the additional employment seen in the CE scenario would be generated in the agricultural sector, which accounts for over a third of the net employment impacts seen in the modelling results. As discussed in the previous section, however, these impacts on agricultural employment should be interpreted with caution, due to a limitation in the modelling methodology. The employment impacts observed in the CE scenario reflect an implicit assumption that the additional output in domestic agriculture due to prevention of food losses is as labour-intensive as other forms of agricultural production, when in reality it is likely that this circular economy activity would be much less labour-intensive than most agricultural production.

Figure 3-1 Absolute employment changes in selected sectors in CE scenario (relative to the baseline scenario)



The results suggest that smaller employment impacts would be seen in construction and financial and business services, as rising output in agriculture and other sectors would lead to an increase in investment expenditure and intermediate demand. Employment in the waste management sector, meanwhile, would be directly affected by CE activities, as output and employment would need to increase in order to achieve a more ambitious waste collection rate. The net employment impact of greater use of recycled materials in construction and electronics, plastics and metals production would be roughly neutral, as gains in employment in the recycling sector relative to the baseline would be offset by a slightly larger decline in employment in the petrochemical and metals sectors.

As explained throughout this report, CE strategies can have important impacts on informal workers. The model is only capable of quantifying changes in overall employment volumes, but not to assess the impacts of specific groups within the workforce in qualitative terms. This means that the shifts in economic activities in this assessment can affect the job types and skill sets required. Involving informal workers in the economic transformation process is thus crucial for achieving societally beneficial outcomes.

Environmental impacts and benefits

Our model suggests that the economic growth seen as a result of circular economy activity in Kenya would produce higher carbon emissions than in the baseline, with CO_2 emissions forecast to be 0.16% higher than baseline levels by 2030.[5]

The recycling sector would see the largest rise in emissions as a result of CE activities, it sees greater demand for secondary products as inputs into construction and the production of electronics and plastics.

[5] These results include only emissions of CO_2 from energy use (such as burning of fossil fuels in transport). They therefore do not take account of emissions of other greenhouse gases (such as methane), nor of emissions of CO_2 from other sources (including emissions from industrial processes, from changes in land use and from landfill). This is due to a lack of reliable data for these emissions at the sectoral level required in this study. As a result, the CE scenario emissions results do not fully capture the climate impacts of CE activities, in particular in the agricultural and waste sectors.

This rise in emissions from the recycling sector would be offset, however, by a corresponding fall in emissions from the metals and petrochemical sectors, whose output it would effectively replace in a more circular economy. Our results suggest that the net effect of this sectoral shift in output on CO_2 emissions would be fairly neutral.

A smaller rise in emissions would be seen from the transport and power generation sectors, among the most energy- and carbon-intensive sectors in the Kenyan economy. As circular economy activities generate economic benefits that spread throughout the economy, business and consumer demand for transportation and electricity would increase, leading to greater consumption of fossil fuels for energy. For the impacts of circular economy activities to be fully carbon neutral, Kenya would likely need to take separate measures to ensure that the transport sector sees higher uptake of renewable energy sources.

It is important to take account of some methodological limitations when interpreting these environmental impacts. Firstly, our modelling likely overestimates emissions impacts from certain circular economy activities, such as in agriculture, as we faced limitations in how accurately we could model these activities. For instance, we modelled the prevention of food losses in the agricultural supply chain as an increase in demand for domestically produced agricultural goods, to substitute for imports of those goods. This implies that preventing a given amount of food losses requires the same amount of energy as growing an equivalent amount of food. As was the case with employment in this sector, however, it is likely that the former is more energy-efficient than the latter as this food was already produced in the baseline case, but no measures were taken to prevent it from being lost. Similarly, the model does not necessarily capture the effect that greater recycling rates would have on reducing landfill emissions, or the effect of reduced food losses on organic waste emissions, as our results only include emissions from energy use and process emissions.

Secondly, it should be noted that the results presented here only project the emissions impacts in Kenya, and do not attempt to project the net impact on global emissions. For instance, a substitution of imports for domestic production would, all else being equal, result in no net change in emissions, as production has simply relocated from one place to another. However, this development is represented in our results as an increase in emissions in Kenya, without taking account of any corresponding decrease in emissions outside of its borders.

Thirdly, these emissions impacts should be seen in the context of environmental goals, more broadly defined. For instance, the increase in emissions as a result of circular economy activities must be weighed against the abatement of other forms of pollution, such as that generated by uncollected waste. Economic statistics such as national accounts generally do not capture the broader co-benefits of increasing waste collection output in terms of human health, ecosystem services, reduced pollution, resource savings and conservation of natural capital. However, due to the lack of data on sectoral resource consumption and waste generation, such impacts could not be quantified.

4 Cooperation between the EU and Kenya

4.1 Policy dialogues

Kenya and the EU have been actively cooperating for over 40 years. As a result of this long-standing partnership, several comprehensive trade and development agreements have been drawn up between the two parties. With the aim of reinforcing these joint coordination efforts and political dialogues between the respective governments and other key actors, Kenya is engaging in the EU's Joint Programming, which is currently forming the most important bilateral framework for dialogue between both parties. The first phase of the EU Joint Programming in Kenya, covering the period of 2013 to 2017, was aligned with Kenya's Medium-Term Plan II and aimed to support Kenya in the following priority areas: (i) Agriculture, rural development, and Arid and Semi-Arid lands; (ii) Energy and transport; (iii) Democratic governance, justice and the rule of law; and (iv) Water and sanitation (EU Delegation Kenya, 2018). Building on the first phase, Kenya and the EU agreed on the *Joint Cooperation Strategy 2018-2022,* focusing on improving and further specifying the existing development opportunities in Kenya. The *Joint Cooperation Strategy* supports both the implementation of Kenya's *Third Medium-Term Plan 2018-2022*, as well as Kenya's *Big Four Agenda,* the countries primary unilateral development strategy. Although there is currently no thematic focus on promoting circular economy in EU-Kenyan policy dialogue, some of the aspects listed in both the Joint Cooperation Strategy and the *Big Four Agenda,* show significant overlaps with certain CE concepts (see 2.5.1). This is a recurring theme in the current cooperation between the EU, EU member states and Kenya, where CE is usually not addressed directly, but CE components are nevertheless an integral part of the cooperative development approach (*ibid.*).

Accompanying the *Joint Cooperation Strategy 2018-2022* the EU also established the Cooperation and Partnership Facility (EC, 2019). The facility serves as a key component for strengthening and promoting political dialogue between Kenya and the EU while also acting as an enabling mechanism for the implementation of the UN Sustainable Development Agenda 2030 in Kenya. The CPF is organised in three components – the Dialogue Facility, the Technical Support Facility and the Support of the National Authorising Officer. The Dialogue Facility manages the strategic dialogue and partnership between both parties on economic cooperation, national policy reforms and other areas of cooperation. In close collaboration with the National Treasury, the facility additionally supports the implementation of the *Joint Cooperation Strategy with Kenya* and of any other ongoing EU-Kenya development cooperation programmes. To facilitate knowledge sharing and dissemination of best practice and success stories between the EU, EU member states and Kenya, the dialogue facility also provides a support structure for cooperation dialogues by arranging for logistical support for any type of dialogue platforms (e.g., workshops, seminars and conferences) (*ibid.*). The second component, the Technical Support facility, focusses on providing technical support in specific, jointly identified focus areas. By enabling peer-to-peer exchanges, structured to share expertise and EU policy experience, it aims to ensure an efficient implementation of the Kenya's Vision 2030 and the "Big 4" agenda. The third component of the CPF is the Support to the National Authorising Officer. By harmonizing and coordinating aid actions of the partners involved in national and international development cooperation initiatives in Kenya, this component serves as an additional instrument to foster exchange and cooperation between the parties. It also facilitates means of effective communication within any EU-Kenya cooperation, through visibility and communication activities (EC, 2019).

Building on the existing collaborative approach of the joint EU programming and EU strategies, the EU and its Member States recently proposed the Team Europe Initiative – Green Deal Kenya, which is aiming to support a post-COVID green recovery within Kenya. The initiatives five key areas of intervention include the support of a Circular Economy (along with smart agriculture, renewable energy, natural capital, and sustainable urbanisation). Green Deal Kenya will also include a comprehensive policy component designed to assist the relevant authorities (national; counties; municipalities) in developing, reforming and increasing coherence between policies, regulations and standards, facilitate the exchange of best practices and conduct policy, investment, B2B and multi-stakeholder dialogues between the EU and Kenya's partners.

In addition to the above-mentioned frameworks for political dialogues between Kenya and the EU, a number of international events provide ongoing opportunities for regular exchanges on CE-related issues. One of the most recent examples in this context is the Sustainable Blue Economy Conference, held in Nairobi in 2018. The conference was hosted by the Government of Kenya in collaboration with Portugal as a co-host and featured the appearance of several high-level EU and Kenyan delegates, such as the EU commissioner for Environment, Maritime Affairs and Fisheries. During the conference, both parties substantiated their will to cooperate by agreeing on the joint the "Go Blue" campaign, aiming to unlock potential sea-land opportunities in coastal urban centres by promoting sustainable economic growth, sea-land development and maritime law enforcement (EU Delegation Kenya, 2018[B]). In 2019, the EU furthermore hosted the Erasmus+ platform in Kenya, facilitating bilateral interchange between both parties and fostering scientific and academic discourse. The fair, which featured over 1000 students, gave participants the chance to interact with representatives from the EU, EU member states and Erasmus Alumni. Since many of the courses offered as part of the Erasmus+ programme feature important CE elements, such study fairs help to further stimulate CE-related exchange of expertise.

The close cooperation of the European Delegation in Kenya with UNEP (based in Nairobi) and the United Nations Environment Assembly (which meets biannually in Nairobi) as well as the delegations close coordinating with Multilateral Environmental Agreements (MEAs) or the African Ministerial Conference on the Environment (AMCEN) offer a further opportunity for regular dialogue, especially on environmental issues.

It is important to note that any future policy dialogues between Europe and Kenya that aim to create any tangible impact of circular economy advancement on the ground are based on objectives and targeted, measurable outputs that make "sustainable behaviour ***desirable*** for Kenyans". Participants on both sides of this dialogue must further understand that finding solutions can only come from fully understanding the battle of narratives that play out in Kenya for Kenyans. On one side, the narratives coming from participatory and impactful community initiatives, which try to redesign entire value chains and services for the sake of locally distributed socio-economic benefits. One the other, the narrative of consumerism being divulgated by large multinationals with the power of changing consumers' preferences and behaviour, towards an increased tendency to purchase new products. To support future activities for CE-relevant policy dialogues between Kenya and the EU, the following table sets out the main opportunities and barriers to be considered in this context.

Opportunities and Barriers for future CE-related policy dialogues between Kenya and the EU

- The currently weak plastic waste management infrastructure and regulation in Kenya offers room to start a dialogue with Europe regarding CE policy measures that can provide tangible improvements of the plastics pollution situation while assisting in the development of a resilient local plastic recycling system financed through EPR contributions. These dialogues could be structured alongside Kenya's Plastic Action Plan, which already outlines opportunities for accelerating circular economy measures for plastics.
- The recently proposed Team Europe Green Deal Flagship initiative provides a great opportunity to direct post-covid investments towards projects that facilitate the rollout of a CE in Kenya.
- In the past, there have been many cases in Kenya where detailed guidelines for action have been developed on the basis of high-quality analyses and recommendations of the gaps in academic research. One example of this is a wealth of waste management plans for Kenya, which were developed by the Ministry of the Environment and each contained clear recommendations for action. However, the guidelines themselves were never implemented and often disappeared in response to governmental power shifts, as part of buyout and corruption attempts, or when new staff were recruited without the necessary background knowledge, simply dropping all the work of former officials. For future policy dialogue and development between Europe and Kenya, it is thus important to develop a structured policy execution strategy including timelines and responsible parties as part of the overall policy development framework conditions.

4.2 Development cooperation programmes, including by the EU Member States

Development cooperation remains an important pillar of Europe's comprehensive partnership with Kenya, supporting social, economic and political development in an effort to move beyond the lower middle income status (World Bank, 2018). Currently eleven EU development partners, including Denmark, France, Finland, Germany, Italy, Ireland, the Slovak Republic, Sweden, and the Netherlands, are actively engaged in the EUs Joint Programming with Kenya. Other EU partners such as Austria, Belgium, Czech Republic, Greece, Hungary, Poland, Portugal, Romania, Estonia and Spain are also represented in Kenya through bilateral development cooperation programmes (EU Delegation Kenya, 2018[A]). Although CE is an important part of many of these cooperative development approaches, most do not specifically address the concept. Moreover, the majority of projects are still limited to the water, sanitation and agricultural sectors. The following table provides an overview of relevant CE-related development cooperation projects and programmes conducted in Kenya:

Lake Victoria Basin Integrated Water Resources Management programme

Given Kenya's long-lasting water supply issues, development cooperation programmes in the water and sanitation sector have in the past been a key component of the EU's overall development efforts in Kenya. One of the most recent projects, the Lake Victoria Basin Integrated Water Resources Management programme, was launched in 2020 and is endowed with a budget of €40 million. The programme is intended to facilitate the implementation of priority investment projects within the Lake Victoria Basin region. The cross-boundary approach of the project also encompasses targeted activities in Kisumu, where the project aims to construct public ablution blocks in informal areas. The ablution blocks will be constructed so that they are directly linked to the central wastewater system. This is intended to decrease disorderly discharge of wastewater and improve the water quality and availability, thus resulting in better management of the available transboundary water resources (IWRM Lake Victoria, n.d.).

Ending Drought Emergencies: Climate Proofed Infrastructure for improved water supply and sanitation in Arid and Semi-arid Lands (ASAL) areas

Co-financed by the National and County Government of Kenya and the EU, the project aims to facilitate climate-proofed infrastructure for improved water supply and sanitation in arid and semi-arid lands areas. The EU project contribution amounts to €20 million and forms a substantial part of the total estimated project cost of €27.1 million euros. The overall objective is to set-up measures to ensure integrated water resource management in communities that are located in drought-prone areas. The 8 counties that were selected for implementation are: Baringo, Kajiado, Kilifi, Kitui, Mandera, Samburu Taita-Taveta, and West-Pokot (EC, 2016).

Water Towers Programme

The EU-funded Water Towers Programme targets the preservation and management of the so-called water towers. These are high-elevation forests, which serve as natural water reservoirs, which are essential for Kenya's overall water supply. Through improved natural resource management, sustainable land management and agricultural water management, communities are provided with means to ensure the preservation of the water towers (Ministry of Environment and Forestry, 2018). However, the funding for the initiative, which was launched in 2016 has been partially suspended since 2018, after allegations of violation of human rights (EU Delegation Kenya, 2018C).

Nakuru County Sanitation Programme

In Nakuru county the EU carried out a project, which specifically aimed for a circular approach to water and wastewater treatment by implementing a commercially viable sanitation value chain. Residents of the (peri-)urban low-income region developed two types of products from faecal matter and urine discharges: a bio fertiliser and biomass fuel briquettes. The contract value amounted to €4.2 million and the project was implemented over a five-year span from 2013 to 2018. A steering committee was elected to oversee the implementation of the project and to ensure sustainability of the project (SNV, 2018). News reports from 2019 indicate that the briquettes have gained popularity among the Nakura residents and that the introduction of the wastewater processing chain has been an encouraging contribution to the general livelihood of residents (Mwombe, 2019).

AgriFi Kenya Challenge Fund

Another EU funded capacity building programme in Kenya is the AgriFi Kenya Challenge Fund, which aims to disseminate best-practice agricultural methods amongst smallholder farms. The project particularly emphasizes the use of environmentally sustainable and climate smart agriculture over the entire value chain. The fund, among other things, supports Agri-Food businesses in acquiring technologies that reduce waste and spoilage both during the ripening process and post-harvest stage (AgriFi Challenge Fund, n.d.). Overall, the AgriFi Kenya programme provides a total of €18 million euros in funds for agri-enterprises to support smallholder agriculture in Kenya.

Green Innovation Centres for the Agriculture and Food Sector (GIC)

In order to foster innovations in the agricultural and food sector, increase the incomes of small farming enterprises and boost employment in the regional food supply of rural target regions, the German Federal Ministry for Economic Cooperation and Development (BMZ) has founded 15 "Green Innovation Centres" for the Agriculture and Food Sector – one of which is located in Kenya. The Green Innovation Centres support smallholder farms to sustainably increase their agricultural production and income by promoting the expansion of innovations. This is for instance achieved by providing advisory services, organising educational and training courses, and enabling an easier access to loans (GIZ, n.d.).

Green Growth and Employment Programme (GGEP 2016 -2020)

In a cooperative effort by the Kenyan and Danish Governments the GGEP aims to contribute to inclusive green growth and employment in Kenya. The project goals are achieved within two areas of intervention, namely: sustainable growth and jobs from investment and trade, and sustainable use of natural resources and community resilience. Under these two areas, activities will be implemented around trade facilitation, value chains, renewable and non-renewable energy, investment in natural capital, resource efficiency and cleaner technology, climate change mitigation and adaptation, competitiveness, productivity, advocacy and market access (Danida, n.d.).

Denmark-Kenya Strategic Sector Cooperation Project

Denmark's Strategic Sector Cooperation aims at mobilizing the competencies of Danish public authorities directly in long-term strategic cooperation with counterpart authorities in developing and growth economies. In Kenya the SSC project is spearheaded by representatives from DANIDA, The Ministry of Environment and Forestry, Ministry of Industry, Trade and Cooperatives, the National Treasury, National Environment Management Authority (NEMA), the County Government of Nairobi, KAM and other private sector players, academia and research organizations. The partnership is aimed at accelerating Kenya's transition towards a circular economy, with a focus on industrial production and the waste sector/resource efficiency. It involves implementing circular economy approaches to policy development; enhance industry regulation and authority to industry collaboration (KAM, n.d.).

Switch Africa Green Kenya

SWITCH Africa Green is supporting seven African countries (Burkina Faso, Ethiopia, Ghana, Kenya, Mauritius, South Africa, and Uganda) in their transition to an Inclusive Green Economy, promoting a shift toward sustainable consumption and production (SCP) practices and patterns. For doing so the project assists small, medium and micro-sized enterprises (SMMEs) with the transition towards incorporating resource efficient and cleaner production (RECP) methodologies in their businesses, while also promoting eco entrepreneurship through the application of sustainable consumption and production practices. Which has been a successful platform (NCPC, 2020). SWITCH Africa Green is an EU funded programme jointly implemented by United Nations Environmental Programme (UNEP) in collaboration with United Nations Development Programme (UNDP) and United Nations Office for Project Services (UNOPS). The project was funded by the United Nations Environment Programme and the European Union and ran from November 2015 to January 2018.

Although the landscape of development cooperation projects and initiatives in Kenya covers a diverse range of issues, it seldom addresses CE as an overarching economic model. This applies to both EU-directed cooperation activities and programmes/projects funded by EU member states. Nevertheless, the existing framework of development cooperation projects and programs does offer a range of opportunities for future CE-related activities, some of which are presented in the following table.

Opportunities and barriers for future CE-related development cooperation between Kenya and the EU

- The multitude of CE-related EU/ EUMS funded development cooperation projects in Kenya already taking place under the EU's "Joint Cooperation Strategy" with Kenya shows that there is significant potential to include CE as a priority area for the programming period after 2022.
- Including CE as particular part of the EU's development cooperation programmes in Kenya offers significant opportunities to establish both the EU and Kenya as a front-runner in this area. CE-related projects could for instance draw upon existing projects such as the Green Innovation Centres for the Agriculture and Food sector, providing targeted advisory services and training on CE-measures in respective sectors. Furthermore,

Programmes such as the AgriFI Kenya challenge Fund may be adapted to increasingly support circularity approaches for Kenyan smallholder farms and agricultural production.

- The transition to a CE in Kenya will require to mainstream new consumption models and increased consumer awareness, this may provide a unique starting point of intervention for future development cooperation.

4.3 Activities by the European Investment Bank (EIB) and other European Development Finance Institutions (DFIs)

Alongside the development projects financed by the EU and its Member States, several European Development Finance Institutions have committed themselves to supporting development projects in Kenya in line with the EU development strategy. The following section lists some of the relevant CE-related activities of the European Investment Bank (EIB) and other European Development Finance Institutions (DFIs) in Kenya.

