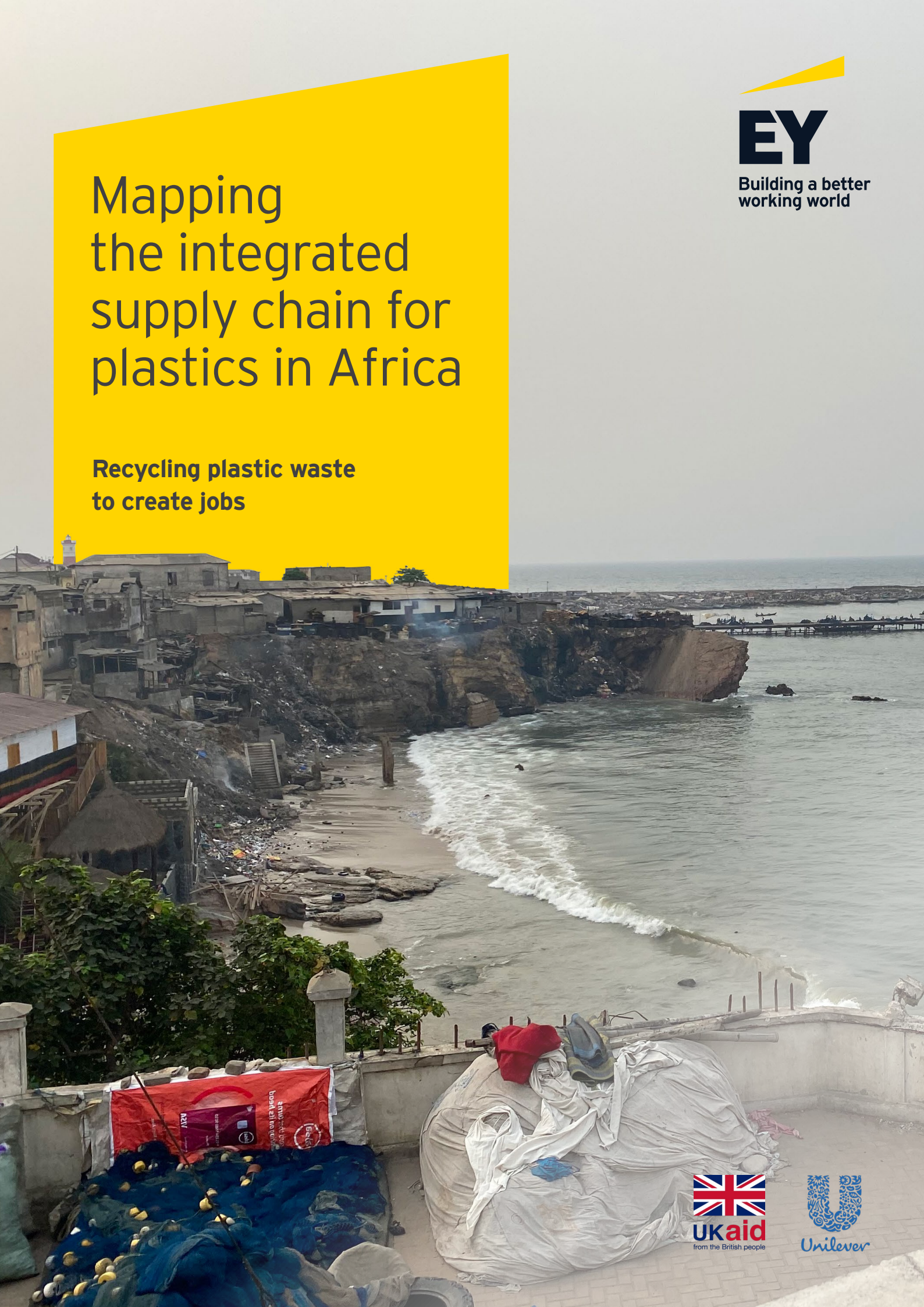
Mapping the integrated supply chain for plastics in Africa

Recycling plastic waste to create jobs



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Contents

Welcome

EY, Unilever and FCDO are united in tackling the plastic waste management problem in Africa. Together, we believe, by providing greater transparency on the plastics supply chain and highlighting the large job creation potential of the sector we can use this opportunity to contribute to the United Nations Sustainable Development Goals (No poverty (1), Decent work and economic growth (8), Industry, innovation and infrastructure (9), Reduced inequality (10), Sustainable cities and communities (11), Responsible consumption and production (12), Partnership to achieve the goals (17)) and the local circular economy. Through this, our ambition is to empower the livelihoods of the people and recognize their important contribution to addressing the global plastic problem.

A transparent and economically viable integrated plastics supply chain, in a selection of major Sub-Saharan cities, is an important foundation for a plastic-free environment in future. It is a key requirement to scale up and recycle plastic collection, and enable stakeholders to identify new innovative solutions and integrate the groups who contribute to the value stream.

While we do not claim to have all the answers, we believe that what we can share here can help impact investors, governments and social entrepreneurs to have an aligned and impactful approach on closing the plastic gap while benefiting from the opportunities that stem from effectively integrating the domestic people.

Figure 1: Markets in scope of report

Jaime Aguilera

President
Unilever Africa

At Unilever, the vast majority of what we sell to African consumers is made in Africa. Unfortunately, for now at least, plastic is still the only way to keep many of our products safe and affordable for them. We are of course working hard to find alternatives, but we have to be realistic that plastics still have a place in our packaging. However, we also passionately believe that plastics have no place in the African environment. African cities are covered in plastic litter, clogging drains, being dumped or burned and the recycling systems essential to reducing the problems are often limited or absent. That needs to change.

The good news is that tackling this problem will create opportunity. Every tonne of plastic recycled is a tonne of virgin material that is not imported using scarce foreign exchange. Every recycling system creates jobs, where it counts on the streets of Africa. Waste pickers, who are so often marginalised in society, can get decent, safe and well paid work. Collecting, transporting and processing recycled material will create many opportunities for African businesses.

No single organisation can seize this opportunity alone. Businesses, governments and non-profit groups all need to work together to tackle an issue of this scale. To do that we need a far bigger vision than a series of individual recycling and collection projects. Given the scale of plastics waste being created daily in Africa we need a step change and this study helps tell us what that step change should be. I therefore want to thank the authors at EY, the UK Government who cofinanced the work as well as all the different companies and individuals who gave their time and insights.

The economic challenges from COVID plus the need to supply the world's fastest growing population with safe and affordable goods mean the pressure to create a fully scaled up and effective African recycling industry is greater than ever before. I hope this report will encourage everyone to raise their ambition so we all collaborate together to build on each other's strengths and swiftly turn this vision for African recycling into reality.

David Woolnough

Deputy Director Research (Tech & Innovation)

The Foreign, Commonwealth and Development Office (FCDO) leads the UK's work internationally, promoting the UK overseas, defending its security, projecting its values, reducing poverty and tackling global challenges.

Only 9% of all plastic waste ever produced has been collected for recycling[1], with current collection rates at about 14% globally[2]. Environmentally and socioeconomically damaging, plastic waste is one of the greatest challenges of our time. It requires a systemic, resilient and collaborative response from all actors engaged across its value chain. This includes governments, non-profits, impact enterprises, manufacturers and wider society. These partnerships must find routes to limit the use of plastics and to improve the ways in which waste is managed, particularly in low- and middle-income countries where the impact is so keenly felt.

We hope that this report will help those across the industry to make more informed investment decisions that support the transition towards a circular supply chain for reused plastic. Together, we can shift the global approach to plastic; reducing its production, keeping it out of our oceans, landfills and drainage systems. Following the devastation of the global epidemic, this also presents a chance to improve millions of lives through the creation of safer, greener jobs in a reformed waste collection and recycling system. In short, this is an opportunity we cannot miss.

1. Production, use, and fate of all plastics ever made, ROLAND GEYER, JENNA R. JAMBECK, KARA LAVENDER LAW, SCIENCE ADVANCES, 19 JUL 2017: Vol 3 no. 7, e1700782 (https://advances.sciencemag.org/content/3/7/e1700782)
2. World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company, The New Plastics Economy – Rethinking the future of plastics (2016, http://www.ellenmacarthurfoundation.org/publications)

This document is an output of a project funded by UK aid from the UK Government, however the views expressed do not necessarily reflect the UK government's official policies.

Fabian Wehren

Partner

With millions of tonnes of plastic still entering the environment every year and the fact that there are still very few sustainable mechanisms in place which make it economically viable for participants to break this cycle. Therefore, innovative, circular solutions need to be found which engage all members of the supply chain.

Through EY Ripples we're teaming with clients and other large organizations to positively impact 1 billion lives in our communities by 2030. We are proud to have had the opportunity to collaborate with Unilever, and FCDO, to access and support the waste management sector in Sub-Sahara Africa through the "Transform" Programme.

Our objective is to make a difference to communities, improve livelihoods, collaborate with entrepreneurs and help bring together all stakeholders to achieve a plastic free environment – through for example establishing a viable circular plastics ecosystem. We hope that sharing the insights and analysis from this work will create awareness of the importance of the informal plastic waste sector and highlight some of the gaps in local plastics supply chains which are preventing the achievement of environmental objectives.

1. Executive summary

The African continent currently leads the world in the **mismanagement of municipal solid waste,** with **93%** of waste not being effectively collected or disposed (Ryberg, Alexis, & Hauschild, 2018). Limited collection and recycling capacity combined with rapidly changing and diverse markets create barriers to capitalizing on opportunities to create jobs, promote economic activities and reduce import dependencies. This is particularly evident in the management of plastic waste throughout the Sub-Saharan African region.

This report maps the current plastic supply chain in a selection of Sub-Saharan African cities in order to identify current capabilities and challenges and to establish **a business case** and **road map** for **transitioning to a circular economy** of **plastics.** This work contributes to addressing knowledge and transparency gaps, and supporting the scaling of an integrated supply chain for recycled material to enable a circular economy of plastics in the region. In selecting the locations examined in this report —**Accra,** Lagos, **Kampala,** Nairobi and Addis Ababa — a range of indicators were considered, such as the level of maturity of the local plastic value chain, projected amounts of mismanaged plastics, the need to improve livelihoods and economic growth expectations.

Common findings of local African waste supply chains suggest that a circular business model of plastic can only be achieved through the **structured inclusion of the informal plastic collection sector,** which is responsible for collecting high-quality plastic at source. If enabled through education and training, they can leverage their community network to **positively influence consumer behavior** for waste segregation at source. Recycling capacities of post-consumer recycled plastic through the most common channels of energy recovery, up-/or downcycling, exports or offtake by domestic compounders and packaging converters are not utilized. Currently, the solutions **focus on rigid mechanical recycling** with a few flexible recycling options observed. The high number of stakeholders across the plastics value chain of each city exacerbate the problem of **poor overall plastic data availability.**

This report explores the collection models for plastics, while the most common is landfill recovery model moving to an integrated, closed loop will rely on more community-based collection as an input for circular recycling methods as bottle to bottle recycled polyethylene terephthalate (rPET) or pyrolysis in the African context. To achieve an integrated supply chain at scale, the following challenges have to be addressed:

- **Logistics:** Within an unregulated plastic collection environment, logistics cost for transportation, and sorting properties to access less infrastructurally connected areas in a city, make the plastic collection for certain low-value types unsustainable
- **Pricing:** Low post-consumer-recycled plastics price and recycling demands are not supported through mandatory extended producer responsibility (EPR) schemes in West and East Africa — only Polyethylene terephthalate (PET) in exceptional cases. They are a key requirement to compete against low-virgin plastic prices

- **Regulations:** Waste regulations in the cities are not enforced enough; industries are hardly incentivized and waste strategies among different authorities are not fully aligned

With **South Africa taken as a benchmark** (for plastics collection and recycling infrastructure, and consumer behavior and regulations), the following **recommendations** are made for the supply chains of the Sub-Saharan cities in scope:

- **Alternatives** need to be developed for plastics packaging to be recyclable, compostable or reusable
- **EPR schemes** for all types of rigid or flexible plastics have to be setup and focus on mechanical recycling capabilities to start growing capacities over the next five years
- Target **input for recycling** should be **45%** for overall plastic waste per city by 2025
- Plastic recycling gap of **over 83 kt** for Accra and Kampala needs to be closed
- Recycling gap of over 480 kt is estimated for Lagos, Nairobi and Addis Ababa
- Target **80% plastics diversion** through **community collection** model **by 2030**
- Build up **over 200 collection centers** to accept all types of plastics for Accra and Kampala over the next five years (estimated costs: over US$30m)
- **Aligned efforts** of **all** supply chain **stakeholders** in a city are required to reach commonly agreed targets. Single company or industry initiatives will hardly achieve a sustainable solution

The recommended road map and time frame of an integrated plastics supply chain at scale have to be and cannot be looked at in isolation. Local strategic collaborations, NGOs, governments, EPR schemes or innovative technologies need to enable each value chain to reach their targets.

