UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

STUDY ON PLASTIC VALUE CHAIN IN KENYA

SUSTAINABLE DEVELOPMENT GOALS

Acknowledgement

This country study on plastic value chain in Kenya was conducted by the consortium of cyclos GmbH and AHK Services Eastern Africa Ltd. under the UNIDO project "Study on available sustainable alternative materials to plastics, and innovative packaging and recycling technologies that meet market needs in Africa to reduce plastics leakages to the environment".

The project is funded by the Government of Japan under the MARINE initiative to support G20 Osaka Blue Ocean Vision, which was shared as a common global vision in June 2019 at G20 Osaka Summit under Japan's G20 presidency. The vision aims to reduce additional pollution by marine plastic litter to zero by 2050 through a comprehensive life-cycle approach that includes reducing the discharge of mismanaged plastic litter by improved waste management and innovative solutions while recognizing the important role of plastics for society.

The purpose of the UNIDO project is to provide stakeholders in and beyond Kenya with an overview of available options matching with local contexts and needs so that they could take necessary actions to reduce plastic waste leaking to the environment in their country. The country study in Kenya collected information on current legal, policy and institutional framework in relations to the plastic value chain including production of alternative materials and single use plastics, distribution, and waste management including available treatment paths.

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Disclaimer

The study was conducted from December 2020 to May 2021. Some of the information collected then might have been changed over the time as situations and initiatives progress. Although efforts are made to update the information, it may not be able to cover all the changes in the country.

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List of abbreviations

DKS	Draft Kenya Standard
DRS	Deposit-Refund System
EA	Environmental Audits
EAC	East Africa Community
EIAs	Environmental Impact Assessments
ELC	Environmental Law Court
EMCA	Environmental Management and Co-ordination Act
EPR	Extended Producer Responsibility
EPS	Expanded Polystyrene
HDPE	High Density Polyethylene
JICA	Japan International Cooperation Agency
KAM	Kenya Association of Manufacturers
KAWR	Kenya Association of Waste Recyclers
KEBS	Kenya Bureau of Standards
KEPRI	Kenya Extended Producer Responsibility Initiative
KEPRO	Kenya Extended Producer Organization
KNBS	Kenya National Bureau of Statistics
KPAP	Kenya Plastic Action Plan
LDPE	Low Density Polyethylene
NEMA	National Environment Management Authority
PES	Payment for Ecosystem Services
PET	Polyethylene Terephthalate
PETCO	Kenya PET Recycling Company
PP	Polypropylene
PRO	Producer Responsibility Organization
PS	Polystyrene
PVC	Polyvinylchloride
SAC	Standards Approval Committee
SEAs	Strategic Environmental Assessments
SPC	Standards Projects Committee
SWM	Solid Waste Management
TC	Technical Committee
UN Habitat	United Nations Human Settlement Programme
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
WEEE	Waste from electric and electronic appliances
WG	Working Group
WMCA	Wildlife Management and Conservation Act


THANK YOU
THANK YOU
THANK YOU
THANK YOU
Have A Nice Day
Please return to a participating store for recycling.
WARNING: TO AVOID DANGER OF SUFFOCATION, KEEP THIS PLASTIC BAG AWAY FROM BABIES AND CHILDREN. DO NOT USE THIS BAG IN CRIBS, BEDS, CARRIAGES OR PLAYPENS. THIS BAG IS NOT A TOY. NOT RECOMMENDED FOR FOOD STORAGE.
HDPE

Executive Summary

This study is presented by the consortium cyclos GmbH and AHK Services Eastern Africa Ltd. with support from Chebet & Co. Advocates to UNIDO. The aim was to identify and assess measures to reduce plastic litter through improved waste management practices relevant for the Kenyan context. Based on the Kenya Plastic Action Plan [2019] and underlying previous analyses of policies, regulatory and institutional frameworks, the consortium conducted a comprehensive review of Kenya's plastic value chain and policy. Emphasis was laid on analysing the status quo – including recent developments and perspectives evolving from ongoing discussions – of the regulatory and institutional framework as well as how the plastic value chain actors respond to this dynamic environment.

Certain steps to advance waste management in Kenya have already been taken by both the private and public sector. Most notable development is the initiation of a system of Extended Producer Responsibility (EPR). This EPR system is currently supported by upcoming regulations by the public sector, as well as by the private sector, most prominently through the Kenya Extended Producer Responsibility Initiative (KEPRI) – with a focus on plastic waste fractions. Despite certain challenges and the requirement to further develop the policy framework, **the EPR regulations and related initiatives like KEPRI represent the most promising approach for addressing current deficiencies of the Kenyan waste management sector.** Yet, all these actions need to be considered as pieces of a wider puzzle. **Building a holistic and robust waste management framework and hence effectively mitigate the problem of littered plastics is a cross-cutting task that involves policy makers on all levels of the government, businesses and the civil society all at once.**

Next to a continuous improvement and development of the regulatory framework, actions to improve ease of waste management may also be taken specific to plastic fractions and items prevalent in Kenya. **Therefore, this study proposes measures for relevant plastic fractions and items that allow to curb adverse effects on the waste management system and the environment.** These measures are generally falling under four brackets, that is:

1. investment in waste management infrastructure,
2. fee modulation within the EPR system,
3. design changes for increased recyclability and, lastly,
4. bans – as already implemented in the past concerning plastic carrier bags.

These four strategies are in referral to a holistic and robust waste management framework, hence will require engagement from a variety of actors from all angles of society. Nevertheless, **particularly the further operationalization of the EPR system is supposed to play a key role,** enabling to successfully and efficiently advance these strategies and reduce the adverse effects from waste management practices.

1

Introduction and Methodology

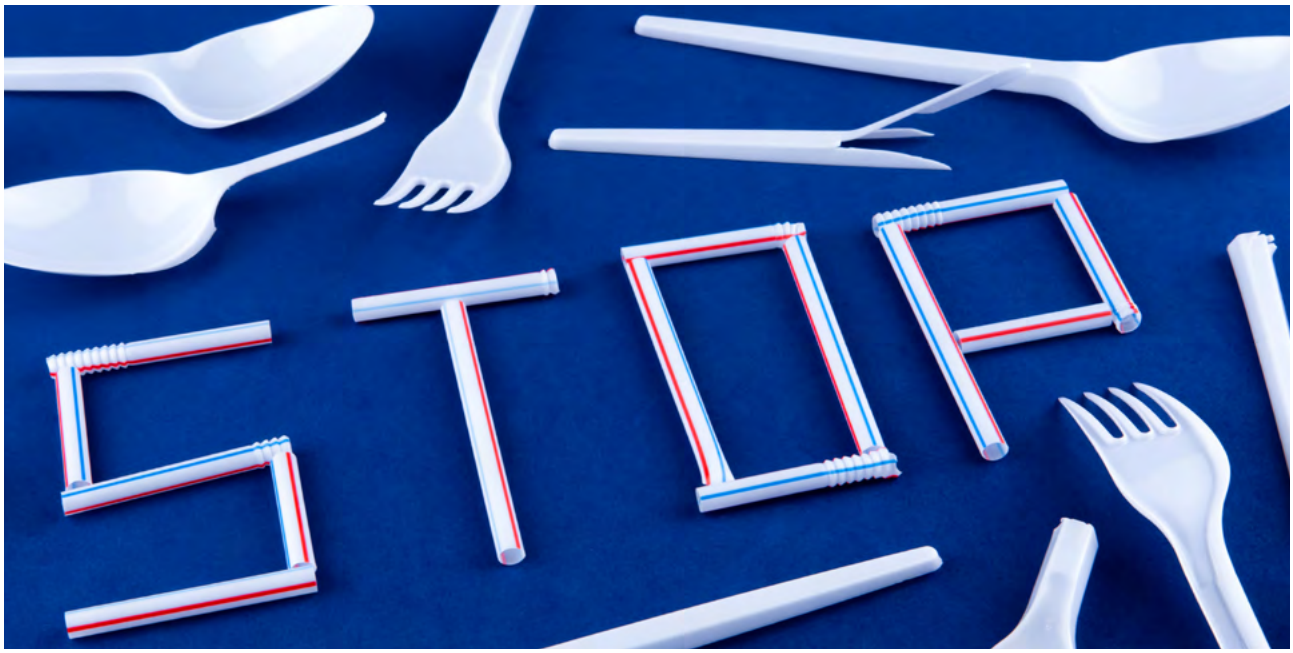
With funding from the Government of Japan, UNIDO is implementing a "Study on available sustainable alternative materials to plastics, and innovative packaging and recycling technologies that meet market needs in Africa to reduce plastics leakages to the environment (SAP190137)". This study represents the Final Report for the joint undertaking of an assignment appointed by UNIDO to the consortium of AHK Services Eastern Africa Ltd., Nairobi, Kenya (AHK) and cyclos GmbH, Osnabrück, Germany (cyclos).