EIB and AFD

The EIB has been active in Kenya since 1976 and has even established a regional representation for East Africa in Nairobi in 2005 (EIB, n.d.). A recent project financed jointly by the EIB and the French Development Agency (AFD) covered a 70 million investment in water and sanitation schemes in Kisumu, Kenya's third largest city. The program involved upgrading existing water supply services and significantly extending wastewater connections for the inhabitants of Kisumu, of whom initially only around 16% had access to the existing public sewerage system. Furthermore, people living in the catchment area of Lake Victoria also benefit from the project, as it reduces the pollution of the lake, among other things. The improved water infrastructure covered by the project was further designed to accommodate the changing climate. This is of importance as Kenya has been classified as water-stressed and has experienced a number of severe droughts in recent years (EIB, 2018). Both Kenyan and European partners thus regard the project as an important step towards achieving the country's sustainable development goals and adapting the city's key infrastructure to current and future needs.

Together with the German Development Bank (KFW) EIB and AFD furthermore launched the Clean Oceans Initiative in 2018. The initiative identifies projects that combat plastic waste in rivers, seas and on land. The focus is on regular waste, wastewater and rainwater management projects that reduce the emission of plastics and other wastes and thus overlap with the CE concept. The goal is to finance €2 billion in public and private sector projects by 2023. A third of this amount has already been distributed. To be eligible, projects need to demonstrate efficient and effective ways of stopping plastic waste (EIB, 2020). The related EIB Clean Ocean Project Identification and Preparation Programme (COPIP) may further help to identify and support projects with circular economy solutions to ocean plastics pollution in Kenya.

KFW

The German Kreditanstalt für Wiederaufbau (KfW) found that the Kenyan water network system was not only lacking the financial means for improvement but also the technical knowhow. In addition, the countries incentives to provide water and sanitation systems, especially in informal areas, have been generally low. For this reason, the Kenyan government has established the Water Services Trust Fund. The fund provides water network actors with access to both innovative financial opportunities as well as the necessary knowledge. In collaboration with the Services Trust Fund, KfW efforts are concentrated on fast developing cities within Kenya. Overall, 236 projects were financed, positively affecting 1.4 million people, particularly in poorer areas of the country. Other relevant projects financed by the KfW in Kenya

include: (1) "The Urban Project Concept" (UPC), which support SMUs in installing water supply and public sanitary services. (2) "Upscaling Basic Sanitation for the Urban Poor" (UBSUP) supporting basic household coverage of sanitary services including waste management concepts (KfW, 2015). (3) "Small irrigation at Mount Kenya" which aims to facilitate the installation of small-scale watering systems for farmers by stimulating the emergence of local cooperative developments between farmers and encouraging them to jointly build, use and market their watering systems and products (KfW, 2014).

Finnfund

In 2018, an analysis by water and sanitation experts from the Kenyan state and public sector found that 66 percent of latrine waste produced in the city of Nairobi is not processed. Especially the unprocessed flow of latrine waste and the illegal disposal of feces poses serious risks for both the environment and the health of the city's inhabitants. The severity of this problem is illustrated by the fact that in Nairobi alone about one million tons of solid waste are produced annually, with 60% of households not connected to the sewerage system. To address this issue Finnfund is financially supporting Sanergy, a company offering affordable and hygienic alternatives in the city. The company currently employs over 250 people and collects around 6,000 tons of solid waste each year. The collected waste is then converted into valuable end products, such as fertilizer and insect-based animal feed. By installing "fresh life outdoor toilets" Sanergy furthermore helps to solve the sanitation problem and improves the livelihood for the residents in the area. More than 103,000 people use the service on a daily basis and their franchise model has already been adopted by over 1,200 young entrepreneurs (Finnfund, 2018).

Norfund, Swedfund and FMO

Originally initiated by the CDCs group (UK's DFI) the Aureos Africa Fund now works independently. The Fund receives its capital from various international DFIs including, among others, the Norwegian Investment Fund for Developing Countries (Norfund) and the Netherlands Development Finance Company (FMO). One of the projects supported by the Aureos Africa Fund was the Athi River Steel Plant. This steel smelting plant recycles scrap metal to produce hot rolled steel products such as building steel, fasteners, structural steel, bolts and nuts. The company commenced its operations in 1998 and is located in Mavoko Township in Athi River area, some 30 kilometers east of Nairobi (Norfund, n.d.). The project not only provides financial support but also helps the steel plant to improve their emissions in order to meet international standards (Vettivetpillai, n.d.).

Opportunities and barriers for future CE-related activities by the European Investment Bank (EIB) and other European Development Finance Institutions (DFIs)

- Building up the capacity of local financial institutions by providing additional DFI financing offers great opportunities for the scale-up of ongoing investments in local green industries and wider CE activities.
- The EIB's has recently launched its new global climate strategy and Energy Lending Policy. The new strategy will end financing for fossil fuel energy projects from the end of 2021 and instead focus on accelerating clean energy innovation, energy efficiency and renewable energies. Under the strategy, the EIB Group financing will unlock EUR 1 trillion of climate action and environmentally sustainable investment in the decade to 2030. This offers significant potential for the financing of future climate- and environmental-friendly CE projects in both Europe and Africa (EIB, 2019).
- The current financial instruments often exclude the SME sector as they are at a level of 15 to 20 million euros. At this entry point, most SMEs are not able to achieve a positive ROI within 2 to 3 years. To better support SMEs, green bonds, climate bonds and impact bonds are also needed at the entry level of EUR 1 to 5 million.

4.4 Trade and investments in environmental goods and services

In 1976, Kenya was among the first countries to sign a National Indicative Programme for the co-operation with the European Community under the first Lomé Convention. In the resulting close partnership, the European Union continues to be a constant supporter of Kenya's economic development and an important partner in the country's integration into the global market. In 2019, Kenya's exports to the EU amounted to a total trade volume of €994 million, whereas over 90% consist of agricultural commodities such as flowers, peas, beans, coffee, tea, tobacco and fish. The export of flowers is particularly important as 70% of Kenya's total flower production is exported to the European Union, with the livelihoods of over 500,000 Kenyans depending directly or indirectly on the floriculture sector. Imports from the EU to Kenya amounted to €1,619 million (EC DG Trade, 2020) and are dominated by machinery and mechanical appliances, equipment and parts, vehicles and pharmaceutical products. Environmental goods and services are so far only marginally represented in Kenya's trade.

The East African region is considered a mostly geographically and economically homogeneous region and hence the countries Burundi, Rwanda, Tanzania, Uganda, all of which are Least Developed Countries (LDC), together with Kenya as a non-LDC form, the East African Community (EAC). In 2005, the EAC established a Customs Union, which was fully-fledged with zero internal tariffs as from 2010. Moreover, the EAC finalized the negotiations for an Economic Partnership Agreement (EPA) with the EU on 16 October 2014. Kenya signed and ratified the EPA in September 2016. However, for the EPA to be enacted, the three remaining EAC members (Burundi, Tanzania, Uganda) still need to sign and ratify the agreement (EC, 2020). Since 1 October 2014, the four EAC countries with LDC status, continue to benefit from duty and quota free access to the EU market under the Everything But Arms scheme (UN, N.d.).

For a brief period, Kenya fell under the standard Generalized Scheme of Preferences, but was reinstated in the list of countries benefiting from duty and quota free access to the European market, in December 2014 (EC DG Trade, 2015). The EAC decided to exclude multiple product groups from liberalization including various agricultural products, wines and spirits, chemicals, plastics, wood-based paper, textiles and clothing, footwear, ceramic products, glassware, articles of base metal and vehicles. All of them represent sensitive products for the EAC market and are thus protected from EU competition (EEAS, 2015).

Due to the strong agricultural focus of the Kenyan economy, restrictions based on environmental concerns mostly apply for sustainable fishing as well as sanitary and phytosanitary standards which ensure that goods imported into the EU meet the EU SPS requirements to protect human and animal health (*ibid.*). Although the import of secondhand products from European countries for re-use is often proclaimed as an advantage for the recycling economy, this practice has recently been challenged. This is especially the case for less energy-efficient goods such as vehicles or textiles, where local industries in Kenya increasingly suffer from the increased market competition. Since 2015 the EAC has therefore agreed to exponentially increase taxes on imported second-hand clothes with a complete ban to take effect in 2019 in order to develop their own textile industry (IEEP, 2019; Krauß, 2018). Further import regulations have been laid down in both the Basel and Bamako Conventions, which regulate waste management, including electronic waste, and aim in particular to control cross-border shipments of hazardous waste and its disposal.

Due to serious environmental problems, partly resulting from poor waste management practices in the country, the Ministry of Environment and Forestry banned the use, production and import of plastic bags for commercial and private packaging in 2017. Starting from March 2019, these restrictions also apply to importers of non-woven polypropylene and polythene bags, preventing them from importing plastic bags into the Kenyan market (NEMA, n.d.).

Until today, many of the investments in environmental goods and services were provided by donors from other countries, for instance as part of EU projects. However, the Kenyan Ministry of Environment and Forestry is increasingly becoming aware of the necessary measure and investments for addressing waste-related challenges in the country. In particular, waste sorting systems for organic and low-grade plastics are still lacking according to the Ministry. The required investment costs for 15 recycling points and 16 composting plants and the necessary technical infrastructure and trucks are estimated at approximately € 30 million. The expected costs for capacity development are approximately € 3.2 million and the costs for project management are estimated at € 1.7 million Euro for the next 15 years (Global Recycling, 2018). The National Sustainable Waste Management Policy of 2018 builds the policy framework for the way forward. Additional necessary measures have been specified in this policy including the effective and affordable waste collection in all neighborhoods; sorting posts where waste will be separated and sorted for subsequent recycling; composting facilities for the organic waste; waste to energy facilities; and fiscal incentives for investment in recycling technologies and facilities (Ministry of Environment & Forestry, 2019).

Opportunities and barriers for expanding trade and investments in environmental goods and services

- The EPA between the EAC and the EU defines a number of core areas relevant in the nexus of trade and development cooperation. These include among other things:
    - A chapter on agriculture geared towards sustainable agricultural development, including food security, rural development and poverty reduction in the EAC.
    - Provisions reinforcing cooperation on the sustainable use of resources in the area of fisheries
    - A chapter on economic and development cooperation aimed at enhancing the competitiveness of the EAC economies, building supply capacity

  Given the EU's commitment to seek further economic integration with the ECA, all of these core areas can be further aligned with CE-related support activities. Through this, the EU can contribute to (inter alia) increasing the efficiency of the agri-food industry by reducing losses along the value chain, boosting the competitiveness of Kenyan companies by adopting circular business models and/or streamlining the customs procedures while simultaneously strengthening import controls to prevent transboundary movements of hazardous waste.
- To facilitate and improve the export of environmental goods, Kenya needs to move up the value chain. This is not possible without good access to intermediate goods. Ensuring that these intermediate goods enter the EAC markets at lower prices could therefore significantly support Kenyan businesses in producing Environmental Goods in a competitive manner.
- Kenya's trade in environmental goods and services in is still hampered by a range of non-tariff barriers including lengthy procedures related to valuation of goods at customs, as well a lack in quality of inspection procedures, which often leads to poor quality equipment finding its way into the market

4.5 EU companies with circular economy operations in the countries

The following table lists the major EU companies that are involved in CE-related operations in Kenya:

Mr Green, Unilever, DOB Equity, Erema - Netherlands and Austria

Mr Green was originally founded in Switzerland and following the joint investment in the company by the Dutch investor DOB Equity and Unilever in 2014 is also active in Kenya. Mr Green Africa is a recycler and supplier of recycled plastic based in Nairobi, fulfilling the growing international demand for recyclables (Dob Equity, 2019[A]; Dob Equity, 2019[B]). Today, the company employs around 100 permanent employees as well as almost 2000 waste pickers. In their factory, located the greater Nairobi area, a collection and sorting system for plastics from both industrial and household waste has been installed. The company took on the challenge to collect a variety of packaging types, including canister bottles and other products that are often still contaminated with paper labels and printing inks. To enable mixed-packaging recycling at a high quality Mr Green Africa operates with machines by the Austrian company Erema (Erema, 2020). The manufacturing plant in Nairobi further uses waste from product wrapping for the production of recycled boards and re-uses bleaching earth from soap making as fuel in boilers of the company's tea factories (Unilever, 2015). A major buyer of their products is again Unilever with which the company successfully launched what they call "truly circular plastic packaging" in Kenya. Together the two companies follow a "U-turn waste" strategy through which Unilever aims to create a circular economy system for all of its packaging materials (Unilever, 2018).

Worldloop and Umicore - Belgium

In an effort to reduce e-waste through both the establishment and support of recycling facilities and the treatment of e-waste in waste or recycling plants, the NGO Worldloop is active in several countries, including Kenya. As a key partner of the Waste Electrical and Electronic Equipment Center (WEEE) in Nairobi, Worldloop has provided seed capital, as well the recycling equipment necessary for the safe extraction of recyclable materials and the disposal of hazardous fractions (Worldloop, n.d.)

While Worldloop primarily supports the local resale of non-hazardous materials such as plastics, copper, aluminium and other metals in local markets, more hazardous waste fractions such as batteries, lead glass and printed circuit boards are treated in an environmentally sound manner by the Belgian companies Umicore or Recupel. The revenues Umicore generates from the recycling process are going back to the African WorldLoop partners to support the growth of their activities (Worldloop, n.d.).

Veolia - France

The French company Veolia aims to increase the coverage of safe water access in Kenya, which is currently only 50% of households have access to. Following the outcome of previous studies, which recommended a focus on Mombasa city, Veolia aims to build capacity for water quality monitoring, design an action plan for improvement, and support the Coast Water Services Board (CWSB), responsible for the efficient and economical provision of water and sanitation services in the area, during the implementation (Veolia[A], n.d.). As part of another project, Veolia is further aiming to improve the water and sanitation services in the city of Kisumu. The first phase of this project aimed at alleviating the acute water shortage in the city, while a second project phase covered the expansion of the water supply and sewage services to meet the cities current and future needs. The construction of a water distribution system including reservoirs with a distribution network length of 82 km, as well as the design, inspection and construction of a wastewater treatment plant and a sewerage system with a network length of 54km were coordinated by Seureca, a company belonging to the Veolia Group. Besides financial and coordinating support, the company also enabled the local counterpart staff to develop their skills and experience, including on Operations and Maintenance of the new infrastructure (Veolia[B], n.d.).

LafargeHolcim - France/ Switzerland

LafargeHolcim supports the development of the Kenyan Cement company, Bamburi Cement Ltd. Using their expertise and knowledge they provide economic as well as other solutions for waste management related challenges in Kenya (Lafarge, n.d). In 2016 Bamburi launched Geocycle a waste management organization established in various African countries by Lafarge Holcim. Whilst not the most circular approach, Geocycle focuses on waste to energy for cement plants, using a variety of waste-resources as fuel. In this context Bamburi also entered into a contract with oil companies and launched the Safe Waste Oil Disposal initiative (SWOD), which is already fully operational and endorsed by the National Environment Management Authority (NEMA). In addition, the company is working with local transport companies, offering them to dispose used tires at the cement kilns, where they are co-processed.

As outlined above, Kenya has been able to attract many EU companies. The following table lists potential opportunities to further facilitate both existing and future business activities, as well as potential barriers for companies with CE operations within the country.

Opportunities and Barriers for supporting CE-related operations of EU companies in Kenya

- In order to better integrate local businesses in CE-related operations in Kenya it may be necessary to provide additional financial support to these businesses. In this context local Savings and Credit Cooperative Organisations (SACCOs) may play in important role. SACCOs provide financial services to its members, such as the mobilization of funds for investment purposes and the provision of affordable credit. One of the valuable functions of SACCOs are to incentivize and use collective savings to promote investments in business and property for its members. SACCOs are also called Chamas, where Chama is the Kiswahili word for “group” or “body”. In Kenya, there are estimated to be more than 300,000 Chamas managing a total of KSH 300 billion (€2.2 bn) in assets. A collaborative engagement of EU-companies with SACCOs can have a great impact for assisting with setting up circular enterprises.
- In July 2018 the P4G national platform was launched in Kenya. The platform aims to catalyse solutions and accelerate innovative partnerships, which can then act as a catalyst for change and delivery of Kenya’s Vision 2030 as well as for solving systemic challenges to green growth and sustainable development (P4G Partnership, n.d). The National Treasury of Kenya and the Kenya Private Sector Alliance as well as the Ministry of Environment and Forestry and the Vision 2030 Delivery Secretariat, recognizes the need for public-private partnerships that advance global goals and sustainable development and will thus bring together key stakeholders including private sector, government and civil society organizations and academia to form innovative multi-stakeholder public-private partnerships (PPP) that advance green solutions for driving economic growth. Kenya hosts seven P4G projects focused on
    - Energy access and investment,
    - Improved industrial and urban production and consumption practices that foster circular economy
    - Innovation in land use and agricultural technology (*ibid.*).
- Large multi-national businesses (including insurance and banks) and international co-operations are setting themselves up predominantly in Kenya’s bustling and fast expanding capital Nairobi. However, as seen from the Kenyan perspective they often do so in a hierarchal and exclusive manner, importing their standardised setup of business support mechanisms including any infrastructure or goods required or downstream service providers they use elsewhere. Perhaps a more inclusive approach could be undertaken and include local businesses and foster cooperation between companies from the EU and Kenya.

4.6 Research and technical cooperation

Similar to other African countries, a large share of research and technical cooperation between the EU and Kenya is conducted under the umbrella of the EU's largest research and innovation programme, Horizon 2020. The programme has already funded over 310 projects involving researchers from African Union countries with a sum of 123 million euros. With a total of 47 funded projects, Kenya is the country with the third most implemented research projects (EU Delegation Kenya, 2019). At present, however, none of the projects place any particular emphasis on promoting CE in the country. The EU also funds research networks such as the Mombasa based Africa Maritime Technology Cooperation Centre (MTCC). MTCC focuses on enabling African countries, especially Least Developed Countries and Small Island Developing States, to effectively implement Energy-Efficiency and GHG emissions reduction measures through technical assistance and capacity building (MTCC Africa, n.d.).

Complementing the EU efforts, various EU member states are also independently engaged in research and technical cooperation with Kenya. Austria, for example, supports Kenya especially in the field of higher education through partnerships of Austrian and Kenyan Universities (through the Austrian Partnership Programme in Higher Education and Research for Development, APPEAR). Under the Appear funding scheme, researchers from Austria and Kenya currently, work on capacity building for water-energy-food security (Appear, 2017). Similarly, France and Kenya have developed common projects in the field of higher education and research, leading to the opening of three regional institutes of research in Nairobi (on agronomy, sustainable development and social sciences) and more recently to the establishment of a bilateral, co-financed programme of mobility of researchers ("Pamoja") (EU Delegation Kenya, 2018).

In addition to the approaches at EU and country level, many efforts in the field of research and technical cooperation in Kenya also take place at the level of individual research projects. Table E-1, in Annex E gives some examples of such local research cooperation projects. Although CE is not yet a focus of research and technical cooperation between Kenya and the EU, there are first discernible initiatives that can be drawn upon during future CE research efforts. The following table lists some of the opportunities and barriers for future CE related research and technical cooperation activities in Kenya.

Opportunities and barriers for expanding CE-related research and technical cooperation in Kenya

- To expand the existing research and technical cooperation activities between the EU and Kenya it might be advisable to cooperate with local industrial research and development institutions that are already active in the field of CE-research and are thus well suited to participate in joint research initiatives
- Further development of research cooperation on CE-related issues with the Kenyan higher education system could not only provide opportunities to increase knowledge in this area, but also help to support Kenya's capacity for CE-related skills and education. Existing partnership programs such as APPEAR could build the foundation for such efforts.

5 Recommendations

5.1 General findings and recommendations

Making the Circular Economy work for Kenya requires a two-pronged approach, i.e., opening up for the introduction of new, impactful CE measures and commitment to "preservation" of existing systems that are already functional and intrinsically based on CE key principles and strategies. Interview partners feel that Kenyan political leaders can learn from the EU how to obtain political support for tailor-made CE oriented programmes e.g., as part of Circular City blueprints and to guide sensible urban development. Stakeholders also noted that the most obvious ways to make headway with CE implementation in the private sector is when EU-based parent companies start actively influencing CE-related decisions, systems, processes, products and services via their subsidiary companies in Kenya and other African countries. EU companies should ideally rally other companies locally and internationally to influence policy making which is cross cutting for both the EU and Kenya and beneficial for their future mutual CE efforts.