City-specific enhancements that will also be needed include:

- Greater Accra's metropolitan area plastic supply chain needs to start integrating its collection system toward community-based models and plastic diversion at source to prevent more than 40% plastic leakage into the environment
- Additional 67 kt of plastics recycling capacities have to be build up by 2025 in GAMA, and local regulartory authorities need to visibily contribute to these targets
- Kampalas-integrated plastic supply chain will have to solve the 50% increase of plastic waste by 2028 through continued investments into at least 30 additional collection centers at scale
- Greater Kampala Metropolitain Area (GKMA) local up-/downcycling industries to source post-consumer-recycled flexible plastics and additional mechanical circular rigid plastic capacities have to be expanded

The amounts of plastics waste yearly in Lagos and Nairobi cannot be sufficiently managed with the current collection and recycling infrastructure. Although some major developments to build up recycling capacities have been made, some key elements as manadatory EPR scheme for all types of plastics have not been implemented yet to stabilize the market.

2. Limitation of the work and findings

By nature, the information made available within the context of this report can neither be exhaustive nor tailored to the circumstances of an individual case. This information does not constitute advice, any other form of legally binding information or a legally binding proposal on our part.

This report is based on the law as of the date of this presentation and reflects our interpretation of the applicable laws and regulations and the corresponding court rulings. In the course of time, laws, their interpretation and court rulings may change. Such changes may necessitate a revision of this report. Please note that we are not obliged to review and revise this report in the event of changes in the underlying facts, assumptions, laws or court rulings, unless we are engaged to do so.

EY makes no warranty, guarantee or representation as to the accuracy or completeness of the content of this presentation. To the extent legally permissible, we do not assume any liability for any action or omission that you have based solely on information provided herein. This also applies should the information prove to be imprecise or inaccurate.

The data used for this report is sourced from external papers and articles, specific city data collection and interviews, and reports on waste management and public data source. Most of the findings and evaluations are based on qualitative interviews with stakeholders across the integrated plastic supply chain in selected markets. Some stakeholders can be found in the appendix.

More than

75

interviews conducted on the phone or ground

This report aims to increase the transparency on the integrated plastics supply chain on previously selected Sub-Saharan cities. It does not claim to display the full picture and should be used as an indication for each market. All published data as part of the city models is an estimation out of previously conducted local baseline studies and qualitative interviews. Certain data gaps have been closed through high-level assumption as indicated in the relevant section. The plastics data for all markets in scope is frequently changing. The selection of cities has been agreed with the funding partners of this report.

3. Glossary

APRA	African Plastics Recycling Alliance
CEFLEX	Circular economy for flexible packaging
CPG	Consumer products goods
EPR	Extended producer responsibility
FCC	Fluid catalytic cracking
FCDO	Foreign, Commonwealth and Development Office
FP	Finished product
GAMA	Greater Accra metropolitan area
GKMA	Greater Kampala metropolitan area
GPMA	Ghana Plastic Manufacturers' Association
GRIPE	Ghana Recycling Initiative by Private Enterprises
HCl	Hydrogen chloride
HDPE	High-density polyethylene
IFC	International Finance Corporation
KCCA	Kampala Capital City Authority
LDPE	Low-density polyethylene
MESTI	Ministry of Environment, Science, Technology and Innovation
MRF	Material recycling facility
MSW	Municipal solid waste
NEMA	National Environment Management Authority
OECD	Organisation of Economic Co-operation and Development
PCR	Post-consumer recycled
PE	Polyethylene
PET	Polyethylene terephthalate
PLA	Polylactide
PP	Polypropylene
PRO	Producer responsibility organization
PS	Polystyrol
PVC	Polyvinylchloride
rPET	Recycled polyethylene terephthalate
UNDP	United Nations Development Programme
UPMRA	Uganda Plastics Manufacturers and Recyclers Association
WtE	Waste-to-energy

4. Introduction

Plastic pollution has become a major environmental issue globally and is expected to increase significantly in the coming years. Current research predicts a 40% increase in plastic production by 2030, (Wit, Hamilton, Scheer, Stakes, & Allen, 2019) forcing governments, private industries and consumers to investigate and develop new solutions across the plastics value chain.

Up to

1 million

tonnes of plastic is lost to the environment in Africa each year.

Evidence shows that the management of waste across the integrated supply chain is particularly prevalent in Africa. The continent leads the world in the mismanagement of municipal solid waste (MSW),[1] holding a share of 93% of mismanaged waste globally (Ryberg, Alexis, & Hauschild, 2018). Plastic highly contributes to this percentage of mismanaged waste with up to 9.5 million tonnes per year (Ryberg, Alexis, & Hauschild, 2018). This highlights the large inefficiencies along the plastics value chain especially in the areas of collection and recycling.

However, the magnitude of the problem posed by plastics waste in Sub-Saharan Africa gives rise to significant opportunities to stimulate economic activity, create jobs and reduce import dependency. Currently, limited collection and recycling capacity combined with rapidly changing and diverse markets create specific barriers to capitalizing on these opportunities. Low consumer incomes, import patterns, and installed production capacity mean it will take time to develop longer-term, sustainable solutions, such as alternative packaging. Consequently, interventions are needed to address the immediate challenge of current capacity constraints while long-term solutions are developed.

With the increasing awareness of the negative plastic impact on the global environment, in recent years, many initiatives, investments, coalitions, producer responsibility organizations (PROs), EPR[2] schemes and government programs have been established in many African countries or regions. These developments have provided the opportunity for many social enterprises and start-ups to enter the plastics collection and recycling market.

Despite these developments, several research studies, data and field studies prove that very few economically viable integrated plastics supply chains, today, exist (regardless of the type of plastic) in Sub-Sahara Africa. For all stakeholders in local or regional supply chains, there is uncertainty around how much post-consumer-recycled material is collected,

1. MSW considers all types of waste gathered from households, public location or industries.
2. EPR is an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle (OECD, 2001).

processed in the domestic market or exported globally. To support the organic growth of each country, further transparency of the end-to-end integrated plastic supply chain is needed to attract the right level of investments into target companies, organizations and, in particular, the informal plastic collection sector to recognize their high-value contribution to the cycle.

The analysis of this report will assess a list of key locations on the African continent to help build transparency along the plastic supply chain and propose a scalable, sustainable model in the context of each city. Accra, Lagos, Kampala, Nairobi and Addis Ababa have been selected based on key characteristics as the level of maturity of the local plastic value chain and projected amounts of mismanaged plastics need to improve livelihoods or economic growth indicators.

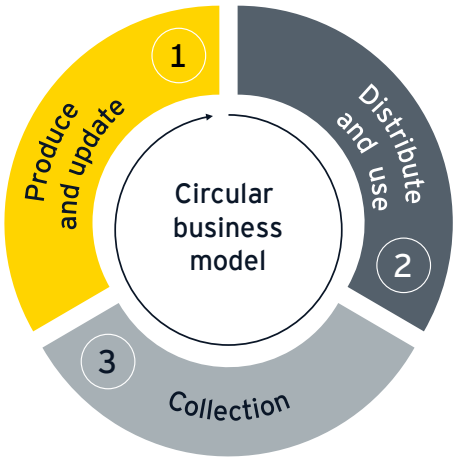
The objective of the city reports is to identify an initial road map, time frame and business case option to create an at-scale integrated supply chain for recycled material in Sub-Saharan African. The recommended business cases will address different timings and stakeholders for action.

5. Integrated plastics supply chain within African context

The proposed model of the integrated plastic supply chain has been adapted to fit into the conditions and requirements within the African context. While it does not reflect the full picture or replace existing plastic value chain models, it does describe the key characteristics of a local supply chain necessary to reach a self-sustaining, domestic plastic circular economy at scale and promote job opportunities.

Circular business models should include the stages: produce and update, distribute and use, and collect. For addressing the problem of plastic waste in the supply chain within the African context produce and update of the plastic packaging or finished goods, and collection of the material from different sources are the most critical.

Figure 2: General circular business model



1. Produce and update

The whole process starts with virgin plastics, a by-product made by petrol chemical companies in the production of oil and fuel. Today, virgin plastics are still the main source for any type of packaging or finished product and the demand is increasing (Wit, Hamilton, Scheer, Stakes, & Allen, 2019).

2. Distribute and use

Through polymer manufacturers, compounders and packaging manufacturers or converters, the final plastic product or packaging is sold to the consumer goods industry (Ellen, Waughray, & Stuchtey, 2016) who eventually distribute the finished product to retailers and their consumers for use.

3. Collection

At this stage, the second major process of the plastic collection starts. Plastic waste at households, community containers or industries is mostly collected through public, formally registered collectors. Non-registered individuals or small entrepreneurs pick up the plastic waste of the streets, at landfills or sometimes at industry partners. The compensation or payment system differs based on the type of collection. Depending on the collector, the waste can be directly transported to official landfills or registered dumpsites, or will be stored and pre-sorted before the plastic is brought to washing, sorting or buy-back centers. Especially in the second direct segregation scenario, many middle-men are involved to compensate for missing storage, sorting or transport capabilities of each individual collector.

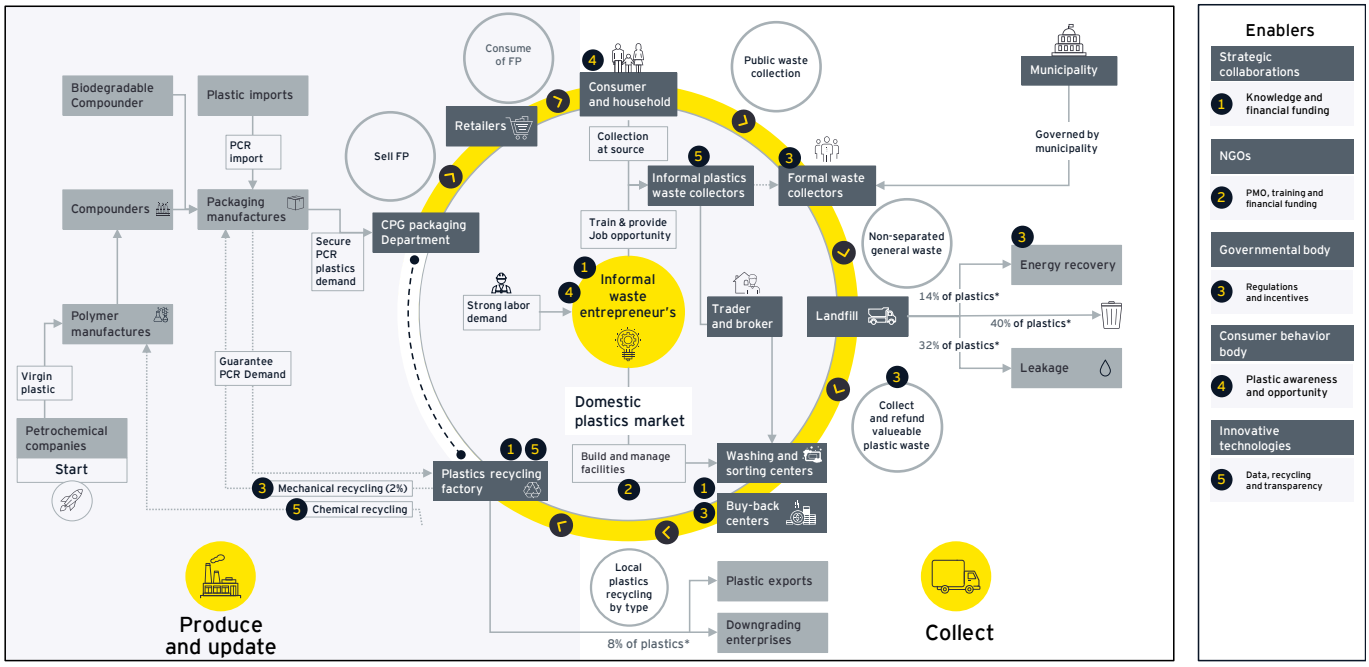
Some amounts of plastic are also segregated directly from the landfills to washing, sorting or buy-back centers. The local plastic waste in the next step reaches plastic recyclers or reprocessors who are usually specialized in different forms of mechanical or sometimes chemical recycling. From there, the plastic follows four common channels:

- Energy recovery through incineration or fuel (local or regional)
- Downcycling or upcycling of the post-consumer recycled (PCR) plastic
- Export of recycled plastic to mainly global customers
- Offtake by domestic compounders or packaging converter to start again

Those steps usually end the loop of the integrated plastics supply chain.