The assignment conducts a local study in Kenya to collect information on current legal and policy framework in relations to the plastics value chain and plastic waste management, as well as alternative materials and single-use plastics in the country. The aim was to **identify and assess measures to reduce plastic litter relevant for the Kenyan context.**

Based on the Kenya Plastic Action Plan (commissioned by the consortium cyclos/ AHK on behalf of the Kenya Association of Manufacturers, KAM in 2019) and underlying previous analyses of policies, regulatory and institutional frameworks specific to the Kenyan context, **the consortium conducted a comprehensive review of the current status of the plastic value chain and policy**, taking into consideration both existing reports, analyses, data samples as well as the interactions with key informants specifically undertaken for this assignment. Emphasis was laid on analysing the status quo – including recent developments and perspectives evolving from ongoing discussions – of the regulatory and institutional framework as well as how the plastic value chain actors respond to this dynamic environment.

Where existing internal and external datasets and knowledge were to be supplemented and the need for further research has been identified, local informants within the various fields have been consulted. Every single one of these expert consultation meetings/ workshops has been prepared according to the information gap that was targeted. A total of 7 interviews, 2 workshops and 3 site visits have been undertaken. For confidentiality reasons, the names of the interviewees and participants will not be disclosed.

This study is presented as a core report over five chapters. After this introduction, the second chapter presents a policy review. The following third chapter briefly describes the status of the EPR system in Kenya. The fourth chapter outlines current waste management practices in Kenya including simplified waste mass flow. The fifth chapter looks in more detail on the plastic value chain. The final sixth chapter concludes with findings and suggestions to further support the waste management system in Kenya, taking into consideration its current stateand its projected development. In order to allow for readability, these chapters condense the analytical work undertaken, concentrating on key findings, key challenges and actions that can be taken. For more detailed elaborations several referrals are made to the annex.



2

Review of policy, regulatory and institutional framework

In light of proposing measures relevant to the Kenyan context, reviewing the current status of plastic value chain, and its regulatory and institutional framework forms the critical basis for any proposed measure. Thus, this chapter lists the most relevant policies, extended producer responsibility (EPR) plans, standards, and current was management practices. **A thorough analysis of the named documents is presented in Annex 7.1.**

2.1 Regulatory Framework

The role of legislation, policy and guidelines (**"regulatory framework"**) in the management of waste (including plastic waste), includes all aspects of plastic waste management cycle, i.e. generation, collection, treatment and disposal of waste. The regulatory and institutional frameworks generally serve the purpose of prescribing, legislating, implementing and or enforcing:

1. prohibitions of certain products or materials, i.e. banning;
2. standards of plastic that is manufactured or imported, this being a possible way to reduce or eliminate particularly harmful plastic waste and associated pollution in the environment;
3. systems for the collection, treatment (including recycling) and/ or disposal of waste.

Since the passing of the current Constitution in 2010, Kenya has a devolved system of government comprising one **National Government** and 47 County Governments. The 4th Schedule to the Constitution expands on this interplay by providing that the National government is in-charge of the **protection of the environment** while **County governments** have the role of **implementing specific National government policies on environmental conservation**. As such, both the National and the County governments have a role to play in plastic waste management in Kenya.

The most relevant provisions within the current regulatory framework in respect of waste management in Kenya, particularly plastic waste management, include the Constitution; the primary Kenyan statute governing environmental matters in Kenya; sectoral laws that have been enacted dealing with plastic waste and or pollution; judicial decisions touching on plastic waste management; National and or County government policies or charters relating to waste management; international instruments to which Kenya is a party and or signatory; and any current draft legislation or policies relating to waste management in Kenya.

Below is a brief introduction into key provisions within the named laws.

1. The **Constitution of Kenya** states in its preamble that the 'People of Kenya' are 'RESPECTFUL of the environment, which is our heritage, and determined to sustain it for the benefit of future generations'. This is detailed Articles 10, 42, 69 and 70, generally revolving around the right to 'a clean and healthy environment'.

2. The **Environmental Management and Co-ordination Act (EMCA)** of 1999 (revised several times since) is the primary and most comprehensive legal and institutional framework legislation prescribing environmental management in Kenya. It provides a general framework for **waste management** in Kenya and a guide for licensing, transportation and **disposal of waste**. A definition of waste is contained in Section 2. Section 86 charges **the Minister in charge of environmental matters** the power and authority to issue definitions, guidelines, regulations and management practices for waste. Section 87 outlines obligations to adequately handle waste, **including the requirement to licence waste disposal sites by the National Environment Authority (NEMA). Recycling or recovery facilities are not referred to** beyond couching respective operations general terms.

3. Section 116 of the Wildlife Management and Conservation Act (WMCA) gives the **Minister in-charge of wildlife matters** power to make regulations in respect of activities in National parks, National reserves, conservations areas, wildlife conservancies and sanctuaries. Based on these provisions **Gazette Notice No.4858** (2020) banned single-use plastic within the mentioned areas.

Next to provisions within the named laws, two petitions were negotiated in the Environmental Law Court (ELC).

1. **ELC Petition No. 50 of 2012** was a case concerning the operation of a dumpsite in Naivasha. The dumpsite, operated by the County Government of Nakuru, was poorly managed and a clear health and environmental hazard. It was not even licenced by NEMA. The case was decided in favour of the petitioners, ordering that **dumpsites have to be operated subject to NEMA audits**, as required by law.

2. **ELC Petition No. 32 of 2017** Kenya Association of Manufacturers and three other petitioners challenged the ban on plastic carrier bags effected by Gazette Notice number 2356. However, the Petitioners propounded no environmental arguments, and it is likely that this factor in absence of other successful regulatory frameworks to reduce plastic pollution in Kenya persuaded the Court in **upholding the ban.**

2.2 Strategies, Policies, and institutional mechanisms for reducing plastic waste in Kenya

Policies represent strategic documents, which then guide the legislation around any particular area. **A policy document in itself however has no force of law and no legal enforcement mechanism.**

1. The **National Environment Policy 2013** has an objective to ensure sustainable management of unique terrestrial and aquatic ecosystems using innovative environmental management tools. The policy seeks to discourage and eliminate unsustainable patterns of production and consumption while instituting intensified awareness creation on the impacts of using non-biodegradable materials such as single use plastics.