5.1.1 Requirement for a Green/Circular Economy Coordination Unit as part of Capacity Building

Kenya needs to have a well-structured Green Growth/Circular Economy Coordination Unit as a one-stop shop for all the efforts in transitioning to a circular economy. The unit should be made as autonomous as possible and provide a unified and coordinated approach to the many circular economy initiatives now emerging. Current lack of coordination and communication in particular between Treasury and the Ministry of Environment and Forestry needs to be overcome. Dialogue between the ministries of National Treasury, Environment & Forestry and Industry, trade & cooperatives needs to set up a CE coordination unit that can structure future EU/Kenya CE collaboration projects and that related policies can be effectively enforced. The existing National Technical Green Economy Steering Committee which was formed in the EU funded SWITCH Africa Green (Phase 1) and already includes National Treasury representation, could assist with the coordination and transitioning to "switching green" across different sectors and value chains and must be seen as a vital building block of the envisaged Coordination Unit. Even when the Kenyan government is not in favour of setting up a coordination unit, the cooperation between the aforementioned ministries needs to be improved so that a broadly supported and coherent CE policy is developed.

5.1.2 Development of a Kenya Circular Economy Action plan

It is imperative for Kenya to create an enabling environment from a policy perspective. Like Europe, Kenya needs to lay down a solid foundation for a unified Circular Economy Action Plan that addresses the CE transition in the entire economy in a holistic manner and seeks to target distinct key product value chains. This plan should consider:

- Encouraging the development of SMEs and associated employment opportunities;
- Follow the CE typology as laid out in the recent study by DG RTD (EC, 2020)
- Be developed with input from key stakeholders in Kenya's public and private sector;
- Involve grass-roots movements as well as educational institutions;
- Include clear responsibilities and milestones per value chain/stakeholder group;
- Be supported by all concerned Ministries of the national government and Kenya's counties;
- Be interlinked and harmonised with the existing economic policy objectives of the big four - thus prioritizing manufacturing, universal healthcare, affordable housing & food security.

A dedicated CE Action Plan should reflect the key economic activity areas in relation to development opportunities in Kenya including, agriculture, forestry & fisheries, food (supply chain), construction and waste management & recycling as well as taking into account what Kenya imports and exports.

The proposed Kenyan CE Action plan should provide a clear roadmap for all parties concerned, signifying what role they have to play and what are the measurable milestones for the required transition to a sustainable economic system. It needs to include stop-gap measures that are suitable to prevent any attempt from specific stakeholder groups to control, corrupt or deliberately "hijack" or falsify the well-intended broader societal benefits of the plan aimed at securing more prosperous living conditions for all Kenyans. Structurally (but not necessarily product value chain target specific), it should be highly action-oriented, analogous to the EU CE Action Plan.

The development of a Kenya CE Action Plan (ideally driven through but not limited by the Kenyan Vision 2030 from the National Economic and Social Council of Kenya (NESC) should be supported actively by government authorities, including but not limited to the Ministries of Treasury; Environment and Forestry; Transport & Housing; Industrialization, Trade and Enterprise Development as well as the Ministry of Agriculture, Livestock and Fisheries and Irrigation.

Existing cultural CE knowledge and functional/indigenous business practices need to be protected

Kenya has a unique heritage, and the character and objective of the Kenya Circular Action Plan needs to reflect this and preserve local designs, cultural CE knowledge and practices while protecting Kenya from any industrial linear lock-in attempts in the name of "progress". Traditional low environmental impact agricultural farming practices delivered by subsistence farmers and providing an abundance of crops through field rotation practices and the natural addition of organic fertilisers are now threatened and increasingly replaced by mass-producing enterprises using monocultures. Indigenous solutions to refill milk (see also the description of the milk ATM under 6.5.2) and cooking oil as well as most regular sundries and chemicals required for Kenyan household maintenance are now quickly being replaced by the import of international products using single-use packaging, which creates massive waste problem.

These abovementioned insights and the detailed recommendations below show that Kenya has much to offer already in the Circular Economy space that needs protection and further nurturing. Further industrialisation and technical advancement as part of the planned transition must be in harmony with circular economy principles and not erode any existing good practices or displace human labour opportunities. The Kenya Circular Economy Action Plan should create an enabling environment to promote future and past "green technology" based practices.

Choosing CE measures and indicators that fit the African policy context and cultural values

Any support from Europe to further the African circular economy Agenda must provide each country inclusive growth alternatives that reflects the needs and realities on the ground. For Africa it might well be based on a vision where abundance and access through sharing and local self-reliance (powered by indigenous knowledge and building hands-on "use optimisation oriented" skills) are treasured over the "western" notion of ownership of goods and where the multi-dimensional CE Index (Schröder *et al.*, 2020) (based on the UNDPs HDI and under consideration of the SDGs) instead of the GDP will become the ultimate indicator to assess the current and future levels of prosperity and well-being of all Kenyans.

5.1.3 *Enabling CE planning and CE financing through international stakeholders*

Key international institutions such as the EIB, World Bank, AfDB can further ensure through the choice of the type of investments they are willing to finance that an enabling environment is created especially for small-scale Kenyan CE initiatives and innovative start-ups as described in more detail in chapter 4. According to interviewees the focus must be "on increasing the availability of affordable capital, training local investment bankers on merchant banking, mezzanine financing, and long-term (5yrs +) financial tools for scientific R&D, train innovators on how to link innovation activities to manufacturing balance sheets, and develop contract innovation research labs that build capacity for local CE production".

It is encouraging to see the robust discussion within the EIB Circular Economy Guide (EIB, 2020) pointing out that "the financial sector must improve the availability of financing and revisit its approach to appraising linear and circular risks" thereby using the value hill model to clearly categorize and describe key characteristics of various CE models and the associated investment concerns that need to be overcome through the introduction of entirely new funding instruments and investment evaluation tools. Another positive signal comes from the World Bank's work in Kenya and the expressed commitment to continue to approve projects that inter alia support the government's Vision 2030 development strategy, which aims to accelerate sustainable growth, reduce inequality, and manage resource scarcity (World Bank, 2020). Some of the existing World Bank key projects that need to therefore be supported and further built on via the proposed CE Action Plan include:

- Inclusive Growth and Fiscal Management Development Policy Financing;
- Kenya Affordable Housing Project;
- Kenya Social and Economic Inclusion Project.

Most Kenyan businesses would not use or recognise yet the term "Circular Economy" as part of describing their business model but might well be aligned with such principles regardless. Therefore, local insurance and financing institutions must recognize the CE-relevance of the activities of these emerging companies and potential game changers in order to make them eligible for accessing grants, micro loans and credit/banking facilities to expand their businesses further. **A dedicated "international to local" skills transfer, training and capacity building programme between EIB, World Bank and local smaller financing institutions would be very useful** to create a replicable and generic evaluation matrix that can identify businesses with high CE potential and benefits in Kenya.

5.2 CE Development through policy dialogues

Future successful CE Policy development must go hand in hand with meaningful policy dialogue between EU and Kenya to establish areas of key collaboration potential and mutual interest. The EU Delegation officially represents the EU in Kenya and some of the EU's stated key values and interests for collaboration already touch on important delivery aspects of a future Kenya CE Action plan (EU Delegation Kenya, 2016).

5.2.1 *Fully leverage EU Position as Kenya's major trading and support partner*

The EU is Kenya's largest export market and a major source of private investment; it provides financing for Kenya's infrastructure and rural development. The EU delegation is therefore ideally placed to work in partnership as a political partner as well as a development partner e.g., by unlocking "Team Europe" based resources linked to food security support and more recently to assist relevant Kenyan authorities

to formulate a consolidated national COVID-19 response. Several stakeholders suggested that the EU could be more pro-active in to assisting the development of policies and funding of programmes that:

- Facilitate access to a buyers' market;
- Provide grants for machinery used in the manufacturing environment;
- Facilitate and provide knowledge and technology transfer required to enable the recycling of all types of waste materials.

5.2.2 Building policy dialogue based on existing local key concerns and related policies to address them

Opportunities for CE-related policy dialogue need to be further explored and strengthened between the key stakeholders from the EU and Kenya especially with regard to Kenyan policies that are considered to have the strongest transition and EU partnership potential, including but not limited to:

- Green Economy Strategy and Implementation Plan (GESIP), 2016-2030;
- Greening Agricultural Sector Transformation and Growth Strategy, 2019-2030;
- Climate Change Act, 2016;
- National Climate Change Action Plan, 2018-2022.

According to the Ministry of Environment and Forestry, an emphasis must be placed on "coming up with tailor-made programmes/projects to implement the provisions of GESIP and market support for Kenya's green products (Goods and Services)". Policy discussions on CE in Kenya have been going on especially on waste management and should be broadened e.g. via the Nationally Appropriate Mitigation Action (NAMA) (UNDP, 2017) related to the CE Solid Waste Management Approach for urban areas in Kenya. As Kenya is also in need of policies that promote and stimulate the maintenance, reuse and repair of goods the Kenyan government may benefit from creating financial policy elements that actively encourage Kenyans to repair in lieu of receiving tax benefits. To guarantee the successful implementation of these policies, awareness on the corresponding repair manifest should be high.

Some interviewees suggested that a multilateral platform or board for policy dialogue is required consisting of all relevant stakeholders e.g., private businesses, NGO's, NEMA, Kenya Association of Manufacturers, Ministry of Industry & Trade, Embassies, Donors, CSO's and the EU. Such a board should:

- Conduct market research relating to CE-related activities and formulate SMART objectives.
- Develop a database of businesses, individual and other stakeholders throughout the country, which can then be leveraged for further market research and to publish findings from the board on a regular basis via emails to inform interested stakeholders.
- Organise regular round table discussions with the identified relevant stakeholders.
- Devolve any funding from Government bodies, directly from donors such as the EU to worthy businesses to maximise the returns on investment and avoid likely corruption.
- Be transparent and publish their research, recommendations and accounts on a website.

As discussed in section **Error! Reference source not found.**, there are several existing platforms that potentially allow for enhancing a policy dialogue on CE-related issues between Kenya and the EU. In this regard, the Joint Cooperation Strategy 2018-2022, in combination with Kenya's Big Four Agenda, plays an important role in promoting CE within the ongoing dialogues. The close cooperation of the EU and Kenya through UNEP, the United Nations Environment Assembly (which meets biannually in Nairobi) as well as engagement of both parties in Multilateral Environmental Agreements (MEAs) offer additional opportunities for including and promoting a regular dialogue on Kenya's transition towards a CE. A comprehensive policy component as envisaged under the Team Europe Initiative, Green Deal Kenya, may

further complement these efforts by facilitating the exchange of best practices and promote investment, B2B and multi-stakeholder dialogues on CE-related issues between the EU and partners in Kenya.
Another platform that is showing promising policy dialogue potential is the policy component of the EU supported SWITCH Africa Green initiative, where Government engages on sustainable production and consumption (SCP) practices. The collected insights and lessons learned can be used as a basis for follow-up initiatives on SCP as well as for continued dialogue on CE in Kenya.

5.3 Existing awareness and capacities on circular economy in Kenya

Although the concept of the CE is gaining traction in Kenya, there is still a significant lack of awareness among the general public, the government and the private sector. As an example, the economic value associated with improved utilisation of the materials present in waste streams is often overlooked by private companies, as the waste sector is seen as a non-lucrative sector, whereas 50 – 80% of the general waste streams in Kenya consist of recyclable materials with substantial economic value.

With respect to consumer awareness, it especially important to ensure that consumers, regardless of their social and economic status, are able to participate in better waste management and recycling practices as well as to adapt their personal behaviour. It is thus recommended to further develop awareness campaigns amongst Kenyan citizens (see Annex B-2). To this regard, a cooperation with the Kenyan Association of manufacturers can be a promising approach.

To increase CE-awareness in the general public and business, science, and engineering communities, **the shift towards a CE in Kenya needs to be supported by an advanced education system that integrates the topic into university curricula and outreach programs**. Here, it is important that environmental awareness and circular economy principles are not handled as optional topics, but as a core element that is incorporated across disciplines, ranging from engineering, architecture, food production, to economics or political sciences. To this regard is recommended to not only advance the STEM agenda (science, technology, engineering, and maths) but also continue to incorporate CE-related subjects into existing curricula and provide educational materials that resonate with the daily needs and wants of a Kenyan. Kenya's circular economy curriculum agenda has been formulated in some detail already, but now it needs to be strengthened further and rolled out in educational modules suitable for the type of learner they target- from pre-school right up to tertiary level.

Good practices for educational models that can be used by curriculum building authorities to understand and possibly support the introduction of circularity concepts to young learners, stimulating them to start applying circular thinking in the school setting, include *Educate! Developing Young Learners & Entrepreneurs in Africa* (Educate!, n.d.). Through its horizontal and interactive learning model the initiative aims to "*identify the urgent challenges that finite resource pose to Kenya's economic system, discuss current consumption and production patterns, formulate campaigns that will get the community to be aware about circularity, and propose better ways to manage school waste.*" (Zablon Wayama, 2019).

Since the EU is one of the global leaders in CE thinking, universities in Kenya as well as Kenya's private sector could benefit from knowledge exchange with European knowledge and research institutions, e.g., through joint research projects or exchange programs. The Kenya Green University Network already forms a solid basis on which future efforts to address CE-related skill and awareness gaps can build on.

5.4 Business Collaboration and Trade

5.4.1 Promoting the circular economy through trade

To facilitate and promote trade in CE-related goods and services, Kenya needs to improve its access to intermediate products that can enter the EAC markets at reasonable and competitive prices. In general, this may mean that for several product groups tariffs may need to be lowered, as compared to other world regions trade tariffs in Kenya are still rather high (see Annex C2). At the same time, Kenya's government, its trading partners and Kenya's private sector could enter a dialogue on the implementation on some product quality standards. This would ensure that sustainably produced domestic products are not displaced by unsustainable low-quality products, while simultaneously promoting domestic players to produce products with sufficient quality and increasing competitiveness of the private sector. CE principles should be taken into account when formulating such standards. Next to product standards, the principles of the CE could also be taken along in a possible revision of the EPA between the EU and the EAC in the formulation and the sustainability chapter for this agreement.

5.4.2 Promoting the circular economy through business cooperation

European businesses setting up operations in Kenya with the intention to sell their goods and services should be encouraged not to do this in isolation but to actively contribute to local practices and utilise local products and services. It is vital that proper research is conducted first on the business and trading dynamics existing on the ground that could be tapped into, for a truly collaborative business partnership. SACCOs (as further described in detail under 4.6) are a key partner to consult with as well as any surrounding communities that have already established neighbourhood alliances for purposes of easing access to certain goods or services. The Kenyan Private Sector Alliance (KEPSA) hosts a Business Hub that is responsible for B2B matching. The Hub also coordinates private sector engagement in foreign direct investments forums. As such, the KEPSA business hub could link European companies interested in doing CE-related investment in Kenya to local businesses, so that partnerships can be set up.

The Kenyan Ministry of Environment and Forestry considers the Kenya Association of Manufacturers (KAM) to be the best positioned to engage with any EU Manufacturers operating in the wider Green Tech/circular economy space from a private sector perspective. Dialogues and business cooperation could be encouraged through the strengthening of the current P4G partnerships under P4G National Platform, which can provide an ideal basis to bring together green businesses from EU and Kenya. The seven P4G projects hosted in Kenya focus on: Energy access and investment; Improved industrial and urban production and consumption practices that foster CE, and Innovation in land use and agricultural technology. In addition to P4G, the Sustainable Inclusive Business (SIB) Kenya, a knowledge Centre established under the KEPSA Foundation in partnership with MVO Nederland, can further support pushing the circular economy agenda in the manufacturing space. KEPSA is also an important entry point for business cooperation in CE-related activities as the organisation is already cooperating with several EU Member States in private sector development projects.

Another type of stakeholder to consult with, for European businesses to get a better "taste for the country" and what it wants and needs regarding a distinct African circular agenda are "community designers" (Zablon Wayama, 2019). They constantly seek to create a place for fruitful exchange and collaboration, about how to rethink value chains and the provision of services and goods to the local residents. For them redesigning economic services (and the way human needs are satisfied) is a crucial principle of the circular economy.

5.5 Recommendations to advance research and technical cooperation between the EU and Kenya

Given the strong existing research and technical cooperation between the EU and Kenya in the context of Horizon 2020 and research Networks such as MTCC, it is highly recommended to extend these partnerships by a clear focus on CE-related issues. Especially the development of CE-research cooperation with the Kenyan higher education system could herby not only provide opportunities to increase knowledge and awareness in this area, but also help to support Kenya's capacity for CE-related skills and education. Existing partnership programs such as APPEAR could build the foundation for such efforts.

To further expand research cooperation in the areas of food science, packaging, development of local sustainable packaging design and manufacturing solutions, it further recommended to involve local partners such as the Kenya Industrial Research and Development Institute (KIRDI). KIRDI is very well positioned to engage in joint Circular Economy research initiatives with EU partner organisations.

Even though CE-related research already exists in Kenya, the findings from such activities are diffusing insufficiently to the private sector level. Therefore, ir is recommended to promote transfer of technical knowledge from academia and knowledge institutes on CE measures, CE business models and successful business cases in CE, to support MSMEs. Furthermore, awareness and capacity building are needed among financing institutions and other relevant stakeholders such as relevant ministries and private sector initiatives. Involvement with universities and technical institutions will also foster collaboration on research activities related to CE. In the Kenyan context such institutions and organisations include, but are not limited to:

- Kenya Industrial Research and Development Institute;
- Strathmore University;
- Kenya National Cleaner Production Centre;
- Kenya Climate and Innovation Centre;
- National Environment Management Authority (NEMA);
- National Environment Trust Fund.

Lastly, there is significant potential for increased cooperation between European universities and other knowledge institutions and their Kenyan counterparts, as a lot of knowledge on CE activities, enabling technologies and business models is already available in Europe. Combining this knowledge with the knowledge of Kenyan institutes of the Kenyan economic context can help to develop CE solutions that are fit for the economic reality in Kenya. Cooperation activities could take many forms, ranging from exchange programs for students and professors, to conferences or joint research programs.

5.6 EU-Kenya circular economy-related cooperation activities

As discussed in section 4.2, the number of EU-Kenya cooperation programs in areas related to C has been limited up to now. However, some (smaller) EU-funded projects, such as those under the SWITCH Africa Green programme, and projects supported by the EU Delegation in Kenya and implemented in cooperation with the Ministry of Environment and Forestry and the Ministry of Finance have already provided important insights and lessons on how to improve SCP/circular economy in the Kenyan/African context. Using the insights from these projects offers great potential to broaden the CE/ SCP focus of future projects within the country.

As cross-border CE cooperation is one of the important elements of the EU Green Deal, it is expected that the CE will play a more prominent role in the next funding period for EU-Kenya cooperation. Discussions on the thematic focus for the next budget programming period are currently ongoing. First relevant results of these discussions are among other things the recently proposed the Team Europe Initiative – Green Deal Kenya (see section **Error! Reference source not found.**), which aims to support a post-COVID green recovery in Kenya by supporting the development of a CE in the country (along with smart agriculture, renewable energy, natural capital, and sustainable urbanisation). The initiative provides a great opportunity to direct post-covid investments towards projects that facilitate the roll-out of a CE in Kenya.

To effectively facilitate the transition towards a CE in Kenya, it is recommended that future CE-related cooperation between EU and Kenya focus more on practical solutions, scalable projects in the local context and situation, public participation and most of all political will. Development projects should further aim to involve stakeholders from the private and public sectors, as well as local innovation and design stakeholders. In addition, waste management, other elements of the CE approach should also be considered as a priority. Furthermore, future projects should be aligned with existing policies to ensure they build up on what already exists and fast track the process for approval and implementation. A promising starting point for improved CE-development cooperation is Kenya's agricultural sector where first projects such as the Green Innovation Centres or the AgriFi Kenya Challenge Fund for a solid basis to disseminate Best Practice CE approaches into the sector.

5.7 Sector Specific Recommendations

There are some differences with regard to the sectors in which the implementation of CE principles is prioritized between Kenya and the EU. This can be partially explained by differences in the economic structure (e.g., more agriculture-focused vs more industrial), urgency of certain societal problems and policy priorities. Still, there is significant overlap between the sectors with high CE potential in Kenya, with the sectors that are highlighted as priority sectors in the EU CE Action Plan (see Annex F). In the sections below, specific recommendations are given for how to implement circular practices in the following sectors:

- The Agri-food sector;
- Packaging (including plastic and paper packaging);
- Construction;
- The Waste sector.

This selection of sectors has been chosen on a combination of economic importance and CE potential. The agri-food sector is by far the largest sector in the Kenyan economy and an important source of employment. The construction sector accounts for 5% of Kenya's GDP, but it is also essential in achieving the affordable housing objective, which is part of the big four agenda. There is significant potential for increased deployment of CE activities in the construction sector, which could increase the availability of affordable construction materials thereby contributing to the provision of affordable housing. The packaging industry is another important sector to look at, because packaged consumer goods are increasingly finding their way into the Kenyan market, but the waste management system is currently not able to cope with the increasing stream of packaging waste. Lastly, the waste sector plays an important role (also beyond packaging waste) as it enhances the availability of secondary materials in a circular economy. Furthermore, many Kenyans are working formally or informally in the waste sector and

as such, improving the functioning and effectiveness of the sector can contribute greatly to the improvement of the labour conditions of existing workers in the informal waste sector.