Figure 3 summarizes the detailed plastic supply chain steps within the African context described above on produce, update and collection.

Figure 3: Integrated plastic supply chain model within African context



* Percentages are based on global estimates (Ellen, Waughray, & Stuchtey, 2016)

In addition, key enablers support the supply chain and are considered as key contributors to obtain an economically viable system:

1. **Strategic collaborations** are independent institutions often initiated by the private sector to secure financial funding and knowledge to local recyclers and collectors to help grow their operations or provide an overall neutral operating framework.
2. **NGOs** are active in different areas of the supply chain and highly contribute to the training, education, funding or project management of local communities and entrepreneurs. In addition, they help to provide data to draw the bigger picture.
3. **Governmental body,** as the key authority and regulator in each country,makes decisions relating to policies, operations and incentives around the plastic waste supply chain.
4. **Consumer behavior body** can be a combination of the above enablers that consistently focuses on raising awareness of the impacts of plastic waste, and positively influences and educates consumers to segregate waste. They can act as a platform for all stakeholders of the domestic supply chain to collaborate.
5. **New technologies** are key to increase transparency, help generate data, secure payments and identify new economically viable recycling options.

Conclusion: In the current situation of enormous amounts of mismanaged waste and low plastic recycling rates in Africa, the below question arises:

Which of the major components of the integrated supply chain are not fully functioning and how can a scalable plastic economy grow further?

5.1. Key findings and challenges

Compared with the plastic waste management value chain found in many developed nations, the value chain in Africa is highly fragmented and lacks transparency. Some of the key findings identified include:

Fragmented stakeholders: The high number of stakeholders can make it difficult to obtain a transparent view of the local plastic market. In many cases, continuous changes at manufacturers, collectors, recyclers or regulatory authority level and different reporting methods make data less reliable and available.

Reliance on the informal waste sector: The key differentiator of most African recycling operations from those found in most developed regions is the strong presence of informal plastic waste entrepreneurs. For each city in the scope of this report, they are the key source for recycled plastic. As segregation at source is low and mainly happening in more wealthy areas of a city, this group provides access to high-quality plastic recycling waste by often collecting the waste directly from the communities. Some of those individuals have formed small plastic business operations, or they have collaborated with social enterprises to expand or participate in larger projects.

Informal collectors are a key source for recycled plastic

Limitation of recycling capabilities: The domestic plastics recycling capabilities are very limited. With the plastic waste import ban of China (2017) and India (2019), the sub-Saharan local recyclers are increasingly focused on developing their recycling manufacturing operations and capability locally. However, most of these solutions are fragmented, lacking a "closed-loop" recycling system.

Recycling capabilities limited to **fragmented solutions**

Most of the solutions involve upcycling or downcycling processes into non-food products such as bins, pipes or the construction industry which extend the lifecycle of the plastic. Export or energy recovery are often performed on a lower scale.

The mechanical recycling methods used are mostly shredding (reduced transport costs), balling, flaking or pelletizing. The plastics recycling capabilities are limited to fragmented solutions rather than a truly circular recycling approach[3] because of high investment costs, risks and uncertainty on economically viable recycling technologies.

Type of plastics recycled: The capability needed for plastics recycling also depends on the type of plastic being recycled. Whereas PET, polyethylene (PE), polypropylene (PP) collection and mechanical recycling facilities for rigid plastic exist in most African cities, a decline in these rates is seen for flexible plastics, including low-density polyethylene (LDPE), PP, polystyrol (PS), Polyvinylchloride (PVC) and other laminates. Vertical integration of plastic packaging converters into recycling operations typically only happens on a small scale. In order to use recycled plastics instead of virgin plastics, converters are dependent on the local recycling industry. Therefore the main source of plastics remains virgin as there is not a strong supply for post-consumer recycled (PCR) plastics for many markets in the scope of this report.

Waste disposal infrastructure: Landfills and dumpsites often do not fulfill global standards, and are often not approved by authorities (rather theyare acknowledged). High amounts of waste still leak into the environment even when it has been formally collected.

At least **40%** of uncollected waste in Sub-Sahara

To achieve the vision of a domestic closed-loop circular integrated plastics supply chain at scale, all activities should recognize the following key challenges in the context of each metropolitan city.

Logistics: High logistics costs for collecting plastic waste relative to the value of the material can make the collection very unstable and expensive. Many of the informal entrepreneurs lack sufficient infrastructure to collect plastics, and do not have the appropriate storage and sorting facilities because of high rental prices. Most are also dependent on small-scale traders or middlemen to transport their plastic to a storage, washing or sorting location – resulting in an increase in price. The cost for a collector to own transport, such as a truck or even a tricycle, is too high. In addition, in some communities, there is poor road infrastructure or limited road access. There can be large areas of a city that are not connected to any waste management system.

3. Circular plastic recycling in this report considers all forms of chemical or mechanical recycling (ie., rPET bottle to bottle), which allow to convert and reuse the plastic into a similar quality form of packaging or finished product of the original use (food or non-food).

Pricing: Prices, and thus revenue, generated for PCR plastics can be very unstable and will differ depending on the type of plastic. Rigid plastic, including PET, high-density polyethylene (HDPE) or PP, usually generates higher prices per kilogram because of ease of collection and greater recycling demand (both locally and regionally). Often lightweight materials, such as plastic bags, packaging foil and most multi-layer packaging will not be collected due to high level of efforts and low market prices. If the market is over-supplied by a specific type of plastic, the prices in the supply chain immediately drop for the local collectors. During interviews with several supply chain stakeholders (please refer to chapter 14.2), this happened for the price of PET at the end of 2019 in several Sub-Saharan cities.

Prices for PCR plastic needs to be < virgin plastic to sustain integrated plastic supply chain

In addition, global macro-economic dynamics can influence the integrated plastics supply chain and all stakeholders involved. For example, the low oil prices experienced during the first half of 2020, as a result of the COVID-19 pandemic, have meant that the production and supply of virgin plastic are once again less expensive than PCR plastic. This development disrupts the entire plastics supply chain. A key medium-term requirement of a sustainable integrated supply chain at scale is that PCR plastic prices need to be less than or equal to the comparable virgin plastics price (Staub, 2020).

Regulation: From a regulatory perspective, some further challenges slowdown the development toward a sustainable integrated plastics supply chain at scale. To collect plastics or waste, in general, collectors and companies need to register and negotiate contracts with each municipality to receive a permit. In order to expand scalable models or projects, the relationship management with each local authority until a final authorization is granted can be very complex and lengthy.

Uncertainty about new governments and their agendas around elections plus frequent discussions on bans for certain types of products of plastic prevent the recycling industry to build up. Regulation on, for example, minimum content of bio-degradable plastics, tax incentives or funds planned to be reinvested into the economy are not enforced although it has been previously announced. The presence of this behavior has a negative impact on the integrated supply chain of plastics.

5.2. Key trends and opportunities

The findings and challenges on the African integrated plastics supply chain reveal a number of areas for improvement to enhance circularity and capitalize on benefits from the large job opportunity potential.

Sub-Saharan country governments, global and local private companies, NGOs, and social entrepreneurs have recognized high plastics awareness and momentum of global events, such as the World Economic Forum 2020 where plastics and circular economy have been very high on the agenda. For example, Ghana was the first Afraican nation to join the Global Plastic Action Partnership (GPAP) in October 2019. During interviews and field visits, it was clear that the commitment and desire for investment from private companies, and investors to partner with local organizations in the plastic supply chain are very high for all cities examined as part of this study. All members collaborate, despite direct competition, to improve plastic circularity and reach their ambitious targets.

On the ground, small entrepreneurs are beginning to expand and vertically integrate from focusing on just collection, to providing logistics services, trade plastics or building up small, local buy back centers with storage, sorting and some reprocessing capabilities. Packaging converters are interested in scaling up and sourcing more PCR plastics as they see the market expanding especially for upcycling or downcycling opportunities.

The demand for the labor market to earn a sustainable, additional income through the plastic waste collection is very high. Still, an unstable waste infrastructure (logistics and pricing) and clear regulatory framework can slowdown the process.

Regulatory institutions acknowledge the challenges and large job creation opportunities. In many cities, the authorities have implemented actions and support to accelerate private sector initiatives. In order to control and better organize the waste collection, Sub-Saharan cities are splitting into zones – for which formal collection authorization is granted.

5.3. Recommended actions

The proposed actions should not be considered in isolation and will be explained in more detail in the following chapters in the context of each city. The actions should happen in parallel and the proposed sequence gives an indication of the highest long-term plastic impact:

Develop Alternatives

Alternative solutions by polymer suppliers, manufactures and recyclers

Regulations

Governmental waste management regulations, tax incentives on investments, recycling subsidies to steer plastics demand and supply

Infrastructure development

Help to develop a scalable plastic supply chain infrastructure

Consumer behaviour

New awareness to reduce contaminants in the recyclable waste stream

1. **Develop alternatives:** As a basis, alternatives need to be developed for plastics packaging to be recyclable, compostable or reusable. This needs to be driven from the upstream supply chain (retailers, consumer products companies and packaging manufacturing) to shape a plastics collection market where all plastics waste has a recycling demand and a value. This will also help to secure an offtake market for domestic recyclers.
2. **Infrastructure development:** Recycling capabilities in relation to the total amount of plastic in each market are very limited. It is essential to scale those up for all types of plastic through different recycling technologies in order to generate a pull-effect for the local collection market of PCR plastic material. Where and how to invest depends on the characteristics of each city and their corresponding split by type of plastic.
3. **Infrastructure development:** Informal and formal collectors need to collaborate further. In particular, the work of informal entrepreneurs and waste pickers needs to be enabled by centrally provided infrastructure, including collection points with storage, sorting and, in the medium-term, reprocessing capability for all plastic waste. These points need to be set up for all communities especially in areas where access is difficult and not served by formal collectors. All volumes of the pickers will be registered per individual and with different payment options (i.e., immediate cash out vs. periodically). The funding needs to come through private and public institutions until the model is self-sustaining. It is recommended that waste pickers or informal entrepreneurs share some parts of the investment to guarantee their commitment.
4. **Regulatory:** To address the challenge of unstable prices and low attraction for the collection of certain types of plastics, EPR schemes for all plastic types need to be established. This model has been successful in South Africa and some parts of East Africa. The form of the EPR scheme depends on the local market and type. They should help guarantee that prices for plastic waste are paid across the collection steps of the supply chain.
5. **Consumer behavior:** Awareness of the negative impact of plastic waste, and the need for segregation at source must be continued at households, schools and open spaces by private, non-governmental or public institutions. To align the messages and impact of the knowledge transfer, it is recommended a domestic independent consumer behavior body is established to achieve a neutral perspective.
6. **Regulatory:** Central incubators, such as tax incentives for investments, accelerated registration or approval processes of projects are required to scale up. Supporting these, public waste guidelines and laws in the Sub-Saharan African cities have to be enforced. Discussions around bans often prevent the recycling industry to act. To improve the plastics circularity in the context of each country or city, it is recommended to introduce laws to stimulate favored recycling methods (i.e., minimum percentage of biofuel in overall fuel) or increase quality requirements for difficult to recycled plastics products (i.e., PS single-use packaging must be fully biodegradable).