2. Under EMCA, each County should have in place a **County Environment Committee**. This Committee is responsible for the proper management of the environment within the County.

3. EMCA mandates NEMA and each County government to prepare an **environment action plan**, which among other matters, should identify and recommend policy and legislative approaches for preventing, controlling or mitigating specific as well as general adverse impacts on the environment. Currently, only the **County Government of Makueni** (out of 47 Counties) has developed such a plan.

4. NEMA developed the **National Solid Waste Management Strategy in 2014** based on the zero-waste principle, where not more than 10% of solid waste generated should go to the landfills. It has five key strategic objectives, that is, to formulate policies, legislations and economic instruments to reduce waste quantities; To inculcate responsible public behaviour on waste management; To promote waste segregation at source; To promote resource recovery for materials and energy generation; To establish environmentally sound infrastructure and systems for waste management. While NEMA is keen to and has been implementing the Strategy, whose implementation, based on the achievement of the strategic objectives, currently stands in the region of 20%.

2.3 Draft Laws and Policies

Several laws and policies currently exist in draft status. The ones identified as most relevant include:

1. The Draft **Environmental Management and Co-ordination (Plastics Bags Control and Management) Regulations, 2018**. If passed, they will be the first plastic waste-targeted regulations in Kenya, providing for plastic alternatives including the promotion of alternative biodegradable packaging materials. These regulations would supplement Gazette Notices No 2334 and 2356 (both concerning the ban on plastic bags, refer to Annex 7.1), which left the substance of implementation, exemption procedures etc to NEMA's technical enforcement team.

2. The draft **National Sustainable Waste Management Policy, 2020**, prepared by the Ministry of Environment and Forestry, seeks to commit the government to establish legal frameworks and take actions that will enable Kenya to harness and incentivize large scale investment in the waste recovery and recycling industry in Kenya.

3. The draft **National Sustainable Waste Management Bill 2019** seeks to establish an appropriate legal and institutional framework

for the efficient and sustainable management of waste. The Bill proposes to establish a National Waste Management Council which would co-ordinate and oversee the implementation of national zero waste plans, policy and laws and report on the achievement of target goals, strategies and activities.

Concerning the interplay of the latter two above mentioned documents, the draft Sustainable Waste Management Policy 2020, which is more recent, was developed by the Ministry of Environment and Forestry, while the former document, the Solid Waste Management Bill 2019 was prepared by NEMA. However, both policies essentially outline and commit the government to take sustainable actions to deal with all waste.

Lastly, and most relevant for this assignment, the draft Extended Producer Responsibility (EPR) Regulations 2021 ("EPR Regulations") introduce and address mandatory extended producer responsibility (EPR) schemes for all products and packaging in order to 'reduce pollution and environmental impacts of the product'. Plastic products and packaging (without further reference on which items are covered exactly) are included in the first schedule to the EPR regulations, making them subject of the EPR compliance schemes. **These draft EPR Regulationsis analized in more detail within the Chapter 3.**

2.4 Identified challenges and gaps

2.4.1 Insufficient Legislation and weak enforcement systems

Perhaps the most glaring deficiency as far as the current plastic waste management in Kenya is concerned is **insufficient legislative interventions**. From our analysis above, we have gleaned that the laws around this, with their prescriptive and mandatory requirements, have not kept up pace with international approaches to curbing plastic waste. **Beyond the radical and now renown total ban on plastic bags in Kenya in 2017** (through Gazette Notices No 2334 and 2356), **no other National laws to specifically address and curb plastic waste have been legislated in Kenya**. There is currently no legislation in force imposing 'polluter pays' principle to assist manage plastic waste.

Further, the **County governments have continued to lag behind as far as County legislation addressing plastic waste** in Counties is concerned. Whilst NEMA has attempted to assist the Counties to come up with legislation through capacity building initiatives, Counties have generally not prioritized or mainstreamed environmental matters leading to the current situation where not even a handful of Counties have legislation governing waste is general. Most recently, NEMA provided a template to the Council of Governors requesting that each County provide NEMA with information on their current state of legislation in respect of environmental matters. Unfortunately, such template has also not been forthcoming from the Counties[1].

The challenge arising from legislative gaps is further exacerbated **by inadequate and weak enforcement systems in the country** with respect to existing legislation described above. From our analysis, successful implementation and enforcement is anchored in capacitating and strengthening institutional mandates. For example, the success of the plastic bag is widely credited to the cooperation between NEMA and the Kenya Police [NEMA 2019], while the ban on single-use plastic in protected areasis credited to the large number of enforcement arms.[2] As outlined in chapter 3.1.4, within the well-equipped and closely monitored Nairobi forests (through Kenya Forest Service), limitation on use of certain plastic items seem to be widely adhered to. Other laws and regulations have however not had similar institutional support with clear mandates, making the laws largely ineffective. The number of assigned NEMA officers stands at 2 for most of the 47 Counties; with Nairobi counting around 15. With solid waste management representing only one of their responsibilities, it generally shows that significantly more personnel are required for ensuring effective enforcement.

[1] Interview with NEMA official

[2] The Ministry of Environment and Forestry, Ministry of Interior and Coordination of National Government and Ministry of Devolution and the State Department for the Development of the Arid and Semi-Arid Areas (State Departments for the ASALS) in collaboration with the Ministry of Tourism and Wildlife.

2.4.2 Lack of a co-ordinated regional approach to plastic waste management

Despite attempts by the East Africa Community (EAC) member states to have a common approach to plastic waste, through the passing of the **EAC Polythene Materials Control Bill** by the EAC Legislative Assembly in 2017, it has never been assented to by the member states and no other legislation concerning plastic waste management has come to fruition.

Given the porous borders and movement of goods across the members of the EAC, lack of a joint regional approach to plastic waste management will continue to be a challenge in curbing plastic waste in Kenya, until addressed more than unilaterally.

2.4.3 Insufficient public sensitization and campaigns on plastic pollution and plastic alternatives

From our study, we find that there is insufficient awareness creation of the people of Kenya by the government on the dangers of plastic waste to the environment as well as safer and or biodegradable materials and technologies. The second strategic objective of the Solid Waste Management Strategy 2014 is the inculcation of responsible public behaviour as far as waste management is concerned; evidencing that the public's lack of consciousness as far as ideal waste management practices contributes to the challenge of tackling waste pollution. In addition, the ELC Petition number 32 of 2017 discussed above mentioned the 'throw away culture' of Kenyans as being one of the hindrances to Kenya curbing plastic waste, a culture which may be subject to change with appropriate sensitization and educational campaigns.

2.5 Discussion of technical standards applicable for plastic waste management

In Kenya, the Kenya Bureau of Standards (KEBS) develops standards that various imported and locally manufactured products must meet in order to be available for sale in the Kenya market. The enforcement also lies with KEBS. Within this assignment, an in-depth research on standards that are potentially relevant to plastics has been undertaken. This includes standards that define food safety, those that are for the analysis of plastic components as well as those that provide for guidelines on life cycle analyses (refer to EPR Regulations 5 (2) i.)). Concerning the potential use of standards for biodegradability, also standards that influence composting processes have been identified. **Annex 7.2** provides an inventory of national standards related to the fabrication, use, and disposal of plastic, i.e. along the whole plastic value chain, with a particular focus on potentially available standards for biodegradable, home compostable plastics.