5.7.1 The Agri-food sector

CE measures in agriculture and the food production value chain should focus on increasing the use of organic waste (the largest waste stream in Kenya), for valuable purposes such as:

- The production of valuable products, such as animal feed, protein supplements or filler material for construction products.
- Soil fertilization products, e.g. through composting, anaerobic digestion combined with processing of the digestate into organic fertilizer or the production of bio-char as is being done by Safi organics.

Even though the use of organic fertilizers is already attractive by itself, as organic fertilizer products can be cheaper than imported mineral fertilizers, the use of these products could be promoted further by incentivizing the use of organic fertilizer products in existing government programs subsidizing fertilizer use. Such programs are likely to be most effective when poorer farmers and households are targeted (Mather & Jayne, 2018).

A second focal point for proposed CE intervention is creating an enabling environment for both existing and future small-scale farmers, since it is well-documented that subsistence farming practices are intrinsically linked to low greenhouse gas emissions and soil quality preservation practices. Industrial agriculture on the other hand has shown to deplete and desertify once fertile soil at a high pace all over the world, predominantly through topsoil destroying tilling practices, combined with monoculture crops heavily dependent on mineral fertilisers, pesticides, and insecticides. Recent insights show that some traditional farming practices like crop rotation as well as controlled animal grazing can be very powerful ways to increase soil carbon content (Kisstheground, n.d.). Actions to support small-scale farmers could include:

- Facilitation of market access and access to finances (micro credits). SACCOs are crucial in their role to connect farmers straight with the food manufacturers in Kenya.
- Setting up of dedicated “farmland programs” that support via educational experts in sustainable farming practices any willing transitioning farmers and ranchers with training, mentorship, and soil testing. Offer a dedicated scholarship program for farmers who need financial assistance to take part.
- EU partners could invest in farming incentives such as ENVIRU and TWIGGA, which will assist to create further demand for organically grown food that uses locally produced organic fertilizer.

Regarding food loss prevention, a range of measures needs to be taken to improve the handling, storage and distribution of produced food products, along the supply chain. In this area, EU institutions could provide support through the provision of finance (including micro-loans) needed for the investments in the required equipment or access to service, including:

- purchasing of better (reusable and heat resilient) bags and crates to store and transport food products and protect them from water and pests;
- Improved storage facilities including dedicated cooling zones/compartments. Lessons learnt from other countries like Nigeria, show that solar-powered coldhubs can be an attractive solution (Coldhubs, n.d.).
- Access to high-quality food transport services or owned transport equipment;

- using and additionally introducing more "fit for purpose food distribution systems such as dispensers for milk that are both safe for the consumers, convenient and don't require any potentially polluting single use packaging.

The SWITCH Africa Green forum via the Green to Grow project (Chamber of commerce, 2019) which has a focus on MSMEs involved in the food value chain of mainly coffee, dairy and mangoes can have a multiplier effect on the economy through its current dissemination of sustainable consumption and production practices. Continued support for such activities could speed up the CE transition in Kenya's agricultural sector.

5.7.2 Packaging

Solving the problem of packaging waste in Kenya does not only relate to finding solutions for packaging waste but also to rethink the whole concept of product distribution. Historically, many valuable packaging-free or low-packaging solutions exist in Kenya and CE policy should aim to support the protection and strengthening of such concepts.

- It would be most useful if the EU could help to preserve these intrinsically circular product supply solutions such as dispensing units as found in small local supermarkets by actively marketing them and co-financing wider distribution thereof. Active technology transfer from the EU to Kenya regarding options for low volume packaging would also be very useful.
- Innovative existing local systems such as the Milk ATM and the cooking oil, household chemical dispensing systems should be actively supported and protected in Kenya as they are offering waste-free solutions the way they operate.
- Active investment support to finance and maintain such systems should be considered including dedicated training programs for individuals on how to operate them as part of the shop set-up.
- A potential international support partner that could assist in such efforts would be Loop as their business model is also concerned with delivering specifically household chemicals and other regular sundries provided by international top brands such as Unilever via mobile dispensing units and/or returnable packaging systems. It would make sense to use a combined approach that would strengthen existing dispensing systems, while introducing new ones as well e.g. via Loop or a similar system existing in Europe where they would add complimentary value to the product range desired by Kenyans.

Plastics Packaging

Regarding the planned development of a Kenya Plastics Pact and seemingly following the strategic trajectory of the first African Plastic Pact in South Africa (SA Plastic pact, 2020), there is great potential to benefit from both the European and South African Plastic Pact experiences regarding a workable policy for Kenya.

Recent research findings such as the "Breaking the Plastic Wave report"(Reddy & Lau, 2020) must be consulted and acknowledged for Kenya as well to understand that any attempt to address Kenya's current and future plastic pollution (and in particular leakage into its ocean) must be fought on multiple intervention levels at the same time. Governing authorities as well as the private sector stakeholders need to be aware that Kenya can not simply "recycle" itself out of the plastic pollution problem that is predominantly caused by packaging. A suite of options needs to be considered and further explored with great urgency including options to:

- Reduce plastic packaging at source;

- Substitute problematic plastic types with other materials;
- Radically improve and expand on existing collection and recycling, treatment disposal facilities;
- Fight damaging practices related to improper management of packaging waste.

Ultimately, nothing less than a true System Change is needed for successful implementation of the aforementioned strategies. System change has to be based on rethinking the entire concept of using so much plastics as the material of choice for "packaging". Failing to do so will make current plastic pollution levels dramatically worse -as predicted in the report for a "business as usual scenario". Initiatives such as the plastic pact, should aim at reducing plastic pollution without the need for full bans of entire economic value chains, e.g., as around the plastic bag. The future Kenya Plastics Pact needs to deliver on the key objectives of setting up collection and take-back schemes preventing plastics to end-up as waste and subsequently pollute the environment. It should promote development of both design and use optimisation solutions for plastic to be circulated in tightly controlled closed-loop systems. The recently introduced ban on the use of single-use plastics in parks and protected nature areas will also contribute to this objective.

It is noted by some stakeholders that large multi-national businesses are supporting many local small-scale waste projects, but that they do not take their responsibility to tackle the full problems they create with their products. Hence, the introduction of a holistic EPR system is so important to make sure a nationwide solution is developed rather than taking a piece-meal approach.

A final recommendation would also be to prohibit it by law to weaken or even remove existing legislation, which could happen as a consequence lobbying by any industrial oil/plastic/packaging manufacturing lobby groups – either from a local or international business.

5.7.3 Construction

Circular economy activities are not widespread in Kenya's construction section. The policy focus is on low-cost construction of infrastructure and housing, where the latter is very urgent as a housing deficit of 2 million houses exists in Kenya. Nevertheless, there is substantial potential for circular activities to make a contribution to more environment-friendly construction and, if done in the right way, more affordable housing. To push forward the CE agenda in Kenya's construction sector, strong cooperation and a collective approach of the private sector, the National Construction Authority and some important institutions like the Ministry of Transport and Housing, the Ministry of Industrialization, Trade and Enterprise Development is crucial. The recently revised Building Code and introduced greening standards can serve as a starting point for Kenya's CE agenda in construction. The following activities need to be undertaken to further the uptake of circular measures in the construction sector, namely:

- Capacity building and training;
- Critical assessment of existing construction legislation and building codes in the light of circular economy principles;
- Promotion of the use and manufacturing of circular construction materials such as Interlocking Stabilised Soil Blocks (ISSBs) or reuse of construction materials from end-of-life buildings;
- Research collaboration on construction related CE actions;

Capacity building and training

A knowledge and skills gap currently exists in Kenya's construction sector when it comes to circular construction. Closer cooperation with the EU could help to fill the capacity gap.

- **Capacity building should address the need for application of a wide range of CE strategies**, relating to the use of circular building materials, reuse or recycling of materials from end-of-life buildings, circular design considerations for architects and project developers and the development of new circular business models, including the switch from selling construction materials to providing construction services. **These aspects can also be addressed in Kenya's professional education programs** for workers in the construction sector.
- **Small-scale and informal enterprises could benefit from skills upgrades through exchange programs and partnerships with successful manufacturing firms from Europe** in addition to receiving nurturing apprenticeship training in Kenyan firms (KIPPRA 2019).
- KEPSA and KAM should take the initiative to **develop relationships with EU-based construction firms** that are already active in the areas of circular building practices to enable knowledge exchange. Trade missions and CE missions could also be suitable events to establish contacts that can form the starting point for long-lasting cooperation activities.
- In order to promote the use circular construction materials such as ISSBs, capacity building is needed to train people to manufacture the blocks, maintain the required machines and to use the blocks in construction projects. Furthermore, the governments and building standards need to acknowledge innovative materials as an accepted and suitable construction material and develop quality standards for them.

Critical assessment of existing legislation

To date, several circular economy actions in the construction sector are being hindered by existing regulations and policies on construction. To remove such barriers, the following policy documents and legislative frameworks need a critical assessment and amendments:

- Construction Industry Policy;
- National Building regulations;
- Defects liabilities regulations;

Promotion of secondary and innovative construction materials

To date, the use of secondary materials in Kenya's construction sector is limited, due to a lack of support to manufacturers of construction materials that incorporate waste materials (e.g. ISSBs) acknowledgement of these materials as full-fledged construction products. Furthermore, there is a lack of proper quality standards to ensure safe and sustainable application of secondary construction materials or components. The situation could be improved by:

- Engaging in discussions with the EU on the quality aspects surrounding the reuse of materials from construction and demolition waste, e.g. through a dialogue with the construction 2020 working group. In the context of assessing possibilities for allowing the use of second-hand materials under strict conditions within the Kenyan building code, the Kenyan government could get some inspiration from the EU Construction & Demolition Waste Management Protocol. As soon as standards for the reuse of construction materials have been developed, it is important that (virtual) marketplaces for second-hand construction materials are established, to facilitate uptake of these products in the sector. The National Construction Authority (NCA) could be an important facilitator and stakeholder for the engagement with the EU in the area of construction related policy frameworks.
- Support of Kenyan SMEs through cheap loans or in the development of leasing models e.g., for ISSB manufacturing equipment. Here EU-based financing institutions such as the EIB could also play a role.

5.7.4 The Waste Sector

Waste is a growing problem in Kenya as the population grows, urbanises and consumption patterns change leading to higher per capita waste generation levels. Waste collection levels are low and waste collection and management activities are concentrated in the urban areas. The waste management sector in the country consists for a large part of informal workers, that do not have an official waste management job and therefore lack income security, health protection and access to proper training and tools. The inclusion of this vulnerable group in a transition to a more circular approach to waste management is essential to generate public support for a CE transition and ensure it generates not only environmental but also societal benefits.

Inclusion of the informal waste sector in the CE transition

There is a number of actions that could be taken to strengthen the position of informal waste workers and equip them for a role in the circular economy transition. Such measures could:

- Involve some form of formalisation of the work, which is not about converting it to a 9 to 5 job, but more about giving status and recognition and providing learning and earning opportunities;
- Encourage and support waste pickers to form cooperatives that can secure contracts to sell materials collectively in order to obtain higher prices. When part of a cooperative, such workers are registered and can respond to tenders and are assisted to receive signage and PPE required to safely and "officially" do a job.
- Assist to add value to waste pickers operating in cooperatives by giving them access to essential health services, work force insurance, micro financing and business building tools including basic business skill education.
- Involve the development of systems where municipalities pay waste pickers a predefined fee per kilogram of recyclables collected as remuneration for the environmental service they provide to the city by diverting recyclables from the landfill. Such payment is fair compensation for a key service, regardless of the value of the materials in the market. Alternatively, could be given a remuneration for the waste picking service independent of the income generated by the sales of the materials.
- Waste pickers will need to be consulted and involved in the development and implementation of policies and systems. To this end, municipalities should hire staff with expertise in integrated waste management and social mobilization around waste issues.
- Set up awareness campaigns with residents to educate them on the important role played by waste pickers and instruct them how to correctly separate their materials.
- The municipality should develop a forum where municipal officials, waste pickers, residents and other actors in the waste management and recycling sectors can engage to develop and oversee the implementation of inclusive waste management policy
- Bylaws should be amended and developed in order to ensure that waste pickers have access to recyclables and are not harassed while performing their work, also not by the national police.

Improving Kenya's national and local waste management policies

Under current legislation, the counties in Kenya are responsible for setting up the waste management system. As a consequence, this is done differently in each county. Government officials at the national level acknowledge that there is a lack of awareness about CE at the county level and therefore, the national government should engage the counties more in conversations about the CE and mainstream circular principles into other national policies in which the counties are involved, such as the Green Economy Strategy and Implementation Plan (GESIP).

Establishment of viable value chains to minimise waste

Newly established voluntary industry initiatives such as the Kenya Plastics Pact or any future government mandated systems (should a voluntary approach fail) need to ensure that financial reward systems such as deposit systems or obligations are put in place wherever needed. This is particular the case for packaging types such as laminated plastic pouches, metallic foils used for snack packings etc that offer very little intrinsic material value on their own and have absolutely no end-use market. Financial incentives for producers or end-of-life product management obligations are necessary to motivate an ongoing and growing interest to develop alternatives.

Obviously, for end-processing of certain recyclables such as plastics (through extrusion) and WEEE (metallurgical processing) high-tech technologies will be ultimately required to recover the valuables but for activities such as collection sorting, grading, repairing/refurbishing and manual dismantling, human labour potential must be optimized and actively capacitated. As such, it is important that a balanced approach with a mix of high-tech and low-tech (labour-intensive) solutions is developed. Recyclers must assist cooperative members to "cut out any middle-men" by assisting them with the development of services and delivery/fetch infrastructure required to bring the recovered materials directly to the recycler.

The municipality must recognize waste pickers as a legitimate part of the waste management system. Municipalities must enable access for cooperatives to both biological and technical resources found in business and household communities and not be gatekeepers. There is vast potential to build highly impactful public-private cooperation models to enable materials recovery at source while ensuring safe removal and treatment of any remaining (hazardous) waste.

E-waste and EPR policies

Much that ends up in Kenya as an increasing financial and environmental waste liability could easily be avoided if the "end-of-life" material would retain sufficient "value" to create an incentive large enough to return it to an end-user for further recycling or at least safe end-of-life treatment. Especially in countries such as Kenya that is manufacturing little in the area of "high tech or convenient consumer type products" (and is thus sitting at the receiving end of such imports) it is vital that sound systems and solutions are developed for their "end-of-life" handling. EPR schemes prevent producers to absolve themselves from any responsibility after a product has entered its lifecycle at use level.

Currently, extended producer responsibility schemes are being developed as part of the Sustainable Waste Management Bill. In the current drafts of the EPR legislation, a large part of the enforcement responsibilities will be laid on private sector associations. The following list of recommendations concern the crucial characteristics of a successful EPR scheme.

- Producers (both from Europe and Kenya) operating in Kenya must jointly start to sustainably finance the working contribution of cooperatives as an integral part of fulfilling their own arising EPR obligations. The informal waste sector must be recognized and then duly remunerated for their services instead of the current approach of only paying for the value items they want to see returned (e.g., precious metals from WEEE).
- The future development of functional EPR systems and establishment of PROs (that will officially be mandated by producers to act in their interest and distribute funds ring-fenced for the purpose of collection, take-back and recycling) is therefore crucial to ensure that materials of low economic value are also responsibly handled in the value chain.

- Retailers of a certain size and type (e.g., EEE sellers) should be legally obliged to accept waste from the kind of product they sell. An advanced recycling fee payable at the purchase of the new product should be sufficient to set up a system for collection and proper treatment of end-of-life products, e.g., through Producer Responsibility Organisations.
- Existing material collection systems and projects outputs must be consolidated to speed up the required economies of scale to develop local processing solutions. Projects that potentially provide access to areas with rising waste management challenge must be piggy-backed on, e.g. the Nordic Development Fund project in Kenya aimed at optimising the rural access to "Off-grid electrification Using Wind and Solar Energy in Kenya" (NDF, 2011) could be an ideal partner to access and consolidate WEEE found in the rural areas of Kenya. Reverse logistics could be used to transport any WEEE back to recyclers in and around Nairobi.
- A dedicated "Innovation Motivation" based financing model could be developed to actively discourage landfilling and instead spur interest to develop methods of recycling, reusing and repurposing materials. Financial drivers could include incentives such as tax waivers, importation duty waivers, income tax exemption etc.

In the area of E-waste, promising developments are already ongoing in Kenya, but these need to be scaled up. The following elements could help to speed up circular practices in the E-waste space:

- Successful initiatives such as Close the Gap could be replicated in other regions and activities can be upscaled. The EU could contribute by investing in the expansion of such activities.
- As a way to accelerate circular economy intervention in this space it is also recommended to allocate more funds and enable regional data sharing between government and consumer tracking organizations on e-waste. This should be augmented by offering tax incentives and provide government subsidies for components and technology.
- Round tables are the recommended format to ensure that organization and foundations working with small recyclers and outside of the major urban centres in Kenya are still able to shape and lobby for required future policy development. Ideally, this must be done with support of an EU partner such as the GIZ who is already involved in many African WEEE training and capacity building initiatives (GIZ, 2019).

6 Conclusions

6.1 Circular economy trends in Kenya

Within Africa, Kenya is one of the frontrunners in terms of policy development in the area of circular economy (CE) and up to now national policy has been the key driver of CE-related developments in the country. To fight the problems associated with plastic waste and pollution, the country has introduced a ban on single-use plastic carrier bags in 2017. Currently, the government is developing an ambitious programme on Extended Producer Responsibility (EPR), as part of its new waste management bill that is currently under review by the Parliament. Most importantly, there has been a major shift in mindset in the private sector during the last decade from opposing and blocking the implementation of new environmental policies to a much more collaborative approach, where it now takes initiative in the implementation of new environmental policies. As an illustration of this, the Kenyan Association of Manufacturers (KAM) has been the driving force behind the development of the Plastics Management Action Plan.

The CE is still a rather new concept in Kenya, and the discussion still needs to broaden from a strong focus on waste and recycling towards the full set of actions covered by the CE concept, particularly the 'inner loops'. Although Kenya and its private sector acknowledge the merits of the CE and its potential to boost innovation and creation of new employment opportunities, its application is still strongly focused on the waste sector. Some other sectors, where significant potential for CE measures exist, like the construction sector, are only starting to translate the CE concept to tangible actions in their sector.

The private sector in Kenya is very innovative and although open to foreign investment, it also realises the value of locally manufactured products. As such, there is a need for local CE tools, products and services that are designed with the African (especially rural) consumer in mind, instead of relying on products designed for the EU market, which are then adapted to the African market. As a UNESCO Associated Centre, CSTI emphasises cultural heritage as the driver for local CE innovation. Afrofuturism has sparked a lot of excitement among young innovators. CSTI would welcome a collaboration network, which is currently focussed on blue economy, earth-based building materials and liquid fuels, but they would like to add chemical recycling as a CE-based research and collaboration area.

6.2 Policy framework supporting circular economy activities

Circular Economy gains traction, but further harmonisation with core economic policy is needed

The potential for the provision of thousands of green jobs and hence wider green economic growth, is one of the key drivers of the propagation of the CE concept in Kenya's private sector. In the Government space the Ministry of Environment and Forestry has the greatest stake and interest in current and future development of the Kenyan CE Agenda. However, up to now the CE policy agenda and Kenya's economic policy have mostly been treated as separate silo's, regularly with competing approaches and interests. However, in response to a rising demand within the private sector for guidance in sustainability measures, the Kenyan Association for Manufacturers has urged the Kenyan government to develop a coherent CE vision and roadmap.

The main objectives of Kenya's economic policy are set out in its 2030 Vison. In this vision, the Kenyan government has formulated four main policy goals, often referred to as the 'big four', namely: food security, affordable housing, the promotion of manufacturing and affordable healthcare.

All of these policy areas have potential links with the transition to a CE, but up to now the consideration of CE and sustainability aspects has been very limited in the approaches and policies that are implemented to achieve the 'big four' objectives. As an example, the push for large-scale construction of affordable housing projects has resulted in public tenders that have incentivised a race to the bottom in terms of price, at the expense of environmental performance and involvement of local businesses and promotion of local employment. Shaping these policies and public procurement in a different way would allow for achieving multiple economic, societal and environmental goals simultaneously. However, environmental and sustainability issues are gaining more and more attention within Kenya's economic development, both at the policy level as well as in the private sector, which is reflected in the 3rd National Business Agenda, where CE aspects are more pronounced.