6. African waste collection and recycling capabilities

Public waste collection model

Landfill recovery model

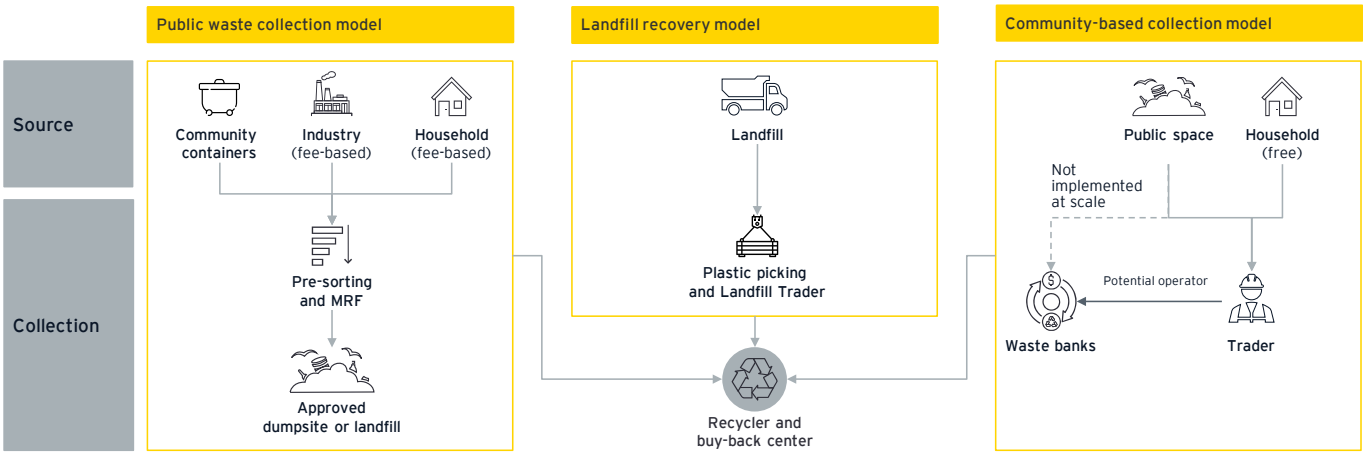
The types of plastics collection and recycling in the context of Sub-Saharan Africa show different characteristics when compared with other continents. The illustrated models for collection and recycling do not claim to show the full picture of every African city, but focus on plastic and exclude any possible models in rural areas.

Plastic waste collection models

In Africa, plastic waste is mainly collected through three different models, which are predominantly influenced by the source of collection.

All investigated Sub-Saharan cities have a public waste collection model where local regulatory authorities provide concessions to private enterprises that collect the municipal solid waste (including plastic waste and other components) from community containers or fee-based from the industry and households. The mixed waste is presorted, where few valuable items as PET bottle or HDPE container are sold to traders, before reaching the landfill. The second-most common plastic collection system and source of recycled plastic

Figure 4: Most common plastic collection models within African context



emerge through landfill recovery which serves hundreds to thousands of informal waste pickers as an additional income. For both models quality of plastic is often lower and high-value items can hardly be found. The largest source of recycled plastic in the cities of Sub-Sahara Africa is generated through the community-based collection model with informal waste entreprenurs or individual at its center. Low prices and logistic costs make the model less reliable. Because of the lower degree of contamination, community-based collection offers the overall best-recycled plastic quality.

Community-based collection model

Plastic recycling technology and capabilities

The life cycle of plastic recycling technologies significantly differs in Sub-Sahara Africa. Mechanical recycling[4] technologies dominate the industry, whereas only a few large-scale chemical recycling[5] attempts have been made. Pyrolysis seems to be the most economically viable chemical recycling method in Sub-Sahara Africa. The plastic upcycling or downcycling industry at scale can be considered as a valuable alternative for flexible plastic packaging types.

4. Mechanical recycling generally is achieved through size reduction of the plastic waste after the material is washed, dried, extruded and compounded (Al-Salem, Lettieri, & Baeyens, 2009).
5. Chemical recycling returns plastic waste to feedstock for new plastics (Al-Salem, Lettieri, & Baeyens, 2009).

7. Case study: South Africa

Plastic benchmarks and key learning

South Africa's integrated plastics supply chain and its recycling industry are well-developed and can be seen as a benchmark for most Sub-Saharan regions. In many cases, it proves to be economically viable, meeting economic principles for the local market. Those conditions are critical as the general municipal solid waste generated per capita per day is up to three times higher compared with other Sub-Saharan countries in the scope of this study (UNEP, 2018).

- By 2030 there will be no plastic waste at any landfill in South Africa. There is a clear, ambitious target support by all regulatory authorities
- Over 46% of plastics input for recycling in South Africa
- Mechanical recycling methods dominate the industry. Only PET is currently recycled into food-grade plastic through an rPET bottle-to-bottle plant
- Flexible packaging is seen as the largest recycling application
- Only observed non-PET extended producer responsibility scheme across Sub-Sahara Africa

Domestic plastic improvement potential

Although some progress has been made, there is a significant improvement opportunity for the South African-integrated plastic supply chain to increase social acceptance of the informal waste sector and identify an inclusive approach of the people. A waste management scheme where informal entrepreneurs remain independent with some form of increased central registration and waste collection monitoring capabilities is required to close the visible waste collection gap of 34%. Consistent consumer behavior campaigns with aligned messaging across the regulatory institutions and the private sector need to be ensured. To stabilize plastics prices extended producer responsibility systems have to be adapted with focus on a scalable, sustainable recycling demand.

Waste management scheme **inclusive of informal sector** required to close **34% waste collection gap**

8. Case study Accra

Introduction

The greater Accra metropolitan area (including Tema) has an estimated population of 4.3 million inhabitants in 2020 and is expected to grow over 5 million by 2030 (United Nations D. o., 2018). In recent years, plastic waste has become a significant issue and is seen as a key contributor toward devastating flood impacts on infrastructure and livelihoods, which occur across Ghana every year as the waste blocks the drainage systems. This development has attracted a lot of domestic and international attention on the market. In addition, small-scale entrepreneurs have also used the opportunity to start their businesses around services in plastics collection and recycling.

Still, the metropolitan area of Accra is facing large challenges to operate the integrated plastics supply chain at scale. Logistics costs to collect and transfer the plastics to the recycler are very high, considering the low and unstable prices per kilogram for many types of plastics. Regional imports of better quality and lower value of plastic scrap increase the competition. Consumer behavior to segregate waste at home is not sufficiently done and frequent discussions with the 28 local municipalities slowdown the process from expanding.

Integrated plastic supply chain model

Accra's integrated plastic supply chain on a macro-level differentiates itself significantly from other plastic markets in the West and East Africa. Accra (GAMA)[6] is seen as the plastic manufacturing hub in the region, with its direct access to marine waters and distinct plastic recycling capabilities.

Countries, such as Burkina Faso, Mali, Togo and Benin, benefit from those characteristics shipping large quantities of plastics waste for recycling or finished goods into Accra and returning with full container loads of finished goods imports for all different kinds of products. On the basis of the UN Comtrade Database (United Nations D. o., 2020) Ghana has imported 309 kt of any type of plastics product in 2018 of which around 190 kt of finished plastic products and various forms of plastic scrap entered into Accra, according to an existing baseline study from 2018 (Gouttebroze, 2019). Plastics export represent only a fraction of 67 kt but with a much higher value of US$206m (United Nations D. o., 2020). Compared with other Sub-Saharan cities, these amounts of exports are still relatively high. For the year 2020, the assumption is made that the total amount of plastic waste in the urban agglomeration of Accra is a little higher compared with 2018 – at around 230 kt of plastic waste (Foundation, 2019). It is important to note that plastic waste data availability for Accra is very limited, unstable and highly dependent on the stakeholder group from where it is collected.

Total estimated plastic in Accra:

230 kt

The above-described macro-circumstances are key to understand the integrated plastic supply chain and the resulting model. The metropolitan area of Accra processes significantly higher amounts of plastic waste relative to its size when compared with other Sub-Saharan cities.

6. Greater Accra Metropolitian Area

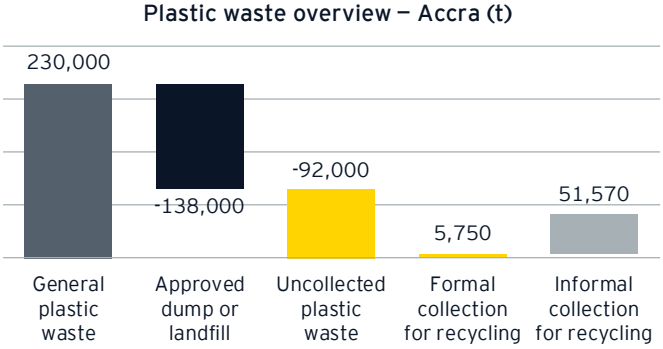
92 kt
remain uncollected

The municipal solid waste (MSW) plastics compositions seem to be equally split with a slightly lower percentage of PP and PS materials (Gouttebroze, 2019). Over 9 major packaging manufacturers operate in the market to supply producing consumer goods companies in GAMA with plastics packaging from virgin plastics. Public retailers and supermarkets with a market share of only 20% play a lower role in the upstream supply chain and thus they have a lower impact on acting as potential influencers for consumer behavior. Of the estimated 4.3 million consumers in GAMA, around 60% are accessed through formal waste collection. As segregation at source is only happening in selected cases, most of the plastics are part of the MSW picked up at community containers and brought directly to the landfill. As a result, at least 92 kt (40%) of plastic waste are not collected and end up in the environment. In addition, the 68 known dumpsites and two approved landfills do not meet engineering standards, and contribute to an even higher number of leakages into the environment.

Focusing on plastics collection and recycling in the integrated supply chain, it can be assumed that 90% of the recycled plastics are collected by the informal sector which has been confirmed by various selected stakeholders. As indicated already in the general model, in Accra, informal waste entrepreneurs and individual waste pickers, thus, form the main PCR plastic source for GAMA besides the imports. Many small-scale enterprises or larger recyclers collaborate with the sector which serves for at least 5,000 people as an additional source of income (Gouttebroze, 2019). Still the 28 municipalities do not officially recognize their efforts. Some of the small-scale collection, trading or even recycling enterprises also operate in municipal areas where they do not have authorization.

The number of official plastic washing, sorting or buy-back centers are assumed to be around 20 but they are rapidly and uncontrollably changing. Often, they are operated and funded through plastic collection projects of the private sector or NGOs. In addition, they are used for training and education purposes of the consumer or informal waste pickers. The transport toward those centers or direct recycling facilities is dominated by middlemen who provide logistics capabilities, such as tricycles or trucks. Independent of the plastics type, the selling price per kg to those middlemen can be up to half the price a waste picker would get at a buy-back center.

Figure 5: Plastic waste overview Accra



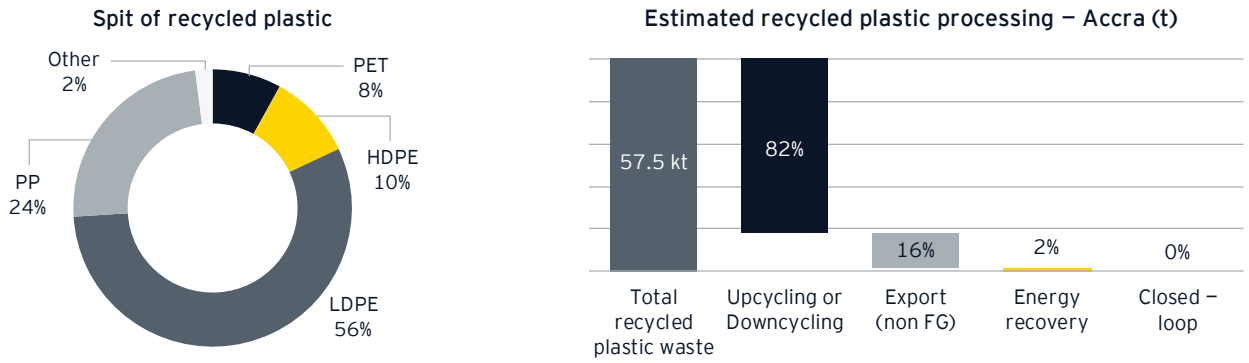
At the downstream supply chain, on the basis of the recycler level, it is estimated that at least 25% of the total 230 kt of plastics waste in GAMA are recycled. This number varies a lot depending on the stakeholder group as no neutral, reliable data source is available. On the basis of the qualitative recycling data of this report, it is assumed that plastic recycling capabilities of 95 kt of plastics exist every year in Accra (approximately 40%). This number is highly driven by a report of Ghana Plastic Manufactutimg Associations (GPMA) which claims to recycle 250 tonnes per day in GAMA (Keesmann, 2019). Considering that certain recyclers only use imported plastic waste from outside Ghana, SC stakeholders have a different understanding of the region in scope and capacities are not fully utilized this report assumes a recycling rate of around 25%.