A number of internationally established standards that contribute to plastic waste management in other jurisdictions has been identified within this assignment.

1. EN ISO 14021:2016 Environmental labels and declarations. This standard requires that environmental product declarations must not be misleading but substantiated and verifiable. The property must be actually and not only hypothetically met.

2. EN 13430:2004 Packaging - Requirements for packaging recoverable by material recycling. This standard defines certain minimum requirements in terms of a declaration of conformity regarding to "material recyclability".

3. EN 15343:2007 Recycled Plastics – Traceability in plastics recycling and assessment of conformity and recycled content. This standard specifies procedures required for traceability of recycled plastics. It gives the procedure for calculation for the recycled content.

4. EN 15347:2007 Recycled Plastics - Characterization of plastics waste. This standard provides a scheme for the characterisation of plastics wastes, laying out those properties for which the supplier of the waste shall make information available to the purchaser, and identifying test methods where applicable.

5. DEN/TR 15353:2007 Guidelines for the development of standards relating to the proper use of recycled plastics

6. ISO 17422:2002. Plastics. Environmental aspects. General guidelines for their inclusion in standards. This provides a structure for inclusion of environmental aspects in standards for plastics products. It proposes an approach,

which is directed at minimizing any adverse environmental impact without detracting from the primary purpose of the products under consideration. The guidance provided by this International Standard is intended primarily for use by standards writers. Over and above its primary purpose, however, the standard provides guidance of value to those involved in design work and other activities where environmental aspects of plastics are being considered.

7. CR 14311:2002. Packaging- Marking and material identification of packaging material.

An adaptation for Kenya may make sense and would require a detailed discussion for every single standard. Refer to **Annex 7.3** for a detailed process outline on how to create a technical standard in Kenya.[3]

Standards need to be distinguished from laws and regulations; all with their specific role in enabling a functional waste management system. It would exceed this assignment to list all requirements for a sound waste management process that fulfils all possible requirements on environment (water, air, soil, odour emissions, for example), civil (standards for setting up structures and technical infrastructure) or work safety, to name a few. Therefore, the analysis concentrated on identifying standards that directly target at the way certain material fractions are handled and used for.

Having queried with an official of NEMA the possibility of curbing plastics waste by prescribing standards for plastic products that are either less pollutive to the environment, or in the case of single-use plastic, prescribing standards that makes them less likely to be imported and or manufactured, **the sustainability of such a measure is doubtful from an enforcement perspective**. According to the NEMA official that has been engaged for this assignment, equipping KEBS or customs officials to check very specific plastic standards (e.g. the microns for plastic bags) is impractical and may lead to lacking enforcement.

On the other hand, the standard on nonwoven Polyethylene bags (KNWA 2884:2019) has proven to be able to direct domestic producers and generally fulfil its goal on a more uniform design for nonwoven bags that have partly substituted the banned thinner plastic bags. As this standard builds a blueprint and showcases the general possibility to formulate respective standards, it opens the possibility to build up on this experience and introduce more standards that set a secure frame for more packaging materials and, potentially, alternative packaging materials.

[3] Also refer to polyderteurope.com as an umbrella platform harmonising existing certification schemes for plastic converters in Europe.

3

Extended producer responsibility (EPR) initiatives in Kenya

3.1 Assessment of the current (draft) EPR regulations

The following assessment is based on 'The Environmental Management and Co-ordination (Extended Producer Responsibility) Regulations, 2021', reflecting the state of discussion in September 2021. For the most part, our assessment is limited to plastic (packaging) waste.

The present proposal is a very valuable guideline in this direction in the sense of an umbrella EPR law (refer to Annex 7.1 for further details), in order to build up EPR systems for packaging and also for different products and packaging streams made from a variety of materials(refer to first schedule). Based on this, a further need for regulation (e.g. via gazette notices)[4] arises in each individual case, which, for example, relates specifically to packaging for non-hazardous products (first stream within the first schedule). An additional gazette may stipulate the specific EPR modalities related to other streams. The four other streams include hazardous products' packaging, waste from electric and electronic appliances (WEEE), waste vehicles and non-packaging items including furniture, ruber and tyres. Only in such a form, the specific requirements can be free of interpretation and the implementation can be verifiable and controlled.

Generally, this draft regulation has several elements proven crucial – such as assigning specific responsibilities to different actors within the wider waste ecosystem. There are, however, elements whose modification could enhance effectiveness as they currently would result in a difficult operationalisation of the scheme.

Allowing for the co-existence of collective schemes (through the PROs) and individual schemes at the same time enables fraudulent business practices. A nation-wide, comprehensive collection of all *packaging waste* from household and equivalent places of origination (as a crucial prerequisite of a sustainable waste management) can only be achieved through the application of collective schemes [Bünemann et al., 2020].

1. In individual schemes, producers collect the quantities of packaging put on the market by them (e.g. 500 kg/year put on the market, so respectively a collection of 500 kg/year); traceability of every single product seems a theoretical concept. Additionally, waste is usually collected at the geographical point of easiest access (and not from remote areas) or by picking the item easiest to separate (e.g. rigids instead of flexibles). Especially at the beginning - but even in more advanced systems - a significant portion of the waste won't be accounted for; legacy waste volumes or illegal waste imports further complicate this matter. Hence, through allowing individual schemes, certain areas and certain items in Kenya would barely be serviced, albeit being in dire need of service.

2. Moreover, the operationalisation concerning collection and monitoring is very complicated, which would – in the imperfect world we live in – highly, up to a point of certainty, increase the threat of significant free riding. A high number of free riders could eventually lead to bankruptcy of the system as few ordinary participants finance a high portion of not-billed packaging waste. Individual schemes can work for packaging waste from industrial and commercial sources. More information on individual and collective schemes are in the KPAP mentioned on pp. 51 to 53.

Certain provisions empower NEMA to potentially level these deficiencies specific to the non-hazardous packaging waste streams (e.g. EPR Regulations 8 (6), EPR Regulations 11 (1)).

3.2 Plans and status of Industry's Extended Producer Responsibility System

From 2017 onwards, more and more Kenyan companies whose business model rely on the usage of plastic decided to take action in order to advance an improved plastic waste management system in Kenya. This is to be understood as a reaction on the **Kenyan Government's commitment to also take controversial measures in order curb plastic pollution and improve waste management practices.**

In 2018, a group of companies under the Kenya Association of Manufacturers (KAM) signed a framework of Cooperation with the Ministry of

[4] All laws in Kenya are published in the government's official publication, the Kenya Gazette, in order for them to be notified to the public. A 'Gazette Notice' refers to a particular Gazette (numbered sequentially) where a specific law is published, whether laws passed by Parliament or by the Cabinet Secretaries (Ministers) in the ordinary course of the legislative process.