Environmental Policymaking in Kenya lacks a holistic approach and effective enforcement

Up to now, environmental policies in Kenya have often been implemented in a reactive and ad-hoc manner, with a lack of a holistic approach and broader policy framework. The ban of single-use plastic carrier bags is a good example of this. When environmental pollution became an apparent and urgent threat to Kenya's important economic sectors such as "tourism", the Government responded by the implementation of a ban on single-use plastic bags. The government frequently uses the policy instrument of a product ban as a perceived remedy. The Plastics ban has been (mostly) effective in banning plastic bags, but the government did not think about alternatives to offer. The new Sustainable Waste Management bill is an important step towards a more structured approach to CE in Kenya, but to effectively promote a transition to a CE in Kenya a national CE Action Plan would be very valuable (see section 5.1.2). Lastly, it is important that enforcement capacity of CE-related environmental legislation is strengthened.

6.3 Existing awareness and capacities on circular economy in Kenya

Although the concept of the CE is gaining traction and getting more well-known in Kenya, there is still a large lack of awareness among many stakeholders. Especially, the economic value associated with improved utilisation of the materials present in waste streams is often overlooked by private companies, as the waste sector is seen as a non-lucrative sector. Therefore, there is a need to grow the awareness about the benefits that the CE can bring in terms of value creation and business opportunities.

Several stakeholders observe that there is a lack of knowledge exchange between the knowledge institutions and the private sector. At the same time, it seems that research institutions and researchers often lack the practical knowledge on how to translate their knowledge into the actual business reality. Since the EU is one of the global leaders in circular economy thinking, universities in Kenya as well as Kenya's private sector could benefit from knowledge exchange with European knowledge and research institutions, e.g., through joint research projects or exchange programs.

6.4 Trade and investments in the circular economy in Kenya

Compared to other African countries, the contribution of trade to Kenya's GDP is rather limited. Partially, this might be explained that apart from agricultural products, Kenya is not a large exporter of natural resources, nor it is a big producer of manufactured products. Next to this, countries that trade with Kenya still face significant trade tariffs, compared to other world regions. Also, in the area of costs associated with trade there is still significant room for further cost reductions, although Kenya has already made

significant progress in this area during the past decade. Similarly, the quality of trade and transport-related infrastructure has improved substantially in this period.

Even though the improvement of the enabling environment for trade could benefit Kenya, it is important that this goes along with an improvement of the quality of the goods that are traded. Therefore, it is important that promotion of free trade goes hand in hand with the implementation of general, environmental and social quality standards, so that sustainably produced domestic products are not outcompeted with non-sustainable low-quality products. On the other hand, increased competition with imported products could also promote an increase in quality standards for products manufactured within the country. Next to technical standards, CE principles could be used as guidance in the formulation of standards and sustainability criteria for new trade regulations or international trade agreements.

Another trade aspect that needs to be unpacked with a view of finding real solution is the "dumping" of end-of-life or unused products and technologies in African countries, including Kenya, often in the form of special product offers. A correlation can be observed between countries in the Northern hemisphere putting in place more stringent environmental policies, and the (illegal) shipping of end-of-life products, such as defect EEE products or End-of-life vehicles to African markets. A similar trend is visible in the textiles market where cheap imported clothing threatens the traditional Kenyan textile industry. Countries such as Rwanda have recently banned the import of any second-hand clothing as a means of protecting their own industry and Nigeria has clamped down on any import of used electronics. These are drastic and bold steps of some African countries in an attempt to prevent "import pollution liabilities", which might become necessary for Kenya too. Such measures are, however, not without negative impacts, as second-hand clothes are cheaper than locally produced clothing. As such, import bans could have a positive impact on local clothing producers, but it might reduce affordability of clothing, especially for poorer households. Intensified dialogue on how open trade and protection of environmentally friendly products and practices can be harmonised could help to move the solution away from outright bans to regulated trade.

Currently, the level of foreign direct investment in Kenya is quite low. prevalence of corruption and perceived political instability risks remain important barriers for foreign investments in Kenya. This is also recognised by the Kenyan private sector, which is urging the Kenyan government to develop a long-term vision and improve the predictability and stability of policies, to create a more favourable investment climate. However, when Kenya addresses these issues it could become an attractive country for international companies to invest in. The country has a track record of stable and high economic growth, it has a young well-educated population and the access to finance for companies is relatively good. Next to this, the attitude of the Kenyan government and private sector to foreign investments and international cooperation is rather open. Combining these strengths with a stimulatory environment for the development of new circular business models, may act as an additional stimulus for international companies to invest in Kenya. This also represents a specific investment opportunity for EU-based countries with experience in the development of circular value chains.

6.5 Existing and future economic, environmental & social impacts

Existing CE-related activities in Kenya's private sector are concentrated in agriculture and waste management. Most of these initiatives make use of local waste streams, such as organic waste or packaging waste and turn these flows into valuable products. Positive impacts of existing CE initiatives include the creation of local economic development, employment creation (also in rural areas), training and capacity building for employees and a wide range of environmental benefits ranging from reduced pollution to mitigation of greenhouse gas emissions and protection of local natural areas and habitats. These existing initiatives showcase the potential for doing circular business in Kenya, but they need to be upscaled further, which can be promoted through a robust CE policy framework, access to finance and an enabling framework for investment.

In this study we have also done a forward-looking assessment, where a macro-economic model was used to estimate the impact of a (limited) set of circular economy measures in the identified priority sectors Agri-food, plastics, construction, EEE products and E-waste and general waste. Overall, the circular measures assessed could lead to an increase in economic activity and create additional jobs, while leading (on the short term) to a small increase in national CO_2 emissions. The key findings are the following (for more detail see section 3.2.3):

- **Economic benefits:**
  - A 0.5% increase of GDP (+ € 619M) compared to business as usual;
  - An improvement of the trade balance, through a reduction in imports worth € 284 M and an export increase of € 34 M
  - Food loss reduction across the agricultural value chain and associated investments are the largest driver of the impacts found in our modelling assessment.
- **Social benefits:**
  - 46 000 additional jobs would be created compared to business as usual, which is equivalent to an increase of 0.15%;
  - If done in the right way, increased activities in waste collection and recycling could strengthen the economic position of (informal) waste workers, and attention for capacity building and training can ensure that these people will benefit from the CE transition as well.
  - The largest employment increases are found to occur in agriculture and the construction sector, whereas some minor job losses occur in the sector petroleum, chemicals and non-metallic mineral products.

Overall, these findings show that even implementing a first set of circular measures could bring substantial benefits to Kenya's economy. This illustrates that circular economy could be one of the cornerstones of Kenya's economic diversification and green growth strategies.

6.6 EU-Kenya circular economy-related cooperation activities

Within the EU-Kenya cooperation programs, the activities in areas related to circular economy have been very limited up to now. There have only been some projects in forestry and climate adaptation, that were supported by the EU delegation in Kenya and implemented in cooperation with the Ministry of Environment and Forestry as well as the Ministry of Treasury. The EU delegation and partner organisations have invested and initiated selected programs in green transformation that range from Agriculture, manufacture to transport and these sectors hold potential for the development of more circular practices.

In this context, the SWITCH Africa Green programme is important to mention as it has shown how partnerships on circular economy related project not only reduce waste and greenhouse gas emissions but also promote e.g., the adoption of sanitary standards and contribute to capacity building in the area of sustainable consumption and production.

It is expected that the CE will play a more prominent role in the next funding period for EU-Kenya cooperation, as cross-border cooperation on CE is one of the important elements of the EU Green Deal. In the next funding period, the EU delegation in Kenya is likely to focus on at least to flagship themes, namely the Green Deal/Green transition flagship and the digitalisation flagship. Within the former, there would be potential to develop some initiatives and cooperation activities that are specifically focused at promoting the shift to a (more) circular economy and these could be rolled out in existing focus sectors such as agriculture and manufacturing.

Interviewees mentioned that "the successful platforms for CE policy dialogue between EU and Kenya should feature more practical solutions, scalable projects in the local context and situation, public participation. The policies should involve stakeholders from private, public and local innovation and design development sectors for inclusivity and to enhance public support for the activities. Furthermore, priority should be given aspects of the CE other than energy and waste management". Also, the policy dialogues should be aligned with existing policies to ensure they build up on what already exists and fast track the process for approval and implementation.

6.6.1 Opportunities for CE promotion within existing EU-Kenya policy dialogues

There are several existing platforms for policy dialogue and EU institutions that can play a role in promoting the development of circular economy initiatives in Kenya. PG4 and SWITCH Africa Green are seen as important policy platforms that can be used as a starting point for further collaboration on CE topics. Furthermore, EU financial institutions such as the EIB and the EBRD can play an important role in financing future circular economy programmes and projects in Kenya.

Stakeholder interviews, e.g. with the representative of the Kenya Ministry of Environment and Forestry confirm that the Kenyan Partnership for Green Growth and the Global Goals 2030 Platform (P4G) is considered the optimal initiative to bring together green businesses from EU and their Kenyan counterparts; this will bring the necessary change and transformation for delivery of Kenya's Vision 2030 as well as solving systemic challenges to green growth and sustainable development. Kenya currently hosts seven P4G projects that are built on three main focus themes, where one is specifically aimed at improved industrial and urban production & consumption practices that foster circular economy.

Regarding potential financing support the EIB has signalled great interest to focus on investments based on green/circular economy business models with a particular focus on SME support (EIB, 2020). The European Bank for Reconstruction and Development (EBRD) might also be interested in developing future investment and funding schemes in the CE space to benefit Kenya. Most Kenyan businesses would not use or recognise yet the term "Circular Economy" as part of describing their business model but might well be aligned with such principles regardless. Therefore, there is an opportunity for collaboration between local insurance and financing institutions and European banks, where local financial institutions can help to identify the CE-relevance of the activities of these emerging companies and potential game changers in order to make them eligible for accessing grants, micro loans and credit/banking facilities to expand their businesses further.

6.6.2 EU Member States promoting circular economy activities in Kenya

Several EU Member States are active in bilateral cooperation projects in Kenya, of which some include CE related activities. Countries that have the most tangible impact and partnership record for circular economy policy support and project development are: The Netherlands, Sweden and Denmark. Amongst these three countries there is a growing understanding that all current and future bilateral activities between EU Members and Kenya must be aligned to increase effectiveness and avoid any overlap and promote knowledge exchange and sharing of best practices.

The Green Growth and Employment Programme (GGEP) and Strategic Sector Cooperation (SSC) projects supported by Danish Embassy and overseen by the Ministry of Environment and Forestry are already increasingly creating an enabling environment to transition a CE. These two programs support the Government through policy dialogues and can potentially be replicated. SSC is supporting Kenya Association of Manufacturers (KAM) to strengthen industrial symbiosis opportunities with the Ruaraka Business Community (RUBICOM) in Nairobi under the current SSC "Gecko research project". The latter seeks to introduce green and circular innovation opportunities for Kenyan companies including the development of more circular business models and (sharing) technologies, resources and facilities between manufacturing companies in Kenya.

6.6.3 Potential for CE Business Collaboration

The combination of a continuation of the improvements in Kenya's investment climate, and the existence of substantial CE opportunities in the country makes it an interesting country for foreign businesses to start up new businesses based on CE business models. The Ministry of Environment and Forestry considers the Kenya Association of Manufacturers (KAM) to be the best positioned to engage with any EU Manufacturers operating in the wider Green Tech/circular economy space from a private sector perspective. It will motivate these synergies through encouraging the current P4G partnerships under P4G National Platform. In addition, the Sustainable Inclusive Business (SIB) Kenya is a knowledge Centre established under the KEPSA Foundation in partnership with MVO Nederland to further drive the CE agenda in the manufacturing space. An interview with KEPSA revealed that there are opportunities for collaboration with Kenya National Platform on Partnering for Green Growth and Global Goals chaired by the National Treasury Cabinet Secretary, can accelerate the country's shift towards economic growth choosing green and sustainable pathway.

6.6.4 Research cooperation

In Kenya, the amount of research and education in the area of CE is limited. However, there are several research institutions and projects that are doing research and technical cooperation projects in the area of CE. Such organisations include but are not limited to Kenya Industrial Research and Development Institute (KIRDI), Strathmore University, Kenya National Cleaner Production Centre and Kenya Climate and Innovation Centre. Within the Ministry of Environment & Forestry two research wings stand out that can be of use in CE research activities namely the National Environment Management Authority (NEMA) and the National Environment Trust Fund (NETFUND). The main challenge is that there is a missing link between the findings from CE-related research activities in these knowledge institutions and the development of economically viable business models in Kenya's private sector. As such, cooperation between private sector stakeholders and CE researchers needs to be increased and knowledge exchange should be facilitated and promoted. Apart from this, Kenyan research institutions could benefit from increased cooperation with European ones that already have more extensive research programs in the field of circular economy. Such cooperation could take multiple forms including exchanges of students, professors or the development of joint research projects.

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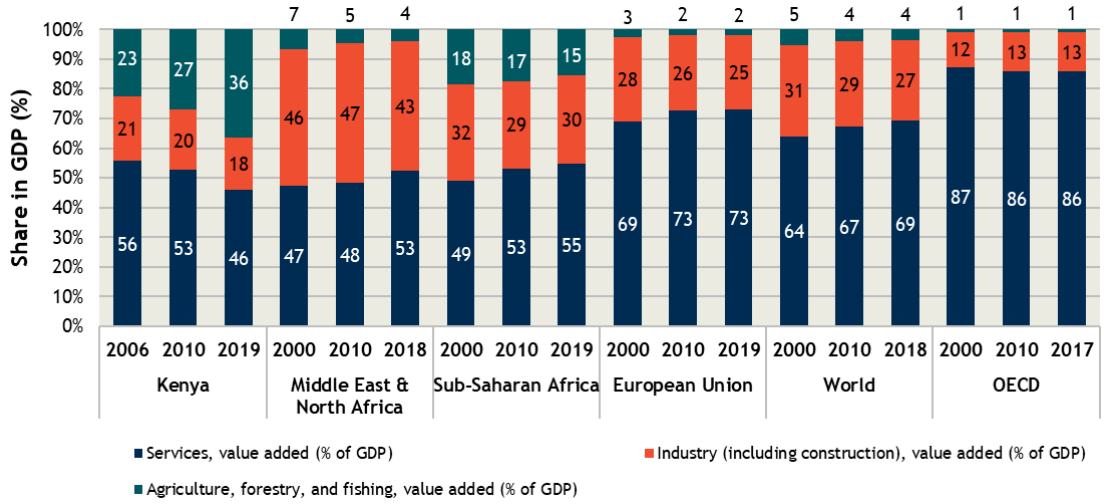
Annex A - List of Interviewed Stakeholders

Interviews Completed

1. **Thomas Tatich and Sebastian Gil** – EU Delegation to Kenya.
2. **Augustine, K. Kenduiwo** – Deputy Director, Climate Change & Green Growth / LECRD Program Coordinator, Ministry of Environment and Forestry.
3. ***Eng*. Maurice Akech** – CEO, National Construction Authority (NCA).
4. **Anja Roymans** – Royal Dutch Embassy in Nairobi.
5. **Michael Waiyaki** – Founder, Miti Alliance.
6. **Dominic Kahumbu** – Founder, Biogas International Limited.
7. **Cecilia Wandiga** – Trustee Board Member – Centre for Science and Technology Innovations (CSTI).
8. **Karin Boomsma** – Sustainable Inclusive Business.
9. **Betty Mwema -** Human-Centred Design Consultant.
10. **Marah Koeberle** – Siemens Foundation.
11. **Peter Mutunga** – ISSB Contractor Building and Construction.
12. **Jacob Fink Ferdinand, Maj Munch Andersen** – Danish Embassy / DTU.
13. **Faith Ngige** – KEPSA.
14. **James Duder** – Production Manager-Ocean Sole.
15. **Miriam Bomett** – Policy Research & Advocacy Deputy Head at Kenya Association of Manufacturers.

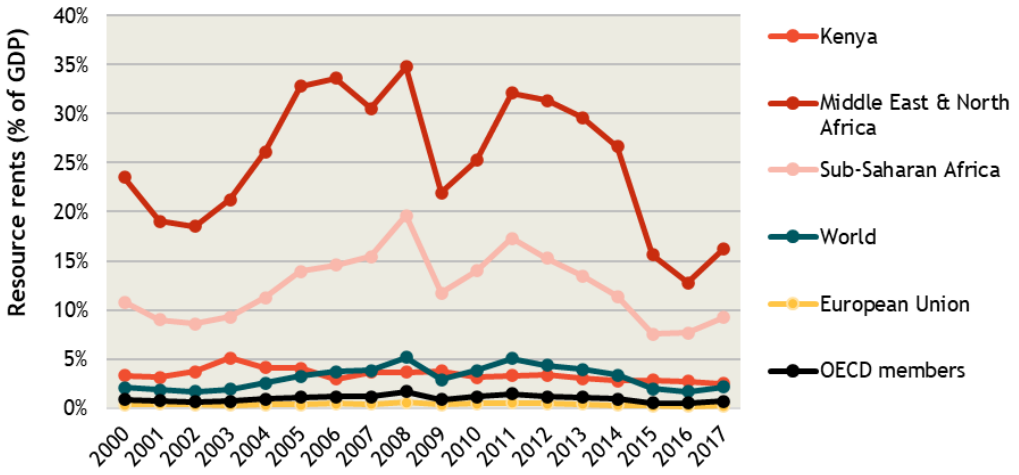
Annex B - Additional graphs and case studies relating to chapter 2

Figure B-1 Comparison economic structure of Kenya with regional averages



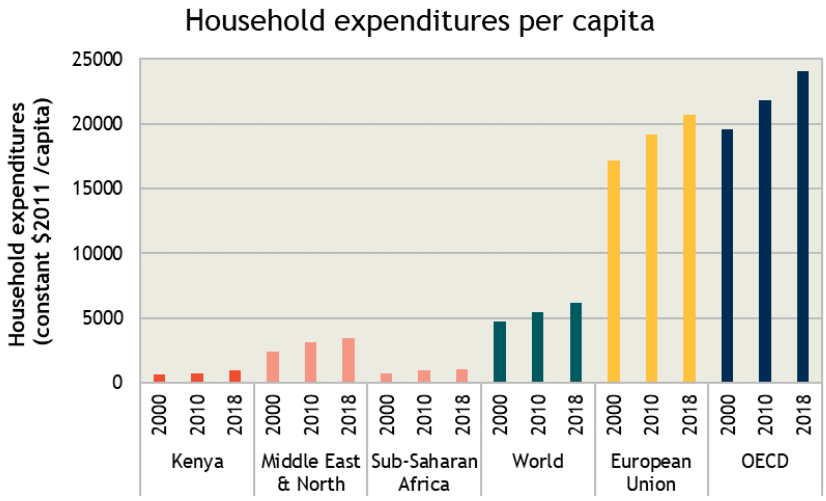
Source: World Bank - World Development Indicators.

Figure B-2 Resource rents as share of GDP (%) in Kenya compared to regional averages



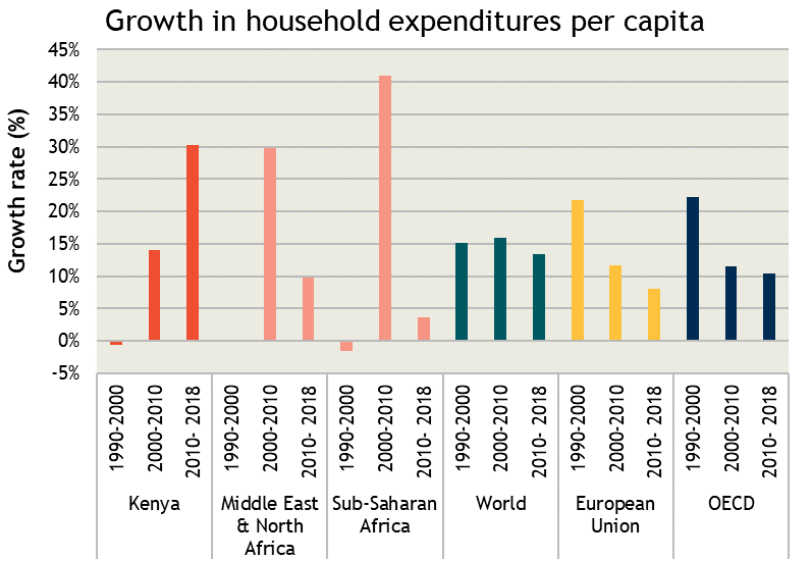
Source: World Bank - World Development Indicators.