A large portion of the plastic waste recycled is imported and transformed into finished plastic goods, such as black plastic bags, bins or pipes – some of these products are exported again. The demanded plastics for recycling are mainly LDPE at 56% (water sachets and bags) and PP (such as pipes) at 24%. Compared with other markets, Accra, today, has a significantly lower demand for recycled PET plastics. Other types of plastics, such as PS, PVC or multilayer plastics are not recycled (Gouttebroze, 2019).

Besides the large gap on collection level today, no closed-loop domestic recycling economy exists in the greater Accra metropolitan area. Most of the collected plastics waste is upcycled or downcycled (82%) into longer-lasting finished goods compared with short-life plastics packaging. There are no local capabilities to produce food-grade plastics out of recycled material. Also, the upcycling potential for the domestic construction industry is happening at a low scale compared with other Sub-Saharan cities. Reprocessed PET waste is mainly exported to Europe because of the missing local manufacturing capabilities. The collected volumes used for energy recovery into fuels are very low and hard to sustain, given the global fuel prices and operational costs. There are no waste incineration facilities.

With the overall large recycling plastics capabilities in the Sub-Sahara, Accra's integrated plastic supply chain benefits from many key enablers to achieve a scalable plastic process and job creation opportunities. Ghana, with Accra as the center,

Figure 6: Split of recycled plastic by type and applied plastics recycling methods in Accra, Ghana



has been selected to become the first African member of GPAP.[7] This initiative provides the country with the necessary attention and forum to bring all stakeholders of the plastic supply chain together, and attract foreign investments. Key strategic collaborations have already formed among the consumer goods companies (Ghana Recycling Initiative by Private Enterprises (GRIPE)) and plastics manufacturer (GPMA)[8] to join forces and address the plastics pollution problem on the ground and with the government. Still, their actions and amount of involvement are not fully aligned and impactful.

The integrated plastic supply chain of Accra is also used to initially operate innovative technologies to better track and gather data on plastic waste. For example, Coliba is using an app to directly report plastic collection volumes of individuals and handle the payment process. The United Nations Development Programme (UNDP) has started to develop an early stage tool to map and track all collection points, companies, etc., across the city to provide transparency on the supply chain.

Enforcement of local plastic regulations are required to achieve an economically viable system.

In the past, many promising activities have been initiated by regulatory authorities, such as MESTI or the MSWR, to tackle specific problems in the supply chain. A 10% tax on plastic and plastic product's creation has been introduced in 2013 to build up a plastic waste recycling fund. It was planned that all flexible products produced in Ghana need to have biodegradable components and if those are below 20 microns are banned from November 2019. The described actions have not been materialized until today. The contribution of the plastic recycling fund is not seen and the ban has not been enforced in the final stages. Although waste management policies exist for Accra, the general law enforcement is very poor. In addition, organizations, such as the GPMA argue that plastic imports are not subject to taxation which is claimed to give the domestic plastic industry a competitive disadvantage (GNA, 2019). During the research, the data did not reveal any significant tax incentives for areas of the plastics supply chain.

In the prospect of the near future (2020 and 2021), a lot of initiatives are currently running to close some of the recycling gaps. Very concrete plans exist to build up domestic closed-loop mechanical recycling capabilities for PET. In addition, a feasibility study is running in 2020 for a large-scale chemical recycling facility in Accra, demanding collection from GAMA and beyond. GPAP has the objective to transform into a self-running program as the national plastic action plan (NPAP) within the next two years and act as the major neutral driver to improve plastic pollution in Ghana.

Yet, to operate an integrated plastic supply chain at scale, close the uncollected waste gap and create jobs in Accra, an improved collection network needs to be set up with the support of key enablers.

Recommended actions and time line

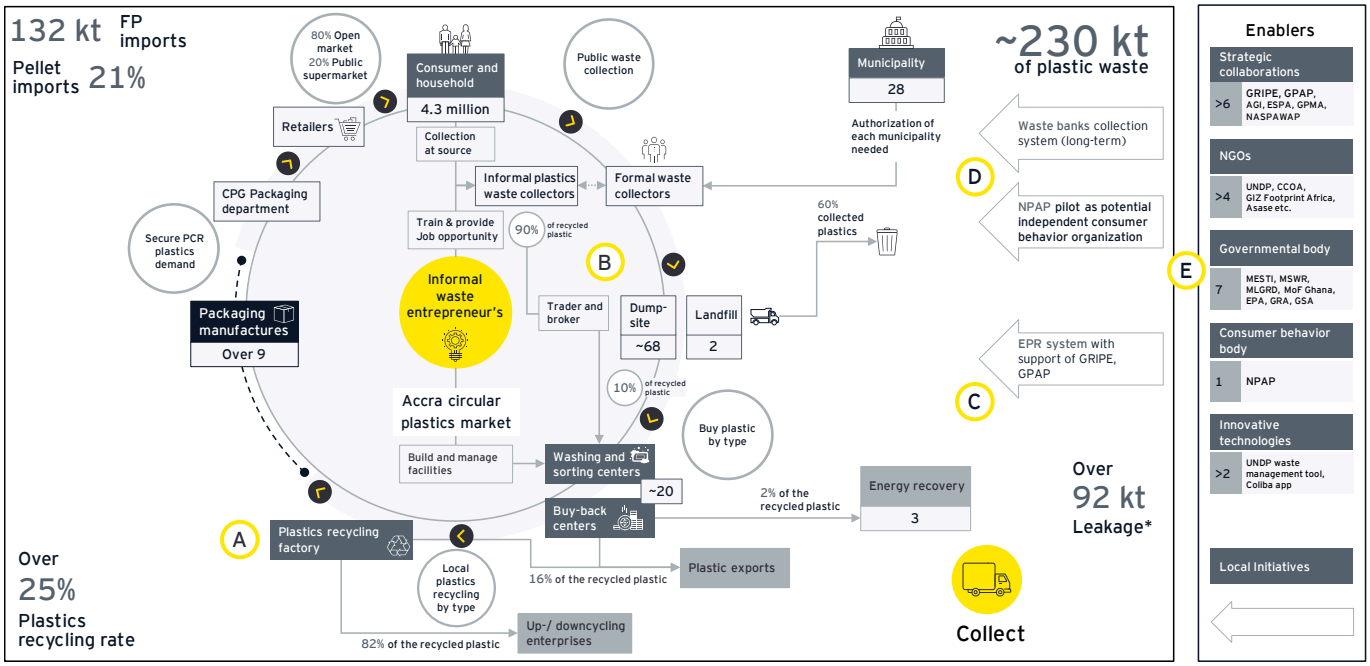
The recommended action for each city focuses on the key dimension's infrastructure, consumer behavior and regulatory. Any recommendation on alternatives is described in chapter 4.3 and applicable for all Sub-Sharan cities within the scope.

The integrated plastic supply chain of Accra, as described, in the previous section faces some significant gaps which shall be addressed with the following actions in reference to time.

7. Global Plastics Action Plan
8. Ghana Plastics Manufacturing Association

So far, no closed-loop domestic recycling capabilities and a large gap in recycling for PET, HDPE and most flexible, multi-layer plastics exist. The waste collection rate does not reach 100% and the important informal sector for plastics collection is not recognized sufficiently. Price fluctuation and logistic costs make it very difficult to sustain plastic operations. Supply chain stakeholders follow too much of their individual agendas, and consumer behavior needs to improve over time. Measures of the local regulatory institutions have not been enforced sufficiently.

Figure 7: Integrated plastic supply chain model Accra



* Leakage: plastics not entered into the SC – uncollected

The plastics infrastructure across the end-to-end plastics supply chain in Accra needs to be the primary focus to reach scalability. The 25% plastics recycling rate for all types must be increased to at least 45% to reach a significant impact on the streets and coastline of Accra (under the assumption of an estimated 276 kt annual plastic waste volume by 2025). This means at least 67 kt additional recycling capacity today and up to 100% of waste collection across GAMA.

A. Plastic collection demand needs to be built up for all types of plastics in the recycling industry. While upcycling through mechanical recycling of LDPE and PP is already operating at scale, it can be assumed that this market is to be soon saturated locally. The largest potential is to close the recycling gap on PET, where most waste is currently exported through a domestic closed-loop recycling solution – a large-scale rPET bottle-to-bottle plant is needed with recycling volumes between 15 kt to 20 kt per year. For flexible plastics, a hybrid solution is required depending on the quality of the plastics. For high-quality PP, PE and PS plastics, chemical recycling through, for example, pyrolysis into fuels might be a highly advanced solution if collection volumes of at least 22 kt can be achieved. The key constraint is the time line by when collection can scale up to reach those volumes. Lower quality of flexible plastics needs to be further contributed into the upcycling industry, which needs to grow further to open additional recycled plastic capacities. Compared with other Sub-Sharan markets, it can be assumed that the upcycling demand into the construction industry could be further developed.

Additional recycling volumes:

67 kt

Up to

100%

waste collection coverage in GAMA

B. To scale up collection and recycling in the short- and mid-term until 2022, industry members must join force and leverage investments through existing alliances rather than investing individually into often small-scale entrepreneurs or projects. For the private consumer product sector, it can be recommended that all GRIPE members use the alliance to centrally bundle their investments into the downstream supply chain by type of plastic. Here, a split on investments into recycling solutions can be made for members with a greater responsibility on rigid plastics (PET and HDPE) and members on flexible plastics (LDPE, PP, PS PVC, Laminates and others). Organizations, such as GPMA or the association ghana industries (AGI) should contribute in a similar way. The degree of investments should be seen in relation to the plastic waste input into the market. For the rigid plastic players in the market, it is recommended to help close the substantial recycling gap on PET and HDPE (i.e., participate in the local bottle-to-bottle plant initiative). Companies with greater amounts of flexible packaging need to find the right balance between upcycling or downcycling recyclers and chemical recycling opportunities.

   GRIPE, GPMA, AGI, the National Association of Sachet and Packaged Water Producers (NASPAWAP) or the Environmental Service Providers Association (ESPA) in the short term need to carefully evaluate which small entrepreneur, trader, collection consortium or project has the knowledge and business case to scale up collection for all types of plastic. It can be assumed that targeted, scalable and especially joined investments will help the scattered collection market in Accra to consolidate and form further collaborations while integrating the informal people. To understand the long-term actions to scale up for plastic collection, please follow the recommendation under point D.

C. In Ghana and major parts of West Africa, no EPR system for plastics has been rolled out yet. Price fluctuations and uncertain demands for specific types of plastic make the collection very unattractive – especially LDPE, PS and laminates collection with their low-weight and limited available recycling technologies. Logistics costs have an additional negative impact to obtain a viable supply chain. Thus, it is recommended to set up a joined industry-owned EPR scheme where every type of plastic stream is included but treated on an individual basis as the demand and recycling capabilities differ. On the basis of the learnings from South Africa, it is recommended that any form of EPR system requires a certain degree of financial or operational

   commitment by the benefitting party. Organization, such as GRIPE, NPAP and others, need to take that additional responsibility to stabilize the plastic supply chain and guarantee a demand for collection under attractive price conditions.