Environment and NEMA, which led to establishment of PETCO, the first voluntary Producer Responsibility Organization. Following its designation and largely built on the experiences of a similar initiative in South Africa, PETCO initially looked at PET bottles only. In order to stipulate EPR regulations that would cover wider waste fractions – namely plastics – KAM commissioned the consortium cyclos/ AHK to draft the Kenya Plastic Action Plan (KPAP), launched in 2019. **The Kenya Plastic Action Plan (KPAP) developed a strategy to set up an EPR scheme for plastic and related packaging materials.**

In February 2020, following the roadmap drawn within the KPAP, a number of companies likely effected by EPR regulations with the support of Kenya Association of Manufacturers (KAM) formed the **Kenya Extended Producer Initiative (KEPRI)**. KEPRI's goals include supporting private sector's collective efforts to address *plastic* waste management, and to realize the commitments made in the KPAP and working with key actors implementing *plastic* EPR schemes in Kenya. In October 2020, an interim steering committee was inaugurated to oversee and **transition KEPRI into an institution, named the Kenya Producer Responsibility Organization (KEPRO).** The steering committee is made up of stakeholders in the waste value chain such as domestic plastic manufacturers, national and international brand owners including a prominent representation by bread bakers, retailers, waste recyclers and collectors, as well as the active involvement of PETCO. KEPRO's strategic business plan was launched in October 2020 by KAM. The strategic plan sets out the direction of KAM's priorities towards a clean Kenya as industry moves from a linear to a circular economy.

Only one PRO per each one of the fivewaste streams is foreseen by the current draft EPR regulations. Therefore, a potentially stiff competition in between applying organizations can be foreseen, given the large amount of funds to be controlled once the regulation comes into place. Currently, KEPRO as a sure applicant has been set up as a not-for-profit organization in order to act as a producer responsibility organization for the non-hazardous packaging waste streams. With a wide board representation from the private sector and hosted by the Kenya Association of Manufacturers, the public-private sector dialogue with the relevant Kenyan authorities is frequent – making KEPRO likely to take over a role as the PRO for the non-hazardous packaging waste stream, as stipulated in the draft EPR regulations. PETCO has been active for an already longer time, yet thus far limiting its activities to PET drink bottles. Yet, an expansion into other categories is considered, therefore being a potential alternative to KEPRO. Notable efforts of other organizations to take over the role of the PRO for the entire non-hazardous packaging waste streams have not been identified.

KEPRO's board has been appointed and members from four categories are already taken in. These four categories are defined as:

1. **Raw material suppliers** that produce and supply primary or intermediate raw materials to be converted into a finished or semi-finished good.

2. **Converters** that transform or combine secondary raw materials to create a new product.

3. **Manufacturers** that transform raw materials into finished goods for sale or other use including intermediate processes that involve production or finishing as well as semi-manufactured goods.

4. **Packers** that use or modify packaging materials in the production or formation of packaging.

The fixed staff is foreseen to be hired within 2021, a Chief Membership officer in 2nd quarter, a Chief Executive officer in the 3rd quarter. **The milestones set for the next year aim at a gradual shift from dominantly linear business practices towards a focus on circularity**. The following table synthesises these milestones in the coming years up to 2030, reflecting the current discussions of KEPRO. Currently, these statements have to be understood as strategic goals, with exact measures or more detailed targets in the process of definition and articulation. It can be assumed that some of the goals will be modified, specified or discarded over time.

The setup of an EPR system in Kenya would addressshortcomings of the current waste management practices, and identify potential interventions to achieve certain goals, e.g. concerning reduced littering rates. In order to identify areas of interventions, an understanding of current waste managemnet practices is required, as outlined in the following chapter.

Table 1. KEPRO's milestones to 2030 [KEPRO 2020]

	2020	2021	2025	2030
Focus area (includes all stakeholders of this area, fraction or application)	Plastic Packaging for bakers	Single use plastic packaging	All single use packaging	All materials beyond packaging
% of members in focus area	40%	50%	80%	80%
Linear Economy Mass flows	Majority	Reducing	Reducing	Minority
Recycling Economy Mass flows	Minority	Growing	Majority	Reducing
Circular Economy Mass flows	Rare	Championing	Minority	Growing

4

Solid Waste Management Practices

4.1 Data Sources

Based on literature review, this chapter gives an update on the current waste management flow. As a limitation, it needs to be stated that comprehensive, currently valid, reliable, holistic data collection on waste occurrence, waste composition and waste management for the whole of Kenya has not been undertaken till today.

An analysis undertaken by Eunomia [2018] served a similar goal as this study, with a particular focus on plastic and its value chain; by estimating material flows of plastic into Kenya based on literature review. For the estimation of recycling flows, primary data collected by Eunomia was used. The most recent data source quantifying solid waste on a national scale has been identified as published by the World Bank [2018].

Waste composition and waste volume analyses undertaken by JICA [2010] and UN Habitat [2019] – focusing on the capital Nairobi – allow to draw a detailed picture for the capital itself. Against the background of the results of the Household Census 2019 [KNBS], these analyses provide a base to extrapolate existing findings for the whole of Kenya considering certain parameters.

4.2 Simplified Waste Mass Flow

4.2.1 Solid waste generation

With detailed waste composition and quantities currently available for Nairobi only, it has to be discussed up to which extent UN Habitat's data can be representative for the whole of Kenya, or certain areas of it. The number of households in Nairobi itself constitutes around one third of all urban households. Taking into consideration the sprawling character of the metropolitan area that grows into neighbouring urbanised areas of the Counties Kiambu, Kajiado and Machakos, **around half of Kenya's urban households can be attributed to the Nairobi Metropolitan Area**. Whereas primary data on the composition of solid waste has only been sampled for Nairobi itself, the results can be deemed representative for the whole Metropolitan area and hence should give a good **indication of waste composition for urban households in Kenya in general.** 39% of the total number of households and 31% of the total population are considered as 'urban'.

UN Habitat's analysis for Nairobi distinguishes households according to the three income classes 'high' (13% of Nairobi's headcount), 'middle' (35%) and 'low' (52%) with several samples taken from every group in order to assess average waste composition within every group. The daily waste amount differs in between 0.62 kg of solid waste per head per day (high income), 0.89 kg (middle income) and 0.19 kg (low income), averaging to 0.49 kg for every habitant of Nairobi. Based on the findings of JICA, UN Habitat estimates that the waste volume needs to be multiplied by 1.3 in order to account for municipal solid waste from establishments like shops, markets, restaurants, hotels and public facilities (schools, hospitals, etc.). This would raise the **daily amount of solid waste per head to 0.64 kg in Nairobi**. JICA calculates the waste quantities for Nairobi in more detail, analysing the occurrence at different establishments. JICA estimates the solid waste volume per person at 0.49 kg per day – slightly less than the more current analyses and coherent with presumably changing consumption patterns.

Primary research on waste amounts in rural areas have not been identified. **A triangulation from the above discussed data for urban areas gives an indication about the rural areas**. The average waste volume per Kenyan household is estimated at 0.39 kg per inhabitant and per day in 2016 [World Bank 2018]. Hence, **utilising 0.39 kg as a national average** [World Bank 2018], **0.49 kg as an average for urban areas** [JICA 2010] and taking into consideration the population distribution according to the 2019 census [KNBS 2019], **the solid waste generation in rural areas would average at 0.30 kg per head per day.**

According to the census, 32.7 million or 69% of all Kenyans live in rural, and 14,8 million or 31% in urban areas. Based on the numbers and calculations outlined above, **a solid waste volume of 18,550 tons per day or 6.8 million tons per year occurs in Kenya**, out of which 8,750 tons per day or 3.2 million tons per year in urban and 9,800 tons per day or 3.6 million tons per year in rural areas.