Figure B-3 Household expenditures for Kenya compared to regional averages



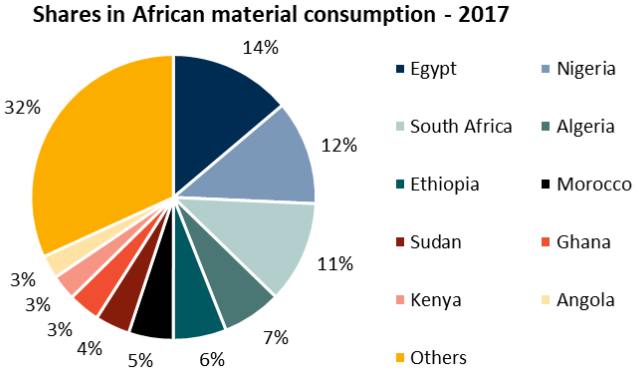
Source: World Bank - World Development Indicators - Households and NPISHs Final consumption expenditure, PPP (constant 2011 international $) per capita.

Figure B-4 Growth in household expenditures for Kenya compared to regional averages



Source: World Bank - World Development Indicators - Households and NPISHs Final consumption expenditure, PPP (constant 2011 international $) per capita.

Figure B-5 Share of Kenya and other African countries in total domestic material consumption Africa



Source: SDG Indicators - Indicator 12.2.1 Domestic Material Consumption by type.

Table B-1 Case study waste management

Case Study: Uasin Gishu County[6]

The county government is planning to buy waste compactors and move the waste to landfills in designated areas. The construction of a recycling plant is also under the priorities of the county. Waste recycling infrastructure is currently lacking. The local landfill sit has created a sense of ownership of waste amongst the neighbouring community for economic empowerment.

A sewer treatment plant is in place in form of the **Eldoret Water and Sanitation Company** (ELDOWAS).[7] The plant treats sewerage from Eldoret town and its surroundings and supplies the cleaned water back to the town and its environment. Water supply is one of the county government's priorities.

Challenges

- There is lack of expertise in waste management which makes it difficult for the county to understand and run processes of recycling waste.
- There is need for the county government to receive technical assistance in regard to experts who would help the county manage waste in a more effective and efficient manner.
- Lack of protective and safety gear at the dump sites where the sorting of waste is done.

Opportunities

- Collaboration in local safety gear manufacturing
- From a systems-thinking perspective the management of water and waste should be combined and certain outputs recovered could feed as a useful production and manufacturing input into a locally developed industrial symbioses set-up. The latter could be designed further as a Special Economic Zone offering tax breaks to complimentary types of businesses to relocate and be part of such a system.
- Training and sensitization campaigns for the communities around dumpsites on sorting and managing the waste.
- The importance of sorting the waste at source
- Creating awareness on the value of waste at various levels.

[6] Not unique to the County but cuts across most of the 47 counties
[7] Eldoret Water and Sanitation Company.

Table B-2 Selection of private sector CE awareness initiatives

Taka Taka Solutions
One of the more prominent first mover companies in the field of recycling in Kenya is TakaTaka Solutions. The company, which is mostly active in Nairobi and on a smaller scale in neighbouring cities, has specialised in the collection, recycling and reuse of materials. TakaTaka actively collects waste from the cities major waste sources such as hotels, malls and other institutions and subsequently sends it to two sorting facilities located in Nairobi where it is sorted into more than 45 fractions. Recycling activities are partly undertaken by the company itself as well as by a range of recyclers and converters that feed sorted, and pre-treated waste-fractions received from TakaTaka into their production processes[8]. Using this approach TakaTaka can recycle 95% of the sorted waste it collects.
Safi Organics
Safi Organics is a Kenyan company that is specialised in the decentralised production of fertiliser using locally available resources and labour. The company has developed technologies that enable them to transform rice husk collected from local rice farmers into high quality organic biochar using efficient low-cost biochar converters[9]. The fertiliser and soil treatments are sold back to the farmers via agents or directly. The local circular economy created by these actions enables farmers to exploit the value of their waste in an environmentally friendly manner, while giving them access to cheaper fertilisers and soils treatments.[10]
EcoPost
EcoPost – "Fencing Posts from Recycled Post-Consumer Waste Plastic" is a Kenyan-based sustainable enterprise that recycles waste plastic into aesthetic, durable and environmentally friendly products, such as outdoor furniture and fencing materials. EcoPost receives most of its plastics from waste collectors around Nairobi and employs over 300 people, including the waste collectors. [11]
Sanergy Kenya
Sanergy Kenya is providing affordable toilets designed specifically for urban slums without a functioning sanitation or sewer system. Their toilets are designed to be used 80–100 per day and waste from the toilets is collected regularly in sealed cartridges and taken to a central processing facility where it is converted into valuable end-products such as organic fertilizer and insect-based animal feed.[12]
PETCO
To foster PET recycling approaches the Kenyan Association of Manufacturers in 2018 introduced a plastic bottle recycling initiative, which led to the establishment of the polyethylene terephthalate (PET) recycling company known as PETCO. PETCO is a joint industry effort to self-regulate post-consumer polyethylene terephthalate (PET) recycling by ensuring sustainable management of plastic materials through recycling and reusing. All private manufactures in KENYA are represented in PETCO, thus ensuring the initiatives popularity across the country. To support these efforts bottling companies in Kenya are also starting to harmonize their product design by shifting to clear PET and utilizing PET labels, thus creating more value for recyclers.[13]

[8] Kenya Association of Manufacturers (2019); Ghosh (2020). Circular Economy: Global Perspective.
[9] http://safiorganics.co.ke/2017/10/11/agricultural-waste-is-the-new-gold-mine-in-mwea/
[10] Ghosh (2020). Circular Economy: Global Perspective.
[11] https://www.inclusivebusiness.net/ib-voices/circular-economy-and-opportunities-small-businesses
[12] http://www.sanergy.com/approach/
[13] Kenya Association of Manufacturers (2019). Kenya Plastics Action Plan.

Table B-3 Examples of initiatives related to consumer awareness on CE

National Environmental Education and Awareness Initiative
In its mission to promote, monitor, conserve, protect and sustainably manage the environmental and mineral resources for national development the former Ministry of Environment & Forestry (MEF) has initiated the National Environmental Education and Awareness Initiative (EEAI). With the initiative, the MEF aims to educate and raise awareness on environmental challenges to all Kenyans and to encourage the participation of all stakeholders in environmental conservation and management.[14]
Clean, Healthy, Wealthy Nairobi
In 2011, the Nairobi City County (NCC) and the Ministry of Devolution and Planning with support from JICA, initiated a project with the slogan "Clean, Healthy, Wealthy Nairobi". The project was designed to provide a waste collection and transportation framework that allowed for the efficient collection of waste from designated points. This was to be achieved by granting a tender to one successful franchisee and raising public awareness on proper solid waste management. It started with information sharing through public forums, and sensitization of citizens in the residential areas. The JICA project ended in March 2016.[15]
Plastic bottle waste management awareness campaign
Initiated by the Kenyan Manufacturers' Association (KAM) and the Wildlife Clubs of Kenya, an initiative to raise awareness among the younger generations on issues relating to the disposal of plastic bottles was launched in Kenya. In particular, the project aims to influence perceptions regarding the littering, re-use and recycling of plastic bottle waste. The initiative's activities include the production and distribution of educational materials to wildlife clubs in schools and the education and training of students and young people. Particular focus will be on how PET bottles can be handled in schools and communities, developing an incentive programme to promote best practice in handling PET plastic bottles in schools, and integrating collection containers in schools to support the collection of plastic waste from households and schools.[16]
CLEAN UP KENYA
Founded in 2015 CLEAN UP KENYA is a nationwide environmental project that seeks to create awareness on proper waste management by proposing a blueprint for what individuals, organisations, communities and the nation can do to promote a cleaner and more environmentally presentable country. By forming strategic partnerships, CLEAN UP KENYA seeks to implement public awareness campaigns, promote many local and national environmental initiatives as well as other projects on proper waste management awareness.[17]

[14] http://www.environment.go.ke/?p=91
[15] Soezer (2017) NAMA on Circular Economy Solid Waste Management Approach for Urban Areas in Kenya.
[16] http://kam.co.ke/manufacturers launch campaign to enhance plastic bottle waste management awareness in schools/
[17] http://www.cleanupkenya.org/about.html

Annex C - Enabling environment on trade and investments - full analysis

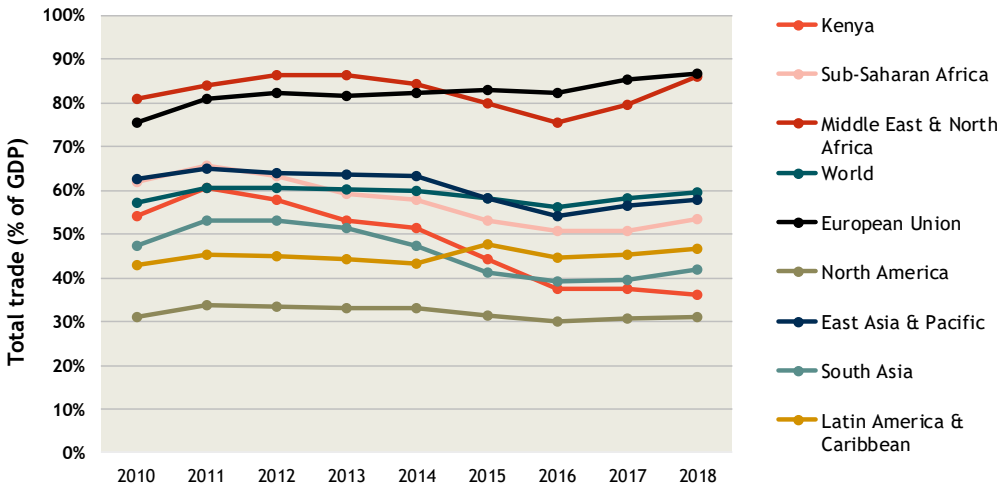
This section looks at the level of trade and foreign investments occurring in Kenya and the factors that influence trade and investment. First, an overview will be given on the trends in trade and investment. Subsequently, several economic, financial and political factors that affect the level of trade and foreign investments will be investigated.

C1 Overview of ongoing trends in trade and foreign direct investment

Trends in trade

The relative level of trade of Kenya with other countries used to be comparable with that of the EU (Figure C-1). In 2011, the level of trade peaked at 60% of GDP and then it started to decline continuously until 2018 when the trade value was equivalent to only 36% of GDP. With these figures, the relative level of trade in Kenya is substantially lower than the average in sub-Saharan Africa and the global average. The total value of import value is 70% larger than the total export value and as a consequence, Kenya had an annual trade deficit of € 5.2-10.2 bn in the period 2010-2018.

Figure C-1 Share of total trade (Imports+exports) in GDP (%) in Kenya compared to regional averages for the period 2010-2018.



Source: World Bank - World Development Indicators - Trade (% of GDP)

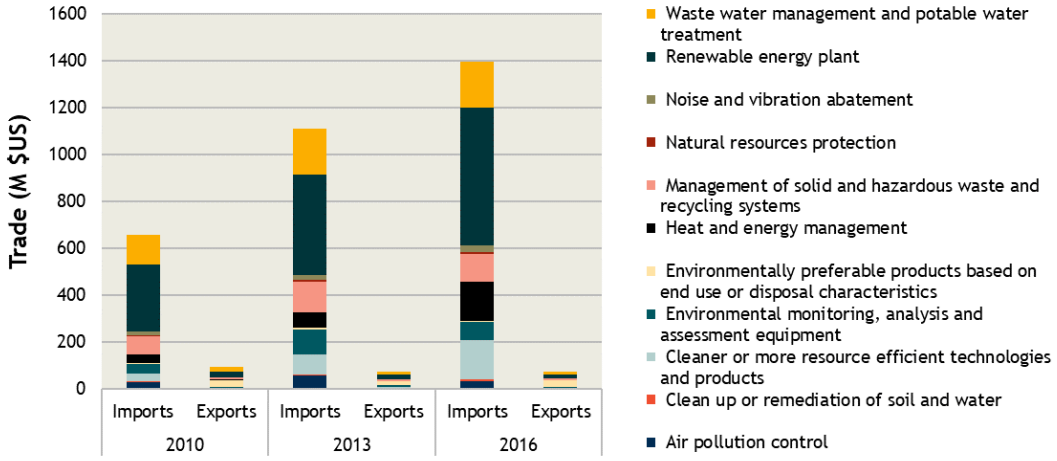
Around 24% of Kenya's exports are going to the European Union and around 12% of the imports originate from the European Union, and this share has been declining over the last decade.[18] Conversely, in 2016 Kenya accounted for approximately 0.1% of the total Extra-EU trade of the EU, for 0.1% of the extra-EU exports and 0.1% of the EU imports from outside the EU. In total around 12% of the EU exports go to Africa and around 1.4% of this goes to Kenya.[19] When looking at the EU's imports from outside the EU, we see that Africa accounts for 5% of those imports, of which in turn 0.9% comes from Kenya. As such, Kenya is the 14th most important export partner in Africa and ranks as the 15th import partner in Africa.

[18] UN Comtrade
[19] Eurostat - International trade in goods by partner.

Trade in environmental goods and services

In the late 1990s, the OECD has developed a list of sectors that deliver (as part of their output) environmental goods and services. In several economic databases the level of activity in these 'environmental goods and services sectors' is monitored, to provide a proxy of the volume of trade in environment-related goods and services. It is important to note though, that in reality only part of the goods and services that are generated in these sectors are related to the environment. In 2010, the environmental goods and services sectors accounted for 3% of the total trade volume and over the years this share increased steadily to 6% in 2016. When looking at the trade balance, we see that imports dominate trade in environmental goods and services, where renewable energy technologies, water treatment technologies, heat and energy management technologies and 'cleaner/more resource efficient products' account for the largest part of the imports (Figure C-2). In exports, 'environmentally preferable products', renewable energy technology and water management and treatment technologies are the most important product groups.

Figure C-2 Imports and exports of environmental goods and services in Kenya for the years 2010, 2013 and 2016.

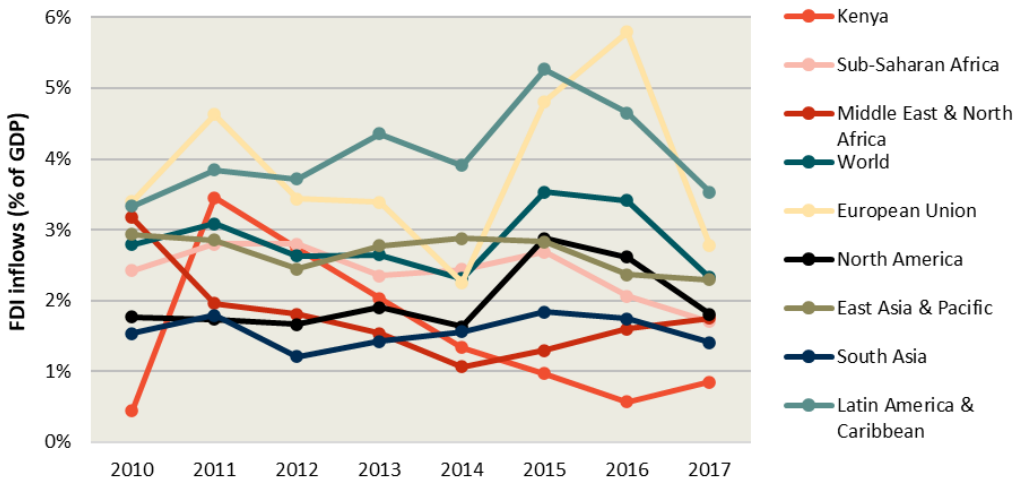


Source: OECD – Trade in Environmental goods and services.

Foreign direct investment

In Kenya, the level of foreign direct investment has been relatively low during the last decade, averaging at 1.6%. After peaking in 2011 at 3.5% investments started to decline steadily and seem to have stabilised just below 1% (Figure C-3). Foreign Direct Investment in Kenya has been substantially lower than the sub-Saharan average of 2.4% and the world average of 2.7%, over the period 2010-2017.

Figure C-3 Share of Foreign Direct Investment (inflows) as share of GDP (%)



Source: World Bank - World Development Indicators - FDI inflows as share of GDP (%)

In conclusion, trade between Kenya and the EU is relatively limited and the contribution of trade in Kenya's economy has been declining during most of the last decade. More worrisome is the declining trend in foreign direct investments in Kenya, and from 2013 onwards the investment gap between Kenya and the average sub-Saharan country started to widen. The following sections will discuss in more detail the issues hindering trade with and foreign investments in Kenya.

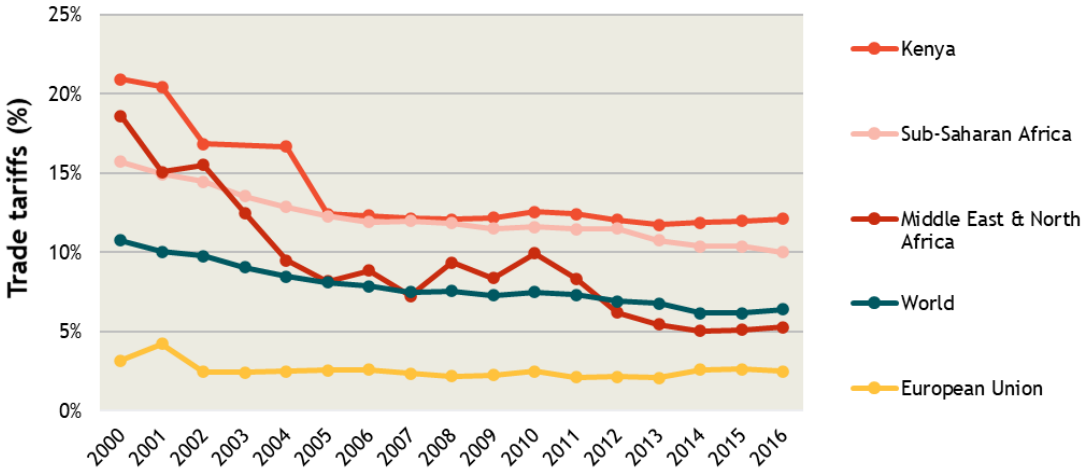
C2 Opportunities and barriers for trade

Trade tariffs

When we look at trade tariffs in Kenya, we can see a long-term downward trend. In the early 2000s, trade tariffs in Kenya were almost twice as high as the world average, but after 2001 tariffs started to decline quickly and converged with the sub-Saharan average (figure C-4). During the period 2005-2012 trade tariffs in Kenya were on par with the sub-Saharan average, but after 2012 the gap widened again as the average tariff levels in sub-Saharan Africa declined further whereas tariff levels in Kenya remained virtually constant. At the global level, trade tariffs have undergone a continuous slow decline from 11% on average in 2000 to 6% in 2016. In Kenya, trade tariffs were still twice as high as the world average in 2016 and 20% above the sub-Saharan average. Therefore, the relatively high trade tariffs in Kenya will remain a barrier for growth in international trade. When asked for the biggest obstacle in doing business in Kenya, 4.5% of the firms mentioned customs and trade regulations as biggest obstacle in 2013.[20]

[20] World Bank – Enterprise survey (2016).

Figure C-4 Mean of the tariff rates applied to all products in Kenya (%)

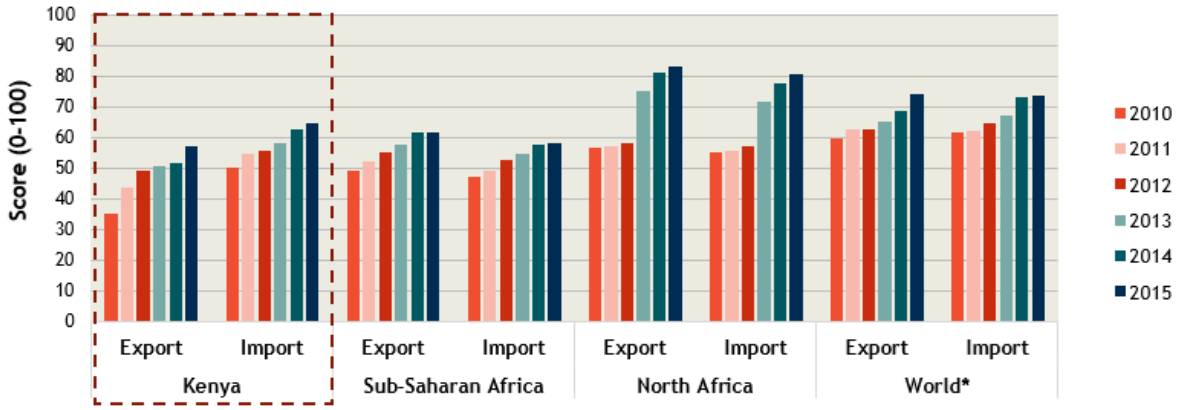


Source: World Bank - World Development Indicators - Tariff rate, applied, simple mean, all products (%)

Trade costs

Apart from trade tariffs, there is a wide variety of costs associated with trade of products and services, including cost related to border compliance and documentary compliance. The Ease of doing business index scores the trade costs of countries based on empirical research. In this area, Kenya used to perform relatively poorly, but its performance increased strongly over the period 2010-2015. In 2010 Kenya scored 35 points for its export-related costs and 50 points for its imports-related cost, while Sub-Saharan countries on average scored 49 and 47, respectively. In 2015, Kenya scored just under the Sub-Saharan average for export-related costs with a score of 57 compared to 61 but outperformed the sub-Saharan average on its score for import-related costs with 65 points compared to 58 points (figure C-5). Cross-border trade costs remain a point for improvement for Kenya as the country still scores below the word average, with export-related costs being the main point of attention.