D. To integrate the informal sector, which is key to high-value recycled plastic material and improve the livelihoods of the people, the plastic collection infrastructure needs to be better organized to reach 100% of waste collection instead of the current 60% in Accra. Therefore, in the long-term, central collection points (waste banks)[9] for recyclable waste (including all types of plastics) need to be established for each community. Starting point need to be communities with no or limited access to the public general waste system where individual waste pickers can leverage their community network, and safely sort, store and cash out their collected materials. It is important to collect and accept all types of plastics at those facilities. This further encourages members of the plastic supply chain to find recycling solutions. It needs to be ensured that enough space to store and sort the material is available, and that initial plastics reprocessing steps exist (i.e., crushing machine) to drive down logistics costs.

   Through the support of GPAP, regulatory institutions (MESTI and MSWR), private industry sectors (GRIPE and GPMA) and established small entrepreneurs need to be involved to centrally agree on locations, accepted waste, financial funding and operational infrastructure of such facilities. Existing enterprises can be contracted to run selected waste banks. In order to sustain the operations, EPR schemes need to help stabilize the pricing over time.

9. A waste bank is one of the community-based waste management system that enables public to actively participate in managing their environment (Retno Wijayantia & Suryania, 2014).

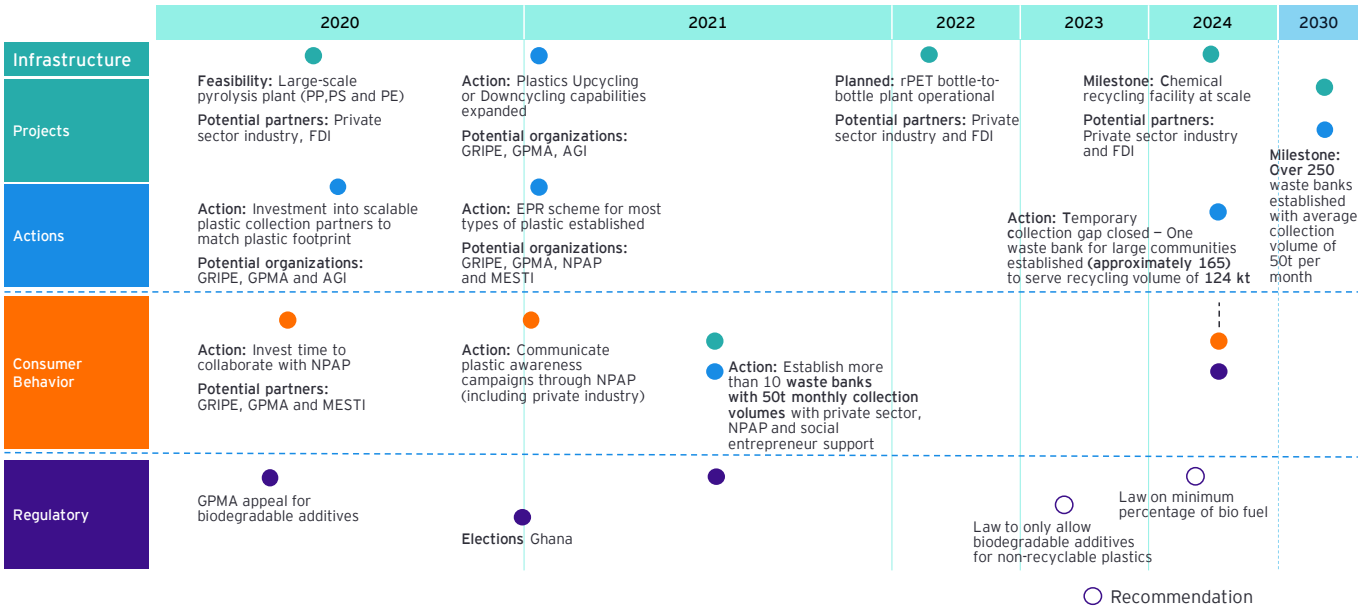
Such an integrated plastic supply chain collection infrastructure can, on the one hand, help to educate the informal plastic collectors and, on the other hand, improve consumer behavior for segregation at source as more people will be reached. It also complements the public MSW collection activities. A future NPAP organization might help to further steer a conscious plastics consumer behavior conversation in Accra (Ghana).

E. Most of the recommended actions require key contribution and participation of the regulatory institutions in Ghana who have recognized plastic waste as a key challenge. Still, an integrated plastic supply chain at scale is only viable if law enforcement is improved.

If for certain types of plastics, such as PS, no economically viable recycling solution can be found, a law to only allow PS plastics with biodegradable additives will need to be introduced to protect the environment. Another solution might be a minimum small percentage of biofuel in the overall fuel mix for Ghana in order to release some price pressure on the downstream plastic supply chain.

To highlight the recommended actions and current developments to reach an integrated plastic supply chain at scale for Accra, some key milestones have been mapped on a five-year time line below. It is important to note that these points cannot be looked at in isolation and that they do not claim to show the full picture of needed actions.

Figure 8: Recommended road map to build up Accra's integrated plastic supply chain



9. Case study: Kampala

Introduction

Uganda's capital Kampala has experienced increasing plastics pollution problems for years. With its up to 3.3 million permanent inhabitants (including Mukono district) and 1.8 million transient (United Nations D. o., 2018) (Kristensen, 2018), the city constantly tries to find ways to tackle key symptoms. The landlocked country is highly dependent on all types of imports transported from the Eastern ports in Kenya or Tanzania. Over the last years, several attemps have been made to ban plastic bags below 30 microns, but all of them have failed as opposed to its neigbors in East Africa.

Total number of plastics is expected to grow over

16 kt

per year in GKMA.

Global public awareness on the lacking integrated plastic supply chain in Uganda is seen because of the missing private industry, the economic relevance of the market in the region and still relatively low estimated percentage of plastics (6%) in the MSW (KCCA, 2020). Still, with Kampala as the main driver, regulatory authorities are closely working with the local industries to increase collection and recycling in a structured and scalable way for some types of plastics.

Integrated plastic supply chain model

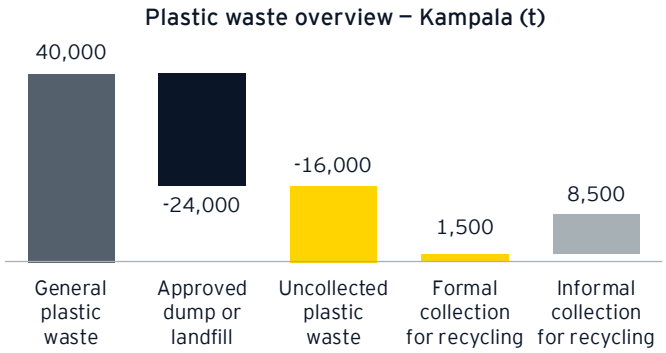
Kampala's regulatory authorities and its private sector are highly involved to improve the integrated plastic supply chain and increase data availability.

Thus on the basis of official estimations, it can be expected that around 40 kt of plastics are generated yearly in the greater Kampala metropolitan area (GKMA) (Kristensen, 2018). This number is expected to grow by 50% to around 60 kt by 2028 (KCCA, 2020). Considering that only 60% of the MSW is picked up, the total amount of plastic in Kampala's environment is increasing every year. To address this topic, the city's public waste management system will be adopted. The initial seven zones, which have been operated by three concessionaires in the formal collection will be expanded to 27-serviced divisions (KCCA, 2020). This will allow new collectors to enter the market.

High dependence on imported finished goods, including plastics packaging.

On the upstream plastic supply chain, most domestic plastic packaging manufactures have formed into Ugandas Plastics Manufacturers and Recyclers Association (UPMRA) to produce different types of plastic products. For manufacturing consumer goods companies in Uganda, some of the packagings are sourced from that industry (especially PET). Most of the plastic finished goods or packaging are imported and sold on the domestic market. This also applies to virgin plastic. This dynamic makes it very difficult to secure a PCR plastics demand for the domestic market on the consumer-goods level. Consequently, to ensure that enough recycled plastic is demanded, regional plastic manufacturing hubs in other East African markets play an important role. In Uganda, retailers are considered to have a very low influence on the integrated plastic supply chain.

Figure 9: Plastic waste overview: Kampala



Of the large amount of 5.1 million consumers in GKMA 2020, only around 3 million are serviced through the formal public waste collection. Segregation at source, in most cases, is not happening, although a certain awareness on the value of plastic waste is known. One source of recycled plastic happens on the way to the landfill where valuable plastic items are picked from the general waste (mainly PET and PE) and sold in separate bags to traders along the street. The rest of the MSW is either brought to the only existing landfill at Kiteezi or dumped at the over 200 official, unofficial or illegal dumpsites (Asiimwe, 2018), which increases plastic leakage into the environment. A second landfill is planned in a few years. At Kiteezi, plastics with mostly fewer values are extracted by informal waste pickers and sold to traders nearby as a second source. The recycling quality of the plastic is very low by then. Still, both sources provide low-scale input into the plastic market. The main source for high-value recycled plastic is again generated through informal waste entrepreneurs or individuals. It is assumed that 80% to 90% of the recycled plastic is sourced through that sector in Kampala. While most of the plastics still reach the recycler through traders or middle-men who can provide improved logistics capabilities, over the last two years, some community-based collection centers have been established on the pirvate sector and KCCA collaboration, which collects all types of plastic at market prices.
The regulatory authorities provide the land, and subsidize, support transport for those centers. This can be considered as an initial step to increase collection efficiencies and scale up the plastics collection supply chain in Kampala. By end of 2020, it is planned to set up 15 collection centers (vs. 6 today) across the city, which should be independently operated through private industry partners. Qualitative data confirms in case a collection center exists, 47% of all plastics in the community are collected.

The unstable plastic price challenge and high logistics costs along the plastic value chain also apply in Kampala. Any type of plastic is sold at least half the regular price through traders or truck loaders (Asiimwe, 2018). Informal entrepreneurs can hardly afford any type of logistics vehicle or storage facilities.

PET is the **dominant plastic type** for GKMA's recycling industry.

The recent ban of plastics exports to India in October 2019, after China in 2017, caused a rapid surplus of crushed PET in Uganda. These macro-economic externalities led to a decline of the local PET prices which is assumed to be the most common type of plastic in the MSW. The low global virgin plastic prices due to the oil crisis in April 2020 can be assumed to have an additional negative effect on the overall recycled plastic prices at different stages in the collection supply chain.

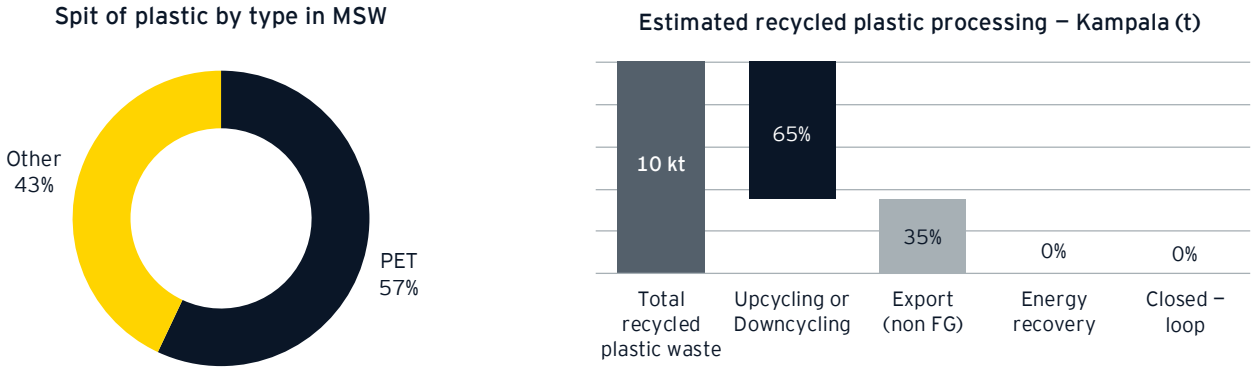
To slightly stabilize that pricing impact, today in Kampala, only one adapted form of an EPR scheme for PET plastic can be identified. It follows a sustained project, industry-driven approach from collection to recycling. For other types of plastic, this does not exist so far.