4.2.2 Solid waste disposal practices

The Kenya Population and Housing Census [refer to KNBS 2019, Volume IV: Distribution of Population by Socio-Economic Characteristics] gathered data about the main mode of solid waste disposal for the whole of Kenya. It distinguishes

between modes of collection as well as other modes of treatment and disposal by single households. This data is publicly accessible for every County and Sub-County. The questionnaires distinguished in between collected (by County government, by community associations or private sector), dumped onsite (i.e. within the own compound or through the latrine), littered (disposed of in the environment), incinerated (openly burnt at home or in close vicinity) and composted (home composting). Table 2 shows the *main* modes of solid waste disposal at the household level for the whole of Kenya, rural areas, urban areas and Nairobi County as part of the latter.

Hence, according to the data of the census, only 22% of Kenyan households mainly dispose of their waste via a collection mode. Around 18% of the households mainly dispose of their waste by composting it. For the remainder, roughly 60% of the households, disposal methods that can be considered inadequate are applied.

The above listed data gives an impression of how solid waste is managed by the single households. It nevertheless does not allow for quantifying waste amounts accordingly. This is due to the following reasons:

1. The form of data collection: it was undertaken through questionnaires asking for the *main* mode of waste disposal, not taking into consideration that several modes are likely to be used. For example, in the case of composting, it can be expected that not all waste is fit for composting, requiring at least one other mode of waste disposal for the respective household.
2. Missing data on quantities and composition of waste, especially for rural areas. Empiric studies on waste volumes and composition have been undertaken limited to the capital city Nairobi by JICA [2010] and UN Habitat [2019], with results mostly cohesive. Reliable data on waste composition for rural areas could not be identified within this assignment.

Based on estimations by UN Habitat, the following Figure 1 illustrates household waste management practices for Nairobi, considering sampled waste volumes. For Nairobi, around 70% of waste is considered collected. This number does not contradict KNBS data, as it refers to the amount of solid waste, whereas the latter refer to a household's *main* mode of disposal. The remainder, around 30% is considered as not collected and would, according to KNBS methodology, also include home composting. Nevertheless, as home composting is negligible in Nairobi, the vast amount of these 30% is inadequately disposed of through burning or dumping on site as well as direct littering into the environment.

Overall, semi-formal and informal dumpsites exist throughout the whole country, particularly in the proximity of urban areas, which includes Kenya's biggest dumpsite Dandora in Nairobi (Figure 2). It is to be considered that the vast majority of waste that is collected from households is also disposed of at a dumpsite. The alternative of this would be illegal disposal in the environment. Regular illegal dumping the scale of a collection vehicle would likely cause law enforcement to act up. Currently, no landfill in Kenya is operated according to international standards [Kenya Plastic Action Plan, 2019].

Table 2. Main Form of solid waste disposal at household level in % [KNBS 2019]

	No. of Households	Collected	Dumped onsite	Littered	Incinerated	Composted
Rural	7.379.282	1.5 %	20.8 %	1.1 %	51.6 %	25.1 %
Urban	4.663.734	54.6%	6.5%	4.4%	26.6%	7.8%
thereof Nairobi	1.494.676	80.8%	2.6%	7.8%	6.5%	2.0%
Total Kenya	**12.043.016**	**22.0%**	**15.3%**	**2.4%**	**42.0%**	**18.4%**

Figure 1. Waste management practices in Nairobi [Kenya Plastic Action Plan 2019]

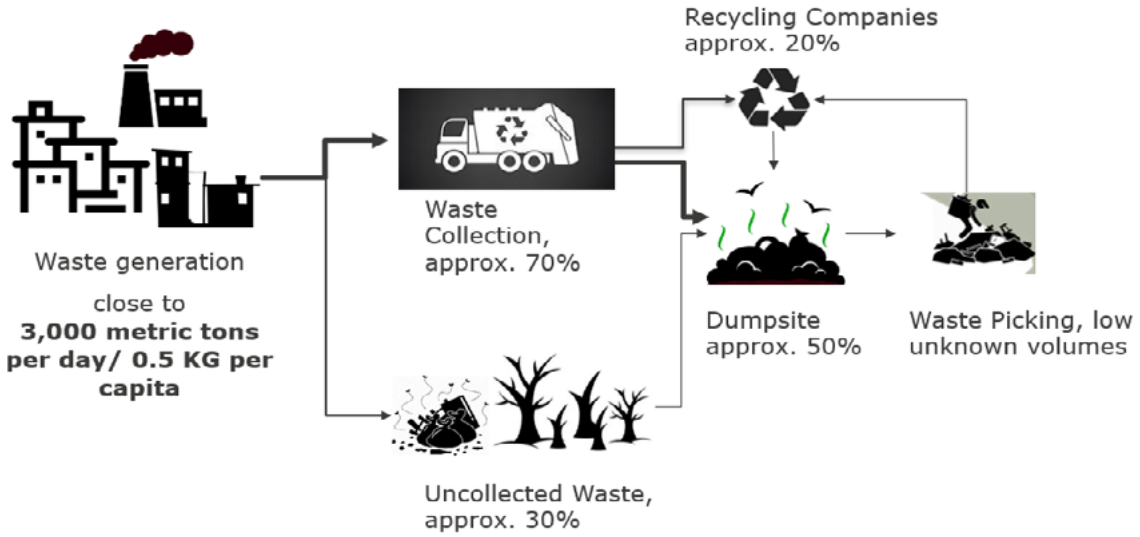
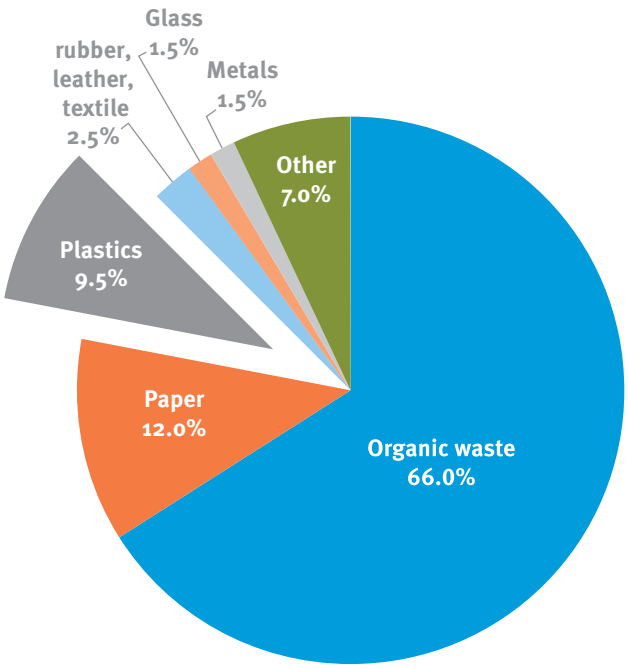


Figure 2. Disposal practices at Dandora landfill & mixed waste collection, Nairobi [© cyclos]

Figure 3. Waste Composition in Nairobi, according to JICA [KPAP 2019]



A description on waste management practices in Kenya, mainly Nairobi, is presented in more detail in the Kenya Plastic Action Plan [2019]. As a concluding finding, extraction of recyclables from waste streams mainly happens through manual processes. With the exception of one company running two sorting facilities within Nairobi Metropolitan area, **formal or systematic waste sorting is by and large missing, with direct landfilling of mixed waste being the dominant waste management method – next to practices that can be considered waste *mis*-management including burning on site or littering into the environment.**

Figure 3 shows the waste composition sampled for Nairobi. Plastic accounts for roughly 10% of municipal solid waste. The mass flow of plastics is further elaborated on in the following chapter 5.