Figure C-5 Score on cross-border trade costs for exports & imports in Kenya compared to global and regional averages.



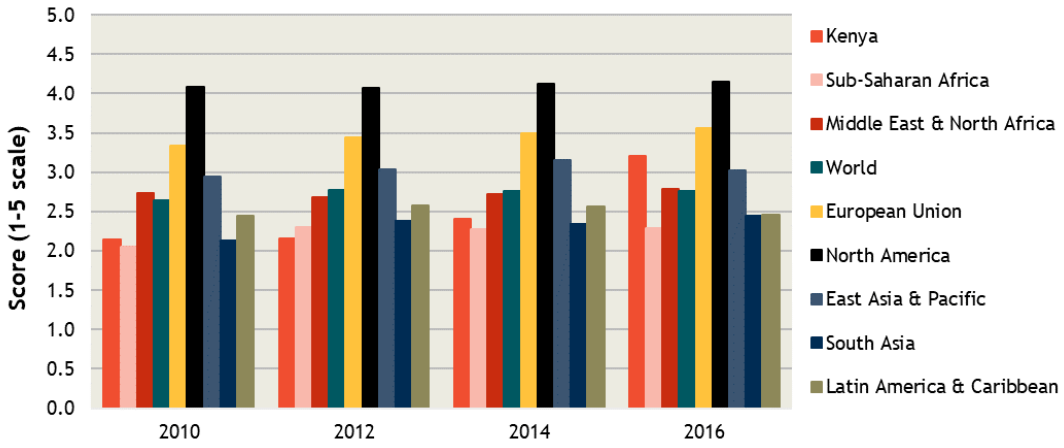
Source: World Bank - Ease of doing business - Trading across borders: Cost to export/import (US$ per container) (DB06-15 methodology) - Score.

Suitability of infrastructure for trade

In order to facilitate trade, reduce transport time and costs, the presence of good transport infrastructure is essential. The World Bank monitors the quality of transport infrastructure as part of the logistics performance index (figure C-6). When looking at this index, one can see that the quality of trade-related

infrastructure in Kenya has improved significantly during the period 2010-2016. In 2010, with a score of 2.1 (on a 1-5 scale) Kenya performed just above the average of Sub-Saharan Africa and well below the average of the MENA region (2.7) and the world average. However, since then its score has been growing and in 2016 Kenya's transport infrastructure scored a 3.2, which is above all the regional and continental averages of the global south and also above the global average of 2.8.

Figure C-6 Score of Kenya in the Quality of trade and transport-related infrastructure compared with global and regional averages



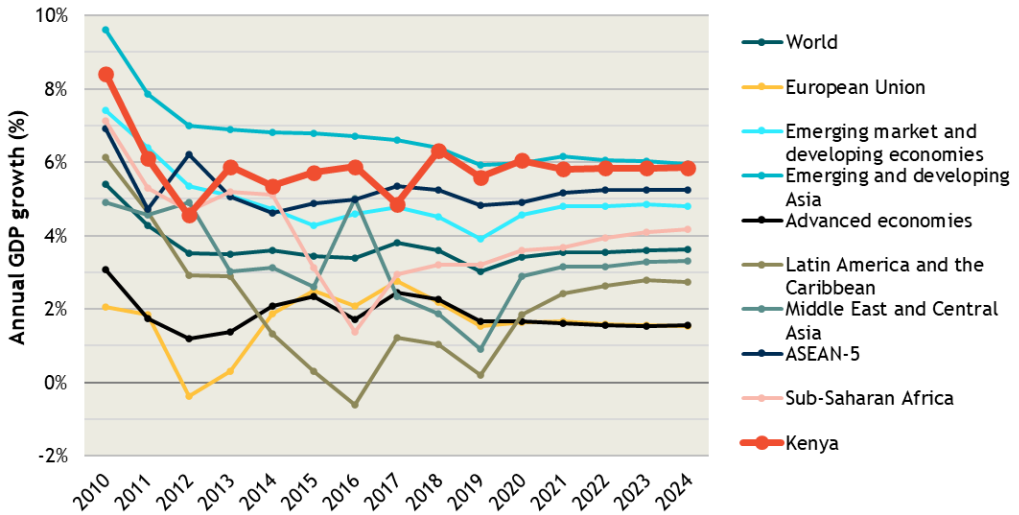
Source: World Bank - Logistics Performance Index - Quality of trade and transport-related infrastructure.

C3 *Opportunities and barriers for investments*

Economic opportunity

The economic situation in Kenya looks quite positive, which should act as a driver for investments in the country. Over the past ten years, economic growth has been solid, with an average annual GDP growth of 5.8% in the period 2010-2017 (Figure C-7). According to the IMF, growth rates of around 6% are expected during the first years of the 2020s, which is well above the expected average growth rates of sub-Saharan Africa (4%) and the world as a whole (4%).

Figure C-7 Historical GDP growth and growth outlook until 2024 for Kenya, compared to global and regional averages.



Source: International Monetary Fund - World Economic Outlook.

Ease of starting a business

Starting up business activities in another country can be cumbersome, because as an organisation you need to get acquainted with all the rules and procedures in the country. The World Bank monitors the ease of starting a business in its Doing business survey and Kenya scores relatively well on this indicator with a stable score of 65 (0-100 scale) in 2009, growing steadily, especially in the last few years, to 82 in 2018. In this same period, the average score for European Member States on this indicator increased from 84 in 2010 to almost 90 in 2018.

Governance, political stability and regulatory quality

As a precautionary safety measure EU companies operating in Kenya in the wider CE space would be advised to proactively develop the CE transition pathways and required scale up of local production a before regulatory policy and enforcement comes into effect. According to local experts interviewed "Kenya government will always tend towards regulatory bans when faced with high pressure from activists and foreign governments. The regulatory bans would not result in livelihood disruptions if alternative production was in place beforehand".

Political instability & security

In the 2007 edition of the World Bank's enterprise survey, 4.4% of the respondents identified political instability as the most important obstacle for doing business in Kenya, but by 2013 this increased to 9.8%, making it the third most important obstacle identified by the respondents.

Corruption

Corruption is still a large problem in Kenya, which hampers the economy and acts as a barrier for foreign companies to invest in the country. In the global Corruption Perception Index of 2018 Kenya has a shared 144th rank when ranking for the lowest level of corruption, with a score of only 27, on a scale from 0-100 (most corrupt-least corrupt). Within Africa, Kenya has a shared 33rd place, when ranking for the lowest level of corruption. In the enterprise survey conducted in 2007 by the World Bank, corruption was mentioned by 9.6% of the respondents as the most important obstacle to doing business in Kenya and by 2013 this had increased to 12.3%, making it the second most important obstacle to doing business in the country according to the survey's respondents. However, the number of people mentioning corruption as a major constraint to doing business in Kenya decreased from 38.35 in 2007 to 21.3% in 2013.

Financial stability

Inflation

Kenya has faced and is still facing strong inflation rates. The inflation compared to GDP has been on average 7% during the period 2010-2018. Furthermore, the Kenyan inflation trends exactly followed the pattern of the sub-Saharan average (figure 2-25) and can be further explained as follows.

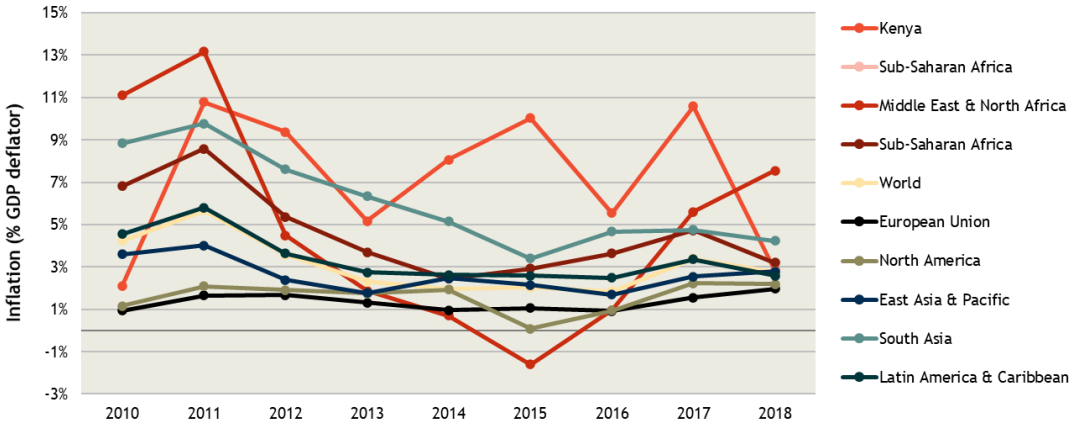
The mandate of achieving and maintaining stability in prices through monetary policy lies with the Central Bank of Kenya (CBK). This is necessary because it can enhance investment, support economic growth and create employment. Therefore, CBK creates an enabling environment to meet government targets linked to economic growth objectives.

In Kenya, the consumer price index (CPI) is the most commonly used form of inflation measure. This index measures monthly price changes in a basket of goods and services that account for a high proportion of general household expenditure. CPI is based on expenditures of both urban and rural households. As at

2018, through the 41st Monetary Policy Statement (MPS) of Central Bank of Kenya (CBK), pursuant to Section 4B of the Central Bank of Kenya Act the inflation outlook read; "The CBK formulates and conducts monetary policy with the aim of keeping overall inflation within the target prescribed by the National Treasury at the beginning of the financial year. Currently, this target is 5.0 percent with a margin of 2.5 percent on either side. The target is consistent with the macroeconomic targets underlying the FY2017/18 Government Budget and the Medium-Term Expenditure Framework (MTEF)." This statement clearly indicates that the CBK's monetary policy supports the Government's objectives with respect to growth.

The Monetary Policy Statement 2018 provided the direction of monetary policy and also reviewed the outcome of the monetary policy stance adopted in the second half of 2017. Notably, the second half of 2017 experienced general macroeconomic stability, reduced food prices, and an uncertain electioneering period. Therefore, CBK opted to conduct monetary policy with the aim of maintaining overall inflation within the Government target range of between 2.5 and 7.5 percent. In the period under review, month-on-month overall inflation remained within the target range apart from August that rose to 8.0 percent due reduced supply of some key food items especially in the second week which coincided with the general elections. However, food prices particularly in towns other than Nairobi fell significantly due to favourable weather conditions. Consequently, the onset of the harvest season for maize in the food basket regions in Trans Nzoia County, normalization of food supply following the general elections in August, and the impact of Government measures instituted to mitigate the adverse drought effects influenced inflation declined from 9.2 percent in June to 4.5 percent in December 2017.

Figure C-8 Historical inflation (GDP deflator %) in Kenya compared to global, regional and continental averages



Source: World Bank - World Development Indicators - Inflation, GDP deflator (annual %)

National creditworthiness

Whereas the inflation rate reflects the monetary stability in a country, the creditworthiness reflects the stability and sustainability of public finance. Of the 23 African countries that have recently received a credit rating from the rating agency Fitch, the majority of the countries received a B+ or B rating, whereas the lowest rating of CCC was given to three countries (Table C1). Kenya's Fitch rating was B+, meaning that the country belongs to the best performing countries in Africa in terms of creditworthiness. Moody's was less positive about Kenya's creditworthiness and rated the country with a B2, with the highest performing African country receiving an A2 rating. The rating agency rated the outlook for Kenya as stable.

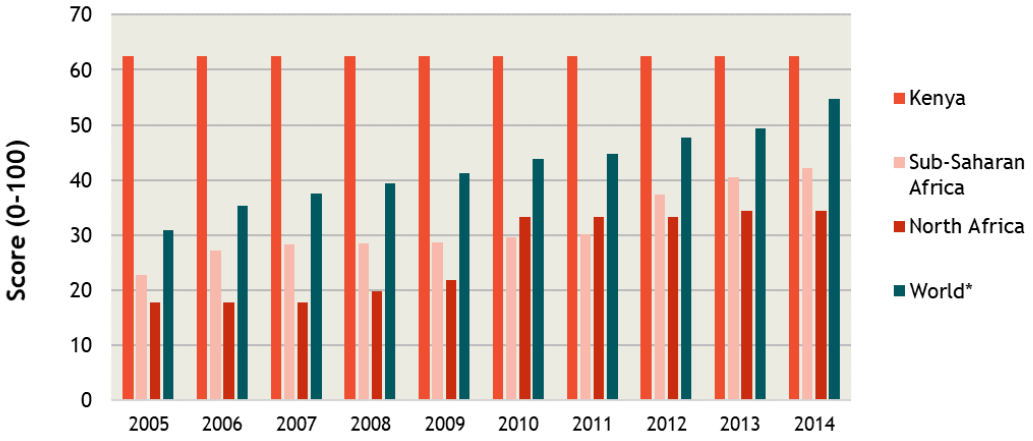
Table C-1 Most recent credit ratings by Moody's for African countries and their outlook (N=23)

Fitch		Outlook	
B+	6	Stable	14
B	8	Developing	5
B-	2	Negative	4
BB+	1		
BB	2		
BBB-	1		

Ease of getting credit

The ability to have access to finance is an important condition for companies to be able to do business. According to the World Bank's indicator on the ease of getting credit Kenya's performs very well in this context, with a constant score over the period 2005-2014 of 63 on a 0-100 scale. Although Kenya seems to outperform most African countries and the world average in terms of the ease of getting credit (figure C-9), its performance in this area did not significantly increase during the indicated period, in contrast to the other countries in Africa and the global average. Also, even though Kenya receives a relatively high score on the access to credit indicator, 13.5% of the respondents of the enterprise survey in 2007 saw a lack of access to finance as the largest obstacle to doing business in Kenya and 41.8% saw it as a major constraint.[21] In 2013, these shares had decreased to 9.6% and 17.2%, respectively.

Figure C-9 Kenya's score (0-100 scale) for the ease of getting credit compared to global and regional averages



Source: World Bank - Ease of doing business - Getting credit (DB05-14 methodology) - Score.

[21] World Bank Databank (2020) Enterprise Survey.

Annex D – Method for modelling of impacts & detailed findings

Part 1 Methodological details of the modelling approach

The FRAMES model

The process of estimating economic and jobs impacts of circular economy activities in Kenya was carried out using Cambridge Econometrics' FRAMES model. The direct, indirect, and induced impacts of additional circular economy activities are captured in this modelling framework, to estimate the full impacts of the circular economy transition in Kenya.

FRAMES, the Framework for Modelling Economies and Sustainability, is an advanced input-output tool. It is designed to enable the assessment of socioeconomic and environmental effects of E3 (energy, environment, and economy) policies.

The key features of FRAMES are:

- An economic accounting framework based on the system of national accounts.
- Integrated treatment of the economy, energy, and the environment.
- Detailed sectoral disaggregation, and a national level input-output table, reflecting the specific structure of the economy.

FRAMES was built using the structure and principles of the E3ME model. E3ME is a global, macro-econometric model of the world's economic and energy systems and the environment. FRAMES, as a single-country framework, was designed to minimise data requirements, to enable modelling work for regions where time series data are limited. The data requirements are substantially lower than more complex macroeconomic models like E3ME. Table F1 summarises the data sources used to construct FRAMES.

Table D-1 Variables and data sources

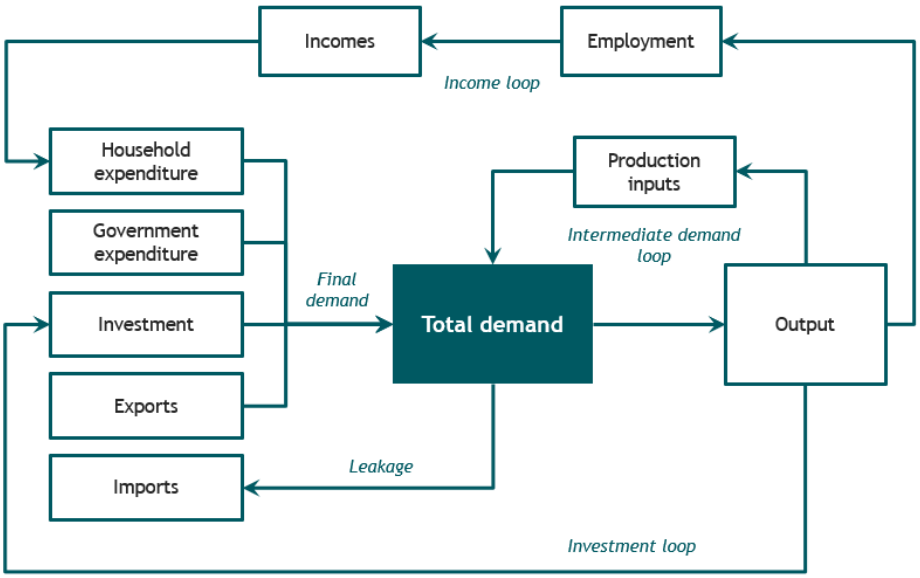
Data	Variables	Source(s)
National accounts	• GDP • GVA • Consumption • Investment • Trade • Gross output	• World Bank – World Development Indicators • Eora National Supply and Use Tables – Kenya (2015)
Employment	• Employment • Compensation of employees	• International Labour Organisation • Eora National Supply and Use Tables – Kenya (2015)
Population	• Current population • Population forecast	• United Nations – Population Division
Energy	• Final energy consumption • Primary energy consumption	• International Energy Agency • Eora National Supply and Use Tables – Kenya (2015)
Environmental	• Emission coefficients	• E3ME
Economic forecast	• GDP forecast	• International Monetary Fund (2019, 2020) • HSBC (2018)

The input-output table used to model the structure of the Kenyan economy was sourced from the Eora National IO Tables database. The economic sectoral classification follows this source input-output table, which includes the following 26 economic sectors:

1. Agriculture
2. Fishing
3. Mining and Quarrying
4. Food & Beverages
5. Textiles and Wearing Apparel
6. Wood and Paper
7. Petroleum, Chemical and Non-Metallic Mineral Products
8. Metal Products
9. Electrical and Machinery
10. Transport Equipment
11. Other Manufacturing
12. Recycling
13. Electricity, Gas and Water
14. Construction
15. Maintenance and Repair
16. Wholesale Trade
17. Retail Trade
18. Hotels and Restaurants
19. Transport
20. Post and Telecommunications
21. Financial Intermediation and Business Activities
22. Public Administration
23. Education, Health and Other Services
24. Private Households
25. Others
26. Re-export & Re-import

Figure D-1 illustrates the economic structure and key relationships in FRAMES. Key parameters estimating the magnitude of relationships were taken from E3ME, specifically an aggregate 'Rest of Africa' region.

Figure D-1 Economic Structure in FRAMES



Treatment of the informal sector

The informal sector is an important consideration when modelling circular economy activities in Africa, as much economic activity may not be fully recorded in official national statistics. This issue is most relevant to agriculture, given the importance of smallholder agriculture in many African countries.

Our employment results include informal labour, as they are based on International Labour Organisation (ILO) data which estimate informal activity. The economic results in FRAMES are calibrated to World Bank economic aggregate data, which also incorporate estimates of the informal sector. However, the input-output relationships and sectoral shares in FRAMES are drawn from Eora's National IO Tables, which do not capture informal economic activity. The EORA data therefore required some adjustments to match the ILO and World Bank data, namely by adjusting GVA, wages and household consumption in the agricultural sector to align with World Bank data on GVA shares by sector. The implicit assumption of this adjustment is that the products of informal agriculture are entirely purchased by other households, and the value added from these sales are entirely channelled into labourers' wages (as opposed to profits or taxes).[22]

Scenario design

FRAMES has been designed to be used for scenario analysis, evaluating the impacts of an input shock to a reference scenario. An input shock may be either a change in policy, a change in economic assumptions or another change to a model variable. By comparing different scenarios – each representing an alternative future with different policies and/or economic assumptions – it is possible to assess the impact of a change in policies and/or economic assumptions. For this report, the following scenarios were modelled: a baseline and a circular economy (CE) scenario with a scale of circularity on top of the level embedded in the baseline, as shown in Table F2.