For the recycling industry in Kampala, it is assumed that over 30 plastic recyclers operate in that market. Most of the recycled plastic in Kampala, in the past, was made for export to markets in Asia. With the ban of plastic scrap imports by China and India, by the end of 2019, the industry is heavily investigating alternative solutions as stocks are piling up.

PET is the predominant type of plastic in the MSW in Kampala with 23 kt yearly based on current research by GIZ and confirmed by qualitative data. This explains the strong presence of PET-recycling capabilities in the market, which can be assumed to be higher than 60% of the overall recycled plastic materials. PP- and PE-recycled plastics (especially LDPE plastic bags) are used by the domestic recycling industry to produce non-food products, such as jerry cans, bags, bins or pipes, for the construction industry. Several qualitative sources confirm that there is a lot more upcycling or downcycling demand of PCR PP and PE in the domestic construction industry. Other types of flexible or multi-layer plastic are not recycled or specifically picked up.

With the decline of crushed plastic exports, it is assumed that only 35% of recycled plastics are exported in 2020 on the basis of the current GIZ research. The main type is PET. The remaining 65% of PCR plastic are focused on the domestic upcycling or downcycling industry through pelletization as no energy recovery or closed-loop recycling capabilites are operational. Current efforts exist to export more PET pellets by the end of 2020. Considering available recycling data of Kampala, this report assumes a yearly plastics recycling rate of at least 25% for 2020 under the condition that not all recycling capacities are fully utilized. For all PET, up to 40% are recycled yearly.

Figure 10: Split of recycled plastic by type and applied plastics recycling methods in Kampala, Uganda



Key enablers are involved in GKMA's integrated plastic supply chain today. Upstream supply chain strategic collaboration among the plastic manufacturing industry collaborate with regulatory institutions, such as Kampala Capital City Authority (KCCA) and the National Environment Management Authority (NEMA), on future initiatives or policies around plastic. Within the consumer goods industry, the major player in PET recycling for Kampala is Plastics Recycling Industries (PRI). Because of the missing manufacturing sites of many large-scale consumer goods players in Uganda, no further impactful strategic collaborations exist today that might take a joined scalable influence on plastic collection and recycling. In addition, many NGOs or sustainable service providers contribute as a key plastics data resource for Kampala and draw attention to the critical plastic improvement areas. Real innovative e-commerce technologies as seen in other Sub-Saharan cities have not touched the integrated plastics supply of Kampala yet.

Compared with other Sub-Saharan cities, it seems that regulatory authorities, such as KCCA or NEMA, have prioritized the plastic waste issue and enabled the plastic supply chain at scale. Although tax incentives on investment in the plastics recycling or collection industry have not been observed, some community-based plastic models (waste banks) are fully operational through governmental waste transportation support and available properties for collection centers (KCCA, 2020). KCCA follows a clear plastic diversion strategy from the landfill and tries centrally to influence consumer behavior for more waste segregation at source. Together with the private industry, the collection centers shall be used for training purposes of the communities. In addition, some of Kampala's regulatory institutions with support from foreign investments (FCDO) help to fund required baseline studies on plastics data in Kampala.

Despite the positive signals to improve the plastics supply chain, law enforcement on plastic policies or guidelines has to be sustained. The several attempts to find solutions for LDPE plastic bags (Kaveras) can be taken as an example.

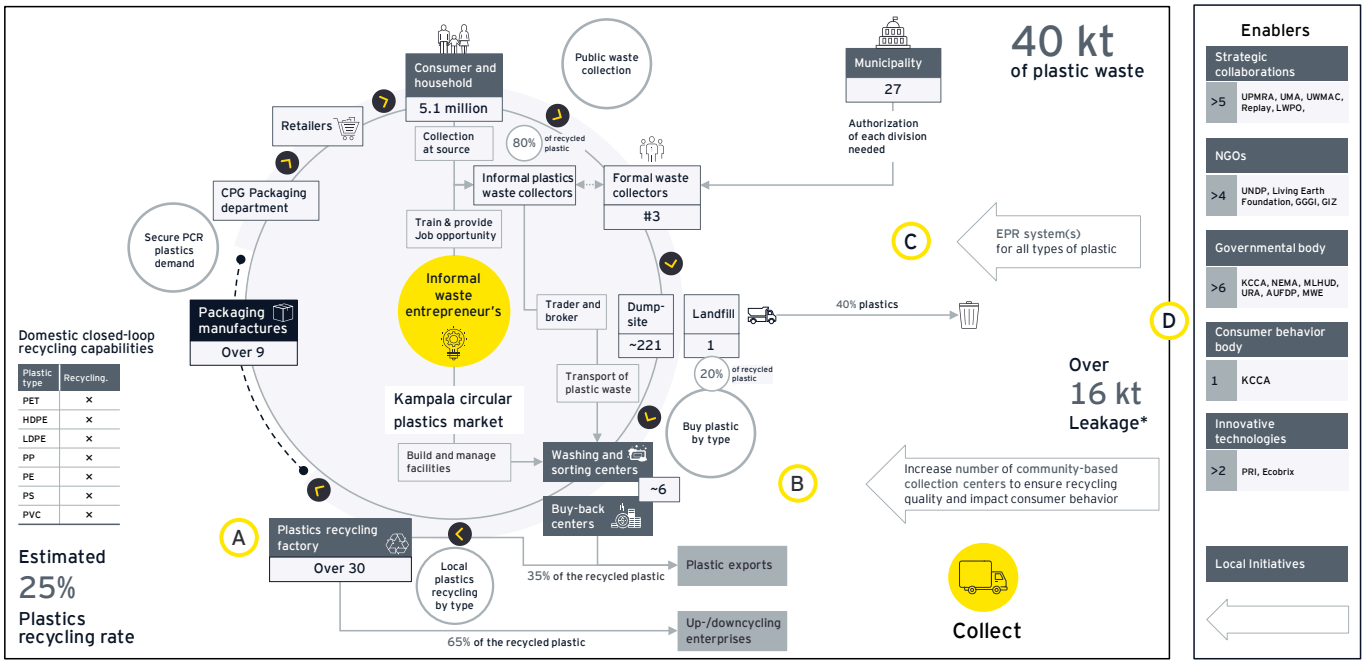
Recommended action

Kampala's integrated plastic supply chain has taken the right direction to reach scalability in the most recent years. Still, 40% of the market is not connected to any waste management system. Recycled plastic collection prices are low and make it even less attractive for informal waste entrepreneurs to obtain an additional income or sustain operations. PS, PVC or any type of multi-layer plastic is not recycled and thus not proactively picked up. Community-based collection models are not at scale yet and they heavily focus on PET. Many plastic supply chain stakeholders focus on their own business-oriented goals rather than looking to improve the livelihoods of people in parallel. A domestic, independent plastic recycling industry is not in place yet and there are a few intentions to close the loop. Private industries need to get more involved and the law enforcement by regulatory institutions must be improved.

In order to be prepared for the expected 50% increase of plastic waste by 2028 (KCCA, 2020), some key infrastructural, regulatory and consumer behavior changes are needed. A collection gap of at least 16 kt needs to be closed and the plastics supply chain infrastructure needs to be able to process an additional 20 kt of plastic waste per year in the future.

A. Kampala's integrated plastic supply chain recycling capabilities are advanced around PET recycling, with PET being the major plastic component in the MSW. With the growth of the economy and general waste over the next years in Uganda, it can be also expected that the plastics share will increase as seen in other Sub-Saharan cities. To close that gap, significant efforts need to be made to generate a demand for all types of plastics. Recyclers need to include more LDPE, PS, PVC and some multi-layers for their upcycling solutions while the upstream supply chain ensures that the difficult-to-recycle material is further reduced. Upcyclers or downcyclers, who are mostly part of the UPMRA or Uganda's Manufacturers association (UMA), have to develop a new solution by benefitting from similar operational business concepts in other Sub-Saharan markets.

Figure 11: Integrated plastics supply chain model Kampala



* Leakage: plastics not entered into the SC per year – uncollected

To stay independent, the solutions for lower-value recycled plastics should focus on domestic demands, i.e., by the construction industry. Governmental tax incentives on recycling equipment investments in proportion to the local PCR plastic used might help to achieve an inclusive transition. Over the next years, a contribution of an additional 9 kt is needed by the upcycling or downcycling, or packaging manfacturing industry, excluding PET and HDPE.

Current recycling initiatives in Kampala show major efforts to further scale up PET recycling. With vertically integrating into the collection, collaborating with PET and HDPE recyclers on the same level, and investment into pelletization solutions for export show a lot of potential to grow. Early discussions between private industry and regulatory authorities are ongoing to build a local fiber plant in Kampala. To bridge the gap of 11 kt per year, further PET and HDPE recycling in the form of a major recycling investment is needed. In order to build a circular, closed-loop recycling system, an rPET bottle-to-bottle recycling should be preferred. Under the East African geographical context, a regional PET or HDPE recycling alternatively should be considered in order to be resilient against global rPET or fiber prices leveraging economic scale for large-scale PET recycling. Higher prices paid per kilogram of PET and HDPE in the neighboring country, Kenya, and leveraging returning empty containers of finished goods imports to Uganda might offtake the logistics costs. Key requirements are consistent regulatory, custom guidelines to enable border crossing and commitments of finished good suppliers to leverage containers. This could help the integrated plastic supply chain in the region to become more resilient against macro-economic diruptions.

B. To serve the increased domestic-recycled plastic demand in the future, collection needs to be scaled up and particularly focused on closing the collection gap of 16 kt plastics per year. The number of collection centers per community must be rapidly increased and located with priority in areas where the formal waste collection has no access. An optimistic calculation of an average 60 tonnes plastic collection volume per month and center as the main source of recycled plastic would require 34 collection centers equally distributed around the GKMA's communities by 2028. Informal waste entrepreneurs need to be included, trained and incentivized to influence consumer behavior for segregation at source within their community in parallel. Similar to concepts in other Sub-Saharan cities, all types of plastics should be collected, stored and processed at those centers to highlight to the local recycling industry that sufficient types of plastic are available in the market. Besides picking plastic waste at landfills, it can be done in communities around collection centers at higher prices. To operate those centers, an initial private industry or foreign direct investments are needed in addition to existing grants for properties and logistic subsidies by the regulatory authorities. Selected, professional entrepreneurs can be supported to operate those facilities while a relative investment from each party must be ensured.