4.2.3 Recycling

As outlined above, waste management within different parts of Kenya differs, with collection of waste dominantly undertaken in urban areas. The current recycling infrastructure is exclusively market based, the extraction of waste happens at any point that is economically feasible. Currently, materials fed into a recycling process are mainly extracted from waste that is collected. These extraction activities are often taking place directly on the collection lorry, and a smaller part also through waste picking from the street or the dumpsite. Further details on recycled plastic fractions are given in chapter 6.

Especially in vicinity of the major landfills in Nairobi but partly also in other economic or logistical hubs throughout the country, a diversified ecosystem of traders, sorters and aggregators has formed taking up valuables from waste collectors. These businesses are largely informal and usually small scale, operating by and large manually. The valuables are forwarded to recyclers taking up specific fractions in a defined quality. The recyclers then process plastics into secondary materials according to the converters' needs. Most plastic recycling processes – and all recycling processes undertaken in Kenya for materials sourced from post-consumer waste – do not allow for food grade use of resulting recyclates.

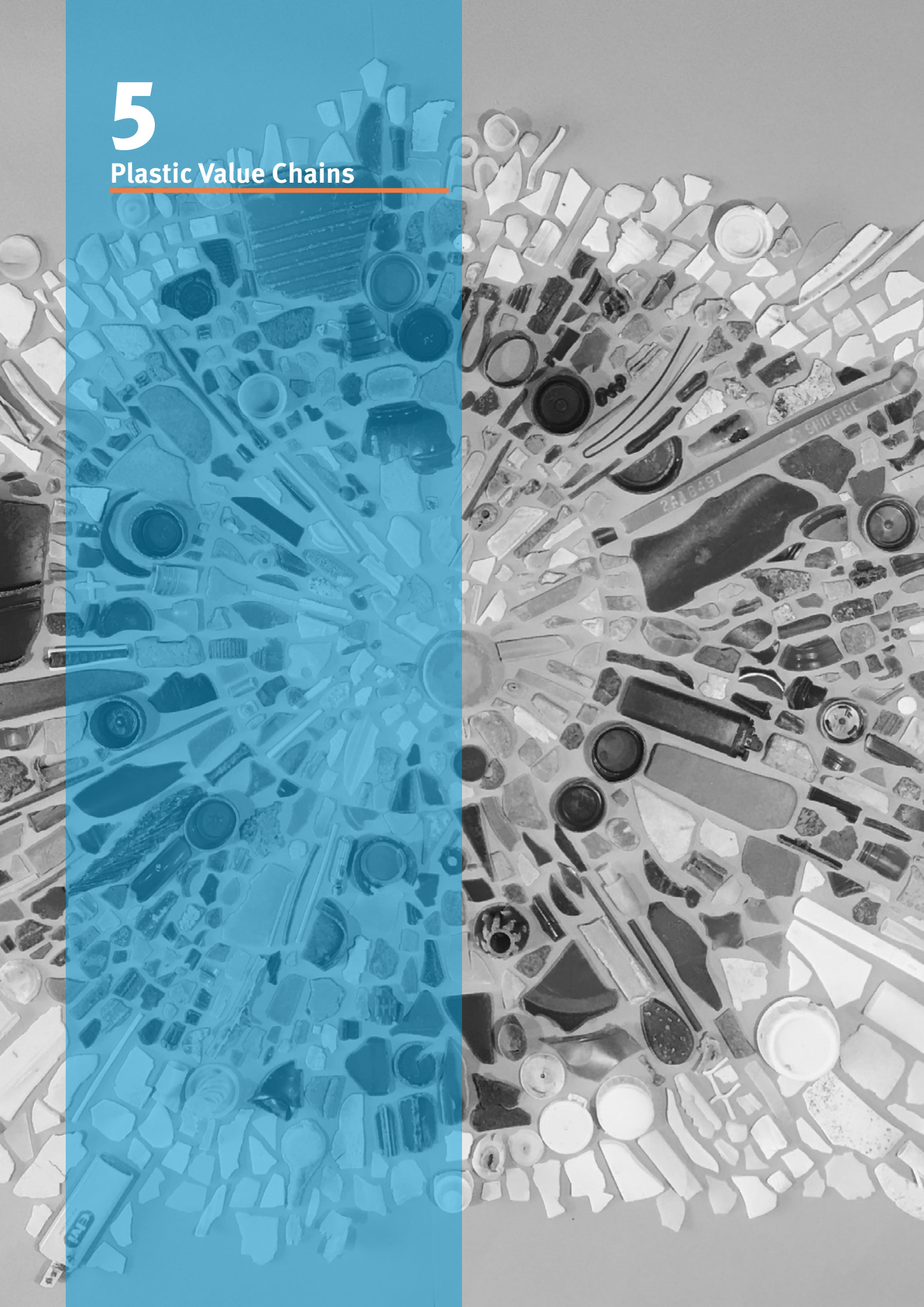
Many recyclers, particularly for plastics but also for other material fractions like paper, are organised as members of the Kenya Association of Waste Recyclers (KAWR). It has 457 members across the whole waste value chain within Kenya, according to their website.

4.2.4 Organic Waste

The National Bureau of Statistics included composting as a means of main disposal for households within the Kenya Population and Housing Census [KNBS 2019]. According to the census, **18.4% of Kenyan households use "composting" as main mode of disposing of their solid household waste**. This number stands 25.1% in rural and 7.8% in urban areas. In the biggest urbanised area within Kenya, Nairobi, a mere 2.2% of households use composting as main mode of disposing of solid waste [KNBS, 2019]. The vast majority of the households' waste volume – around 60% in urban areas and presumably more in rural areas – is organic, hence generally compostable. Against the results of the census, it becomes clear that **home composting is not a preferred way of waste treatment for Kenyan households, particularly not in urban areas**. Presumed ongoing urbanization will rather enhance than revert these practices.

A handful of companies in the vicinity of Nairobi have been identified to realise a business model beyond home composting scale. The respective capacities range from around 10 to 25 tons throughput per day, combined significantly below 100 tons per day. This economic sector is represented through the Compostable Forum (currently no internet presence). The theoretical input from solid waste in the wider Nairobi area can roughly be estimated in a range of 2,000 to 3,000 tons per day. The operational commercial composting operations therefore can process compost in a range of 2-3% of all occurring organic waste. Samples have shown that the technical standard applied is basic. These facilities are not operating as controlled composting facilities according to international understanding. **Commercial or industrial composting is a niche phenomenon in Kenya**.

5
Plastic Value Chains



5.1 Plastic Waste Data Sources

5.1.1 General

Besides a desktop-based study from Eunomia [2018], recent waste generation data that would allow to draw a secure picture the plastic waste flow of Kenya as a country is currently not available. Scrutinising and re-analysing the underlying sources of Eunomia's study against the background of newly available data from the census as well as from the regular economic updated from Kenya National Bureau of Statistics [KNBS 2019; KNBS 2020] combined with aggregated data from World Bank [2018], allow to supplement existing information and hence draw a more comprehensive picture.

The results of this analysis were verified against more current data sampling undertaken by UN Habitat [2019] for Nairobi, which was taking input from a detailed study on Nairobi from JICA [2010] as a base. Both studies limit their scope of research on the Nairobi area, therefore containing limited information on the rest of the country.

Information on the plastic value chain is largely derived from the consortium's network within the industry. Next to existing datasets from previous assignments – the Kenya Plastic Action Plan [2019] and a Business Model for the Kenyan PRO [2020] complemented by other literature review [e.g. Kenya Business Guide, 2018] the direct liaison with key stakeholders for this assignment allow to draw a reliable range for this simplified plastic mass flow diagram.

5.1.2 Data on Imported Plastic

Kenya currently does not produce virgin plastics. The only facility that theoretically could process raw materials into base products for plastics – a crude oil refinery in located in Mombasa – has ceased operations for years already. The (minimal) domestic crude oil production has to be processed abroad in order to be used for plastics.

This **import interface** is the starting point for all plastics, either in the form of finished products and packaging or as resins. Plastic resins – further processed into products and packaging – either originate from abroad, or are being recycled from used plastics domestically. All plastic volumes therefore are imported one way or the other – at a certain point in time also secondary plastic from recycling processes has been imported.

The number of imported plastic resins as a resource is documented and taxed by Kenya Revenue Authority and hence published in the regular statistical releases. KNBS uses two categories to document the direct import of plastics – 'plastics in primary and non-primary form' and 'articles of plastic'. The trade balance, i.e. the net import of both categories stood at 491,305 tons in 2019. This number has followed a steady growth part over the last years, from 467,384 tons (2016) over 447,629 tons (2017) and 474,713 tons (2018).

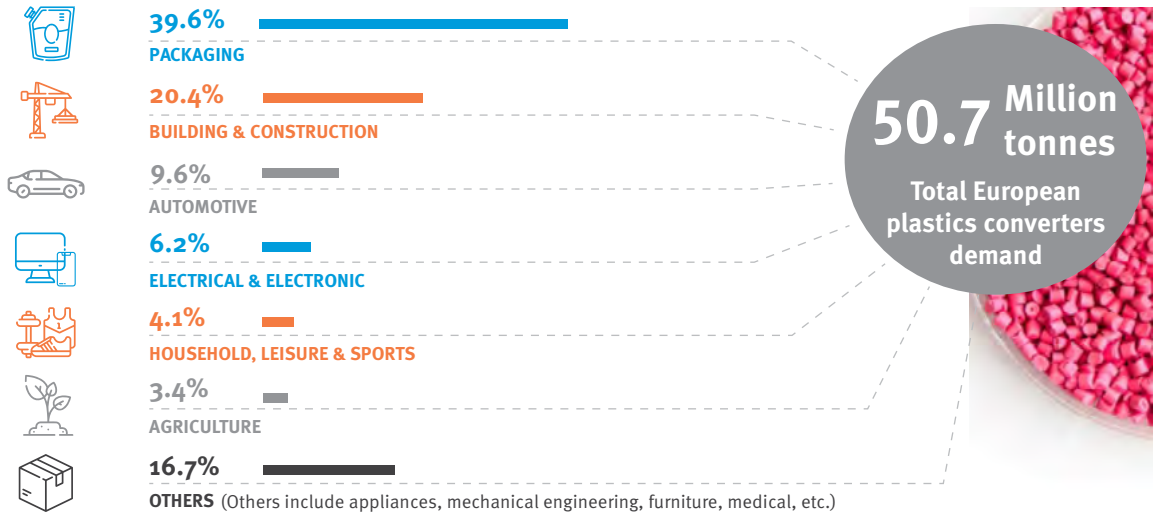
Another category that has be taken into consideration are packaging items whose attribution to the category 'plastic' can be disputed upon, e.g. certain packaging materials that are composed of a mixture of plastic and packaging (e.g. 'tetra packs'). Respective amounts may fall under the category of 'paper' (only import data available) or 'printed matter' (both import and export), whose trade balance combined stood at 353,500 tons in 2016. The respective volumes have fluctuated over the last years, from 336,293 tons (2016) over 365,372 tons (2017) and 393,531 tons (2018).

Another avenue for incoming plastic is in the form of packaging for finished goods (FMCG, furniture, raw materials, etc.) or of products (single use plastics, plastic items, plastic as part of other products like electronics, etc.). The import of plastic as part of these products cannot be accessed through the available data from KNBS. It could be triangulated if the portion of plastic packaging against respective plastic product could be estimated, e.g. based on international experiences with better data availability. Even though Eunomia assumes this ratio to be at 53% based on the South African experience, no justification supporting this assumption for Kenya is available; it has therefore not be taken into consideration for the mass flow analysis. The following figure splits the plastic usage according to different product categories in Europe. Plastic waste may therefore not only occur from packaging but also be derived from other uses – from products that have been imported to Kenya under categories different from the named ones. This aspect needs to be taken into consideration when assessing data gaps.

Under KAM membership base, 'plastic and rubber' sector has a capacity to process 360,000 tonnes plastic yearly [Kenya Business Guide, 2018]. The **reported plastic processing capacities are significantly lower than documented**

input quantities indicate – both concerning virgin and recycled fractions. One possible explanation for this mapping gap is the high portion of manufacturers of packed goods that have insourced plastic processing into their production. For instance, bottlers commonly use pre-fabricated PET items (imported) that are blown into PET bottles. They are then filled with drinks on the same production line and on the same premises. Thus, these companies may not be formally recognised when assessing the plastic manufacturing sector [also refer to interviews from Kenya Plastic Action Plan, 2019].

Figure 4. End use of plastics processed in Europe [Plastics Europe 2020]



5.1.3 Data from Waste Generation

Eunomia's [2018] plastic amounts discussed for Kenya range from 503,000 tons per year on the lowest to 966,000 tons per year on the highest end. Next to import data, the report also considered waste composition analyses. Nevertheless, this latter data source was ultimately discarded – "due to the larger number of assumptions made" – in favour of observations from the Republic of South Africa as a baseline for the data.

Assuming every Kenyan's consumption according to current patterns sampled by UN Habitat [2019] in Nairobi, i.e. a waste volume of 0.64 kg per head per day with a plastic portion of 12%, would lead to significantly higher estimates on plastic volumes. In this case, the number would rise to 1,334,000 tons of waste plastic per year; given the largely rural character of Kenya with significantly differing socio-economic patterns, this number seems to set a maximum cap on current plastic waste volumes.

Utilising the waste figure provided for by World Bank [2018], 0.39 kg per person per day and use the commonly accepted data from JICA [2010] with a plastic portion of 9.5%, the total quantity of plastic that becomes waste every year can be estimated at 644,000 MT; if the more recent plastic portion of 12% according to UN Habitat is used, the respective volume can be estimated at 813,000; each based on a population of 47.6 million in the year 2019 [KNBS 2019]. These numbers are well in range with the above discussed. **The full amount of plastic that becomes waste in Kenya lies within the approximate range of 0.5 to 1.3 million tons per year.**

A certain portion of the plastic used to produce goods also add upon the anthropogenic stock, i.e. is used for a longer time in the form of plastic products. This is the case for applications like building materials – pipes, sheets, etc. – and household goods – buckets, basins, brushes, multi-use cutlery – among others. The in-use time of this wide range of plastic products can range from months over years to decades. Their joint attribute is that they are usually less considered as a source of littering. Packaging and single use plastics, on the other hand, are defined by a short in-use phase that rarely exceeds a few weeks or months. Mis-management of waste from packaging and single use items is considered as problematic in Kenya and political action to curb plastic pollution usually addresses waste from respective fractions.

Table 3. Comparison different