[22] For smallholder farmers, there is of course little distinction between wages and profits anyway.

Table D-2 Scenario design

Scenario	Scenario Description
Baseline	A baseline constructed based on official published economic and energy-sector projections. The modelling baseline does not explicitly assume a certain level of circular economy activities.
Circular Economy	This scenario assumes an ambitious uptake of the circular economy, in addition to the baseline scenario. The base year for the modelling is 2020 and the target year is 2030.

We have adopted an 'activities' approach (rather than a 'policies' approach) to modelling the CE scenario. This choice means that the analysis does not assess potential impacts of specific policies but instead looks directly at the links between specific changes in an economy and the direct, indirect and induced effects, without making any explicit assumptions about whether these changes are driven by policies, behavioural change or new technology.

The activities approach implies generating modelling inputs from a sectoral perspective. Inputs are formed by studying the plausible circular economy activities that will take place in selected key sectors and their supply chains. This is to reflect that the impact of a transition to a more circular economy will vary between sectors, as sectors differ in the way in which resource flows and relationships with the consumer are organised.

Increased waste collection and recycling are modelled as central circular economy activities. In addition, activities for four additional sectors are modelled, selected based on existing policy priorities, but also on the basis of the anticipated scale of the potential benefits (in consultation with country experts): electronics (e-waste), plastics, agriculture and construction.

The selected activities are translated into modelling inputs and methods, so that the economic, social and environmental impact can be simulated in FRAMES. Together, the selected activities should be broad enough to represent the most important circular economy changes and their potential impacts.

Scenario assumptions

Table D-3 provides a summary of the selected circular economy activities and how the identified circular economy activities were translated to modelling inputs that have been implemented in FRAMES.

Table D-3 Scenario assumptions

Category	Circular economy activity	Modelling input	Input size
Waste management	Improved waste collection rate	Increase in waste sector output	Increase from 50% to 95%
E-waste	Improved enforcement of e-waste trade restrictions	Reduction in e-waste (i.e., electronics) imports	n/a
	Improved recycling of valuable materials in e-waste	Investment in recycling sector to improve health & safety standards	€920,000
		Share of recycling investment paid for by private and public sectors	50:50

		Exports of materials recovered from e-waste recycling	€2.2m
Agriculture	Prevention of food loss in agricultural supply chain through improved storage and logistics	Substitution of agricultural imports by domestic agricultural production	€309m
		Investment in storage and logistical capabilities	€85m
		Share of investment paid for by private and public sectors	50:50
Circular production	Increased use of recycled materials in industrial production	Electronics production: shift from virgin metals and plastics inputs to recycled inputs	20% of virgin inputs replaced by recycled inputs
		Plastics production: shift from virgin feedstock to recycled feedstock	25% of virgin inputs replaced by recycled inputs
		Construction: shift from virgin non-metallic minerals (glass, cement, sands, ceramics) to recycled minerals	10% of virgin inputs replaced by recycled inputs
		Agricultural production: shift from mineral fertilisers to organic fertilisers	20% of mineral fertiliser replaced by organic fertiliser

As indicated in the last two columns, the various economic changes associated with the circular economy are modelled through specific input assumptions. They mainly relate to gross output, input-output coefficients, investment and the trade balance.

Gross output

The increase in the waste collection rate is modelled as a change in output in the waste management sector. This increase in gross output can be thought of as resulting from a government mandate, rather than being caused by an increase in a component of demand.

Input-output linkages (intermediate demand between sectors)

We have modelled an increase in the circularity of production for a number of sectors through adjustments to the existing input-output structure of the model. This reflects changes to the supply chain of a sector as a result of higher circular economic activities. For example, if the construction sector uses less primary aggregate material, and substitutes these for recycled materials, this change is entered to FRAMES as an adjustment to the input-output linkages (i.e., coefficients) of the construction sector: it purchases less from the mining and non-metallic mineral sectors and more from the recycling sector.

Investment

Some of the modelled circular economy activities are associated with an increase in investment, such as the investment required to prevent food losses in the agricultural sector, or to increase health and safety in the recycling sector. In these cases, assumptions are also needed regarding the share of the investment costs that will be paid by the private and public (or aid) sectors: we have assumed a 50:50 split in all cases. In practice, this means that 50% of the investment input is represented as a cost to the investing industry; the other 50% is assumed to funded by deficit spending or official development assistance and is thus represented as an injection of funds into the economy.

Trade balance changes

In some cases, the modelled changes to the trade balances represent circular economy activities which directly relate to the trade balance, such as the reduction in imports of e-waste. In other cases, changes to the trade balance are a way to represent a change in productivity in a demand-led model. For instance, we have modelled a reduction in food losses in the agricultural supply chain (effectively an increase in agricultural productivity) as a reduction in imports of agricultural products, as domestic supply is better able to meet domestic demand. Similarly, some portion of the materials recovered from e-waste recycling are modelled as an increase in exports, as we do not assume that domestic demand for these materials has necessarily increased.

Mapping inputs to FRAMES sectors

In some cases, the sectors available in FRAMES were too broad to allow for the targeting of inputs at the level described in Table D-3 above. For example, modelling the shift from virgin plastics to recycled plastics as inputs to the production of electronics requires the disaggregation of two FRAMES sectors. Firstly, we must establish the share of electronics output within the broader "Electrical and Machinery" FRAMES sector. Secondly, we must establish what share of this sector's purchases from the "Petroleum, Chemical and Non-Metallic Mineral Products" FRAMES sector is actually of plastics, as opposed to other petrochemical and mineral products. Once these shares are established, the magnitude of the modelling inputs can be adjusted accordingly.

Table D-4 provides an overview of how each of the modelled activities corresponded to the sectors available in FRAMES. An estimate of output or intermediate demand shares was required in cases where the activity sector did not correspond directly with the FRAMES sector. These shares were estimated, where possible, using data from the relevant national accounts and other sources. If no data were available, the shares were inferred using data for the "Rest of Africa" region in E3ME.

Table D-4 Mapping to FRAMES sectors

Activity sector	FRAMES Sector	Variables affected by modelling inputs
Waste	Education, Health and Other Services	Gross output
Recycling	Recycling	IO coefficients, Investment, Exports
Electronics	Electrical and Machinery	IO coefficients, Imports
Plastics	Petroleum, Chemical and Non-Metallic Mineral Products	IO coefficients
Construction	Construction	IO coefficients
Agriculture	Agriculture	IO coefficients, Investment
Metals	Metal Products	IO coefficients (electronics input)
Chemicals	Petroleum, Chemical and Non-Metallic Mineral Products	IO coefficients (plastic feedstock, mineral fertilisers)
Mining of non-metallic minerals	Mining and Quarrying	IO coefficients (construction materials)
Production of non-metallic minerals	Petroleum, Chemical and Non-Metallic Mineral Products	IO coefficients (construction materials)

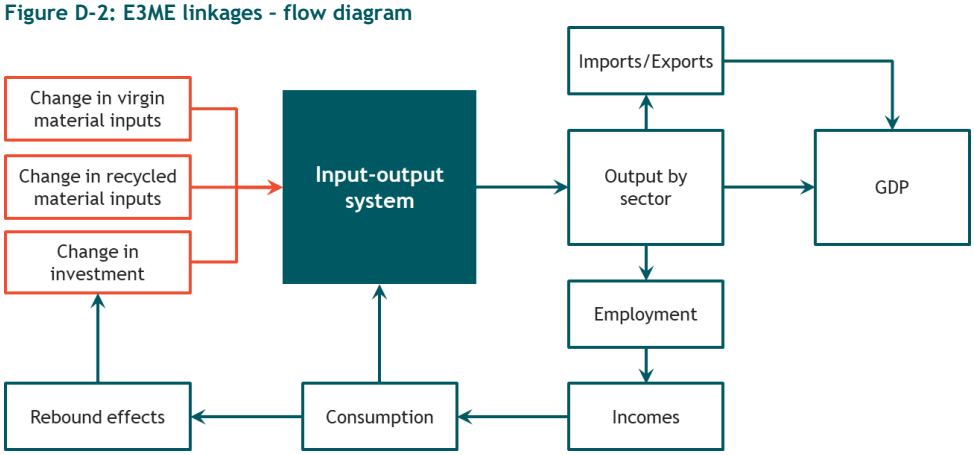
Model linkages and feedbacks

The impact of circular economy activities will not be linear. A change in investment or material consumption may have feedback effects that may in turn alter investment and consumption levels. An

advanced input-output model like FRAMES is able to capture these complex interactions, enabling a deeper analysis of the trade-offs inherent in a circular economy transition, as limits are placed on certain economic activities while demand for others increases.

Figure D-2 illustrates the key linkages in modelling material demand substitution in FRAMES. The modelling inputs adjust input-output coefficients in select sectors, substituting demand away from extractive sectors, towards the recycling sector. This shift in the value of supply-chains affects intermediate demand across sectors, and as a result, levels of gross output across sectors. Differences in output levels result in employment changes by sector; variation in labour intensities across sectors affects net employment change. Output changes across sectors also affect levels of trade and investment activity. Induced effects result from changes in employment, which affect incomes, and therefore consumption.

Figure D-2: E3ME linkages - flow diagram



The net environmental impacts of circular economy activities are not certain, a priori. For instance, the shift towards recycled materials will decrease the share of material use in the economy met by virgin material. On the other hand, the shift towards recycled materials may also be associated with increased employment, increasing disposable incomes and consumption (see Figure 4). The additional investment required by the transition would also filter through the economy, increasing demand in the financial and construction industries, among others.

The overall consumption of raw materials is determined by these trade-offs within the economy. If the rebound effects from the additional demand are strong, the impact of circular economy activities may be to increase the extraction of raw materials more than ever, with improved resource efficiency offset by higher consumption overall. As the relative importance of sectors with different labour and carbon intensities changes as a result of the circular economy, we may expect to see similar dynamics in terms of employment and carbon emissions in aggregate, with employment and carbon emissions being added in certain areas of the economy while employment and emissions potentially being reduced in other areas of the economy. Through its model linkages and feedbacks, FRAMES captures these various effects and estimates the net impacts.

Part 2 - Detailed modelling results

Table D-5 Detailed employment results by sector

Sector	Baseline scenario employment, 2030 (000s)	CE scenario employment, 2030 (000s)	Absolute difference from baseline scenario in 2030 (000s)	Relative difference from baseline scenario in 2030 (%)
1. Agriculture	17314.7	17357.1	42.35	0.24%
2. Fishing	61.6	61.6	0.01	0.01%
3. Mining and Quarrying	219.7	219.7	0.00	0.00%
4. Food & Beverages	236.0	236.0	0.00	0.00%
5. Textiles and Wearing Apparel	102.9	102.9	0.02	0.02%
6. Wood and Paper	63.8	63.8	0.00	0.00%
7. Petroleum, Chemical and Non-Metallic Mineral Products	144.4	144.1	-0.24	-0.17%
8. Metal Products	57.0	56.9	-0.11	-0.20%
9. Electrical and Machinery	106.6	106.6	0.03	0.03%
10. Transport Equipment	11.7	11.7	0.00	0.02%
11. Other Manufacturing	116.9	116.9	0.00	0.00%
12. Recycling	25.8	26.1	0.31	1.19%
13. Electricity, Gas and Water	67.9	67.9	0.00	0.00%
14. Construction	1117.2	1119.9	2.68	0.24%
15. Maintenance and Repair	118.8	118.8	0.00	0.00%
16. Wholesale Trade	1531.1	1531.1	0.00	0.00%
17. Retail Trade	3405.4	3405.4	0.00	0.00%
18. Hotels and Restaurants	577.9	577.9	0.00	0.00%
19. Transport	590.2	590.3	0.04	0.01%
20. Post and Telecommunications	187.2	187.3	0.14	0.07%
21. Financial Intermediation and Business Activities	651.4	651.8	0.43	0.07%
22. Public Administration	725.6	725.6	0.00	0.00%
23. Education, Health and Other Services	1525.0	1525.6	0.56	0.04%
24. Private Households	9.0	9.0	0.00	0.00%
25. Others	2576.7	2576.7	0.00	0.00%
TOTAL	**31544.7**	**31590.9**	**46.2**	**0.15%**

Annex E - Detailed examples EU-Kenya cooperation

Table E-5 Examples of research cooperation initiatives in the area of circular economy

EWIT: Developing an e-waste implementation toolkit to support the recycling and the secondary raw material recovery strategies in metropolitan areas in Africa
By assisting African municipalities in the implementation of effective e-waste management systems for their communities, the EWIT project aims to address the challenges of a rising e-waste stream, limited recycling capacity, insufficient waste management infrastructure and low public awareness of the health issues. The project will develop a comprehensive mapping of the baseline data of African metropolitan areas related to e-waste management, analysing the most relevant experiences, processes, and legal tools available. Based on the results it will then provide a dynamic and easy-to-use information and service portal providing guidance and practical support for the design and development of e-waste collection and recycling schemes. [23]
Towards monitoring sustainable use of biomass in Ethiopia and Kenya
With the technical support from UN Environment, Ethiopian and Kenyan researchers are currently developing and applying sustainability indicators to various biomass pathways, using the Global Bioenergy Partnership (GBEP). The project focuses on building the capacity of those responsible for bioenergy issues, helping them to identify critical bioenergy pathways; collect data; calculate the indicators and interpret the results, ultimately shaping bioenergy policy to meet sustainability objectives.[24]
Resource-Oriented Sanitation concepts for peri-urban areas in Africa (ROSA)
ROSA aims to promote resource-oriented sanitation concepts as a route to sustainable and ecologically sound sanitation. Together with Kenyan partners from the municipal council of and the Egerton University of Nakuru the project will address guidelines for use of waste and excreta, the improvement/adaptation of resource-oriented sanitation technologies and the development of community-based operation and management strategies.[25]

[23] https://cordis.europa.eu/project/id/641660
[24] http://www.unep.org/news and stories/story/towards monitoring sustainable use biomass ethiopia and kenya
[25] https://cordis.europa.eu/project/id/37025

Annex F Linking of Kenyan policy priorities with EU CE Action plan and CE measures

Table F-1 Relation between EU's CE actions and Kenya's CE priorities

Sector/ Sub-sector	Priority to the Kenyan Government	Priority to the EU	Further Opportunities could be explored
ICT & electronics	• Collaboration to enforce and monitor policy tools based on the existing and future advancements in legislation.	• Circular economy action plan and Circular Electronics Initiative' • WEEE Directive including EPR regulatory framework	• Providing support to the Kenyan government on raising public awareness, training and education on all aspects of environmental responsible and socially inclusive WEEE management and along the entire value chain • Assisting with the development and implementation of EPR regulation for the producer managed/funded responsible collection and treatment of all WEEE • Technology and skills transfer to enable development of locally based end-processing solutions that can retain the technical nutrient value of WEEE in Kenya • Upskilling and service level development support to maintain product function optimally and prolong useful product life • Support with innovation hubs and maker stations and development of co-working spaces for safe informal workforce integration to facilitate dismantling and other value adding services

Sector/ Sub-sector	Priority to the Kenyan Government	Priority to the EU	Further Opportunities could be explored
Plastics	• Kenya Plastic Pact (currently under development) • WRAP Plastic Pact and funding companies to achieve waste reduction capabilities. • Government collaborative investment in recycling machinery • A multi sectoral policy formulation on plastic resource management has been enacted, Ministries are sponsoring specific policy interventions that might accelerate circular oriented approach with the support of EU partners.	Circular economy action plan and EU Strategy for Plastics in the Circular Economy	• Development of a robust EPR based system to combat plastics pollution, promote environmentally friendly alternatives and product designs with SMART targets • Targeting Single Use Plastics that have displaced functional refill systems with a view to limit or ban such items and reinstated/protect original waste-free systems to avoid any further linear lock-in by the plastic industry lobby • Partner project and joint milestones such as required post-consumer recycled content. Help Kenya to strengthen industrial policy making in this sector • Retain and expand on any existing government subsidies such as the currently reduced 15% income tax for plastic recycling factories which is however (according to interviewee discussed to be scrapped in the next financial year. • Active financial support to promote R&D that is concerned with any local product development addressing plastic waste by using the latter as feedstock- e.g., to develop road/housing construction materials or outdoor structures/furniture • B2B opportunities between EU companies and national companies on latest plastics recycling technique
Construction and buildings	• The National Construction Authority (NCA) • Drafting of a construction industry policy • Drafting of the sustainable construction waste management framework • Development of the virtual construction waste market • Development of green building codes	Circular economy action plan	• Introducing CE concepts in the construction materials industry (e.g., in cement, steel, bricks) that include utilization of secondary raw materials, and alternative fuels, minimization of wastes and improving recycling activities • Protecting the right to reuse secondhand materials in new buildings • Assist with developing leasing of equipment (e.g., to make ISSB blocks) for SMEs (not just big construction companies) and provide the relevant training • Transfer of know-how on resources efficiency measures in the construction and buildings sector. • Promote human design inspired modular housing systems that have a much-reduced environmental footprint

Sector/ Sub-sector	Priority to the Kenyan Government	Priority to the EU	Further Opportunities could be explored
Manufacturing of and processing of goods including food	• GESIP • KAM • CSTI	• Circular economy action plan	• Greater emphasis is needed on advanced manufacturing technology transfer (especially digital manufacturing) and industrial ecology capacity building. • Functionality could be improved through training and sensitization of the Kenya Association of Manufacturers as well as Kenya National Academy of Sciences. • CSTI26 has focused on creating awareness of advanced manufacturing technology that supports CE bioeconomy and blue economy. Their CE research should be expanded to other manufacturing areas • Increase emphasis on CE technologies for manufacturing (beyond agriculture/bioeconomy), pharmaceuticals, and affordable housing (Kenya's Big 4 Agenda).
Tourism	• Ministry of Environment and Forestry: Ban of use of single use plastics in tourist areas • Sustainable consumption and production	• Not a priority in CE action plan	• Introduction of latest circular economy practices in the tourism sector through capacity building and investments that reduce the consumption of primary resources, minimizes waste generation and improve recycling activities • Given its 9% GDP market share this sector has to be prioritized by the government especially due to the COVID-19 situation e.g., by redeploying tour guides to act as coronavirus guides for their local communities, raising awareness and explaining to their fellow Kenyans how to prevent the spread of infection. • Identify and map small businesses in the tourism supply chain, such as providers of food, transport and souvenirs- so that tailor-made COVID-19 rescue programmes can be also developed for the wider stakeholder system supporting tourism. Government to provide tax breaks, moratoriums on loans and support packages for wages and economic stimulus • Identify projects and develop emergency budgets linked to poverty alleviation and animal conservation programmes that were directly based on tourism revenue pre COVID-19 and need now new sources to be sustained. • Set up of a governmental green tourism unit and policy development promoting utilization of solar water heaters and solar panels for electricity generation as a priority.

[26] https://www.csti.or.ke/

Sector/ Sub-sector	Priority to the Kenyan Government	Priority to the EU	Further Opportunities could be explored
Agriculture sector	• Switch Africa Green • • Part of the GESIP "Big Four Agenda"	• Circular economy action plan • (Food, water and nutrients)	• Active support programmes for subsistence farmers including access to micro loans, insurance cover to protect against crop failure etc. • Promotion of organic fertilizer production and use in Kenya • There has been progress on reciprocal trade agreements in agricultural exports from Kenya to the EU. SWITCH Africa Green frameworks are supportive of transformations at the small-scale farming level. • According to NDC findings this sector is responsible for 62% of all GHGs. It makes therefore no sense to avoid discussions in this report on the need to utilise CE interventions, policies and measures geared at climate protection
Mobility	• Expanded digital infrastructure to support e-hailing services	• European Circular Economy Stakeholder Platform[27]	• Investment in Urban mass transmit and NMT infrastructure to enhance city efficiency. • Commitment to producer responsibilities for End of life of Auto motives beyond the reuse no claim approach for EU owned brands currently in operation on Kenyan roads. • Green mobility promotion especially around mass transport systems and technology transfer in urban planning[28]. • Electric vehicles for rural and peri-urban context where car ownership is low and motorised optimize can accelerate positive environmental, social and economic impacts[29]. • Collaboration on carbon credit programmes related to green mobility alternatives

[27] https://circulareconomy.europa.eu/platform/en/sector/transport
[28] https://www.ntu.eu/news archive/kick off of an eu funded project in kenya/
[29] https://www.siemens stiftung.org/wp content/uploads/medien/publikationen/publication emobility emobilitysolutionsforruralsubsaharanafrica siemensstiftung.pdf

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