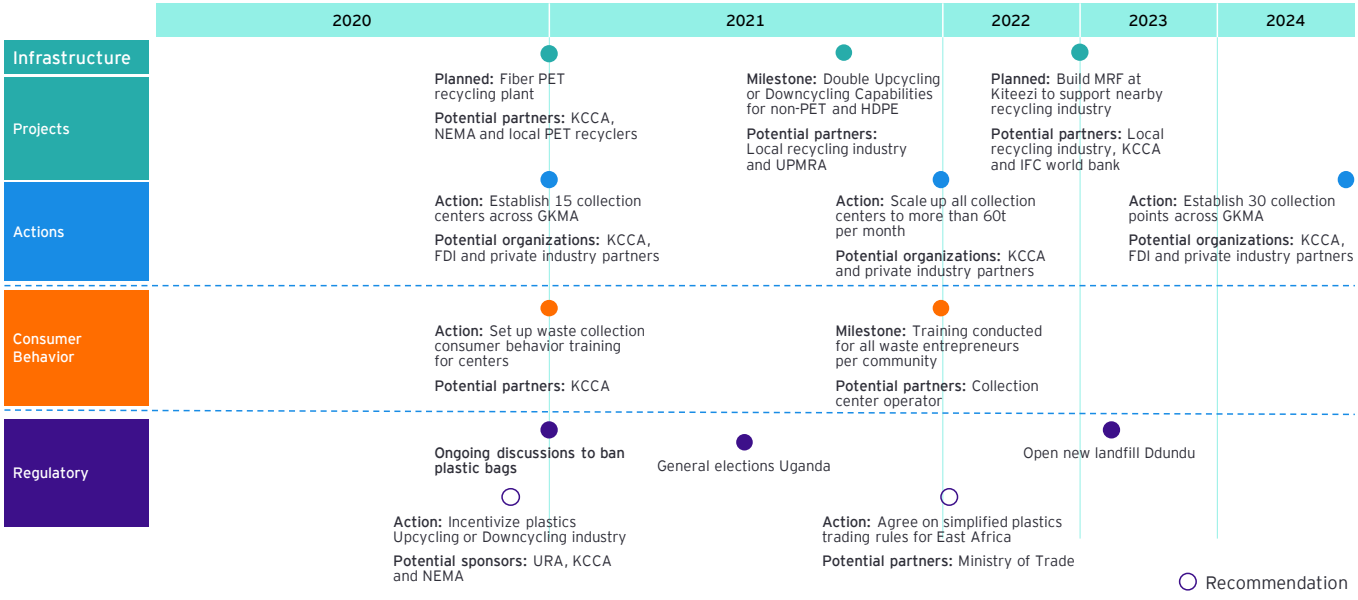
C. Plastic collection in Kampala can improve the livelihoods of the informal sector and serve as additional income. To achieve that plastic pricing in the integrated supply chain must be more resilient to external effects and at a minimum level to sustain collection for all types of plastics. A stable domestic plastic recycling demand by type as described under the first point is the first key component. In addition, extended producer responsibility schemes similar to PRIs project-based vertical integration into the collection supply chain with support from a beverage company (financial) and KCCA (operational) for PET needs to be extended for all types of plastics. In collaboration with UPMRA, UMA and the private industry project-based collection centers should be supported through guaranteed offtake volumes of PP, PE or other plastic components. If prices per type of plastic fall below a centrally agreed level, a temporary financial and operational balancing mechanism has to be agreed and granted by all committed plastic supply chain stakeholders. For example, in case the PP recycling demand is very low in one particular month, collection centers should have the storage capacity and financial means to build up stock to be able to sell the plastic at a later stage once the demand has stabilized. These mechanisms will help informal waste pickers as the main high-quality plastic collection source to obtain a reliable income per period for their families.

D. With governmental institution as a key enabler for a sustainable plastics value chain in Kampala, a strong focus is seen on establishing a scalable plastic collection infrastructure, which is inclusive of the informal sector, and capable of creating additional incomes. To support theápositive development, an increase of collection facilities especially in a more difficult to accessible community needs to be accelerated through their support.

To scale up and enable the plastics recycling industry in Kampala for non-PET-based products, investments incentives into technologies or partnerships with specific companies or associations are recommended to develop joined recycling solutions. With an expected future ban of plastic bags in Uganda, the plastic recycling industry must be encouraged to invest in alternative PCR plastic opportunities.
On a country level, at the Ministry of Trade, regional concepts for plastic waste flows across East Africa should be discussed to become more competitive.

For the upcoming 27 serviced waste collection divisions in GKMA, it needs to be ensured that the process for waste concessions remains centralized, transparent and flexible enough to include future scalable, innovative collection, logistics or recycling ideas and companies. Experience from other Sub-Saharan cities shows that too many local and individual authority guidelines slowdown the plastics collection and recycling cycle. Overall, all ministries and regulatory authorities must work together to enhance law enforcement of National Urban Solid Waste Management (NUSWM) policy or consumer behavior guidelines.

Figure 12: Recommended road map to build up Kampala's integrated plastic supply chain



10. Conclusion

While a high attention on plastic waste pollution can be observed and substantial initiatives have been launched locally or across the African continent, an integrated supply chain at scale toward a circular economy and collaboration from the upstream to the downstream stakeholders have not been reached yet in most markets. If we are to change that picture and improve the SDG targets (Decent Work and Economic Growth (8), Industry, Innovation and Infrastructure (9), sustainable Cities and Communities (11), and Responsible Consumption and Production (12)), then aligned efforts and joined investments of all plastic supply chain stakeholders in a city, country or region are required.

The inherent challenge is to integrate formal and informal plastics collection value chain members into an economically viable system supported through governmental institutions, recyclers and private industry-extended responsibilities. There is no plastics collection or recycling model that works best in all circumstances. Each combination of recommended actions on infrastructure, consumer behavior and regulations needs to be integrated with the context of each local supply chain. Transforming toward an integrated supply chain at scale will require the right balance between economic decisions and leveraging new inclusive income opportunities.

11. Appendix

11.1. Plastic waste generation, treatment and disposal in Sub-Saharan cities

Plastic waste generation, treatment and disposal in Sub-Saharan cities	Accra	Kampala	Lagos	Nairobi	Addis
Macro data					
Metro population 2020 (million)	4.3	5.1	23	9.4	4.6
Overall economic growth (GDP growth)	-5.7%	-5.8%	2.1%	-5.5%	7.5%
Recycling					
Total plastic waste by 2020 (kt)	230	40	767	280	43
Percentage of plastic waste in MSW	14%	6%	15%	12%	5.2%
Estimated total recycling volume (kt)	57.5	10	76	28	n/a

11.2. Selected stakeholders

Project assessment sponsors

Unilever
www.unilever.com

Foreign, Commonwealth and Development Office (FCDO)
www.gov.uk/government/organisations/foreign-commonwealth-development-office

Ernst & Young AG
www.ey.com/ch

Regional

African plastics recycling alliance (APRA)

GSMA Intelligence
https://www.gsmaintelligence.com/

South Africa

Local enablers

African Reclaimers Organisation
https://www.facebook.com/africanreclaimers/

PETCO
https://petco.co.za/

Polyco
https://www.polyco.co.za/

The SA plastic pact
https://www.saplasticspact.org.za/

Plastics SA
https://www.plasticsinfo.co.za/

Ghana

Local enablers

National Plastic Action Partnership (NPAP), Ghana

Ghana Recycling Inititatives by Private Enterprises (GRIPE)
www.thegripe.org

UNDP GHANA
www.gh.undp.org

RevFoundation
https://www.revocean.org/plast_ghana/

Ghana Plastics Manufacturing Association (GPMA)

Local recyclers, collectors and traders

ASASE Foundation
www.asasegh.com

Coliba
www.coliba.com.gh

Environment360 Recycling
www.environment360gh.org

Miniplast
https://miniplast.com

Reptrn
www.repatrn.com

UPPR Ghana
www.upprghana.com

Zoomlion Ghana
www.zoomlionghana.com

Nigeria

Local Enablers

International Finance Corporation (IFC), World Bank Group
https://www.worldbank.org/en/country/nigeria

The Food & Beverage Recycling Alliance
https://www.fbranigeria.ng/

Fair plastic alliance
https://www.fairplasticalliance.org/

Local recyclers, collectors and traders

WestAfricaENRG
http://www.westafricaenrg.com/en/

Wecyclers
http://wecyclers.com/

RecyclePoints
http://www.recyclepoints.com/

Uganda

Local enablers

GIZ Uganda
www.giz.de/de/weltweit/310.html

Global Green Growth Institute (GGGI)
www.gggi.org/country/uganda

International Finance Corporation (IFC), World Bank Group
www.ifc.org

KCCA
www.kcca.go.ug/kwm

UPMRA
www.upmra.org

Local recyclers, collectors and traders

Aquila
www.aquilarecycling.com/

Luuka plastics
www.luukaplastics.com

Plastics Recycling Industries (PRIs)
www.facebook.com/PlasticRecyclingIndustries/

Green Africa Recycling Company

Kenya

Local enablers

Keny Associations of Manufacturers
http://kam.co.ke/

PETCO Kenya
https://www.petco.co.ke/

AHK, Delegation of German Industry and Commerce for East Africa
https://www.kenia.ahk.de/

Local recyclers, collectors and traders

Mr. Green Africa
https://mr-green.ch/kenia/

TakaTaka Recycling solutions
https://takatakasolutions.com/

Ethiopia

Local enablers

Robertsbridgegroup
https://www.robertsbridgegroup.com/

GIZ Uganda
https://www.giz.de/en/worldwide/336.html

CIFA Ethiopia
https://www.cifaethiopia.org/

GGGI
https://www.greengrowthknowledge.org/country/ethiopia

Local recyclers, collectors and traders

Coba Impact
http://cobaimpact.com/

Sino Alluminium

11.3. Selected sources and document references

Akande, D. (2018). The Multifaceted Waste Management Issues in Nigeria: Lagos State as a Case Study. Lagos: SSRN.

Al-Salem, S., Lettieri, P., & Baeyens, J. (2009). Recycling and recovery routes of plastic solid waste. Waste Management, 26252643.

Asiimwe, G. (2018). Kampala Municipal Solid Waste Value Chain Mapping. Kampala: Global Green Growth Institute.

Ellen, D., Waughray, D., & Stuchtey, M. R. (2016). The New Plastics Economy: Rethink the Furture of Plastics. Ellen MacArthur Foundation.

Foundation, P. R. (2019, 05 17). Retrieved from RevOcean: https://www.revocean.org/plast_ghana/

GNA. (2019, 05 10). Retrieved from Business Ghana: https://www.businessghana.com/site/news/general/187010/Plastic-Manufacturers-call-for-the-establishment-of-an-Authority

Gouttebroze, M. (2019). Strategic Roadmap for Better Plastics Management in Accra. Accra: Seureca Veolia.

India, U. (2016). Eliminate Open Defecation.

Jambeck, J., Hardesty, B. D., Brooks, A. L., Friend, T., Teleki, K., Fabres, J., . . . Jonathan Knox, C. W. (2018). Challenges and emerging solutions to the land-based plastic waste issue in Africa. Elsiver Ltd. Marine Policy 96.

KAM. (2019). Kenya Plastic Action Plann. Nairobi: Kenya Association of Manufacturers.

KCCA, K. C. (2020). Kampala Waste PPP Project: Innovation shaping waste management in Uganda. Kampala: Kampala Capital City Authority.

Keesmann, B. (2019). Market Survey Waste and Circular Economy in Ghana. The Hague: Ministry of Foreign Affairs, Netherlands Enterprises Agency.

Kristensen, N. (2018). Kampala Solid Waste Management Project; Technical and Environmental Consultant for Feasibility Study of a WtE Incinerator at Ddundu. Kampala: KCCA.

Masinde, A. (2020, 02 28). Enforce ban on polythene bags — Anywar. Retrieved from New vision Uganda: https://www.newvision.co.ug/new_vision/news/1515707/enforce-ban-polythene-bags-anywar

OECD. (2001). Extended Producer Responsibility: A Guidance Manual for Governments. OECD Publishing.

PlasticsSA. (2019). National Plastics Recycling Survey 2018. Johannesburg: Plastics SA.

Retno Wijayantia, D., & Suryania, S. (2014). Waste Bank as Community-based Environmental Governance: A Lesson Learned from Surabaya. Procedia — Social and Behavioral Sciences 184 (2015) .

Ryberg, M. W., Alexis, L., & Hauschild, M. (2018). Mapping of global plastics value chain and plastics losses to the environment. Paris: United Nations Environment programme.

Solid Waste Management Agency, A. A. (2019). City Government of Addis Ababa Solid Waste Management Agency. Addis Ababa: Addis Ababa Solid Waste Management Agency.

Staub, C. (2020, 05 05). Retrieved from Ressource Recycling: https://resource-recycling.com/recycling/2020/05/05/low-virgin-plastics-pricing-pinches-recycling-market-further/

UN Environment Programme. (2019, 09 29). Ethiopia enhances environmental protections through waste management. Retrieved from UN Environment Programme: https://www.unenvironment.org/news-and-stories/story/ethiopia-enhances-environmental-protections-through-waste-management

UNEP. (2018). Africa Waste Management Outlook. Nairobi: United Nations Environment Programme.

United Nations, D. o. (2018). World Urbanization Prospects: The 2018 Revision. Population Division (2018).

United Nations, D. o. (2020). UN Comtrade Database, Get Data. Retrieved from UN Comtrade Database: https://comtrade.un.org/data/

Van Jaarsveldt, D. (n.d.). Market Analysis: Waste Management and recycling in South Afruca, 2016. Johannesburg: South African — German Chamber of Commerce and Industry NPC.

Wit, W. d., Hamilton, A., Scheer, R., Stakes, T., & Allen, S. (2019). Solving Plastic Pollution through Accountability. Gland: WWF-World Wide Fund for Nature.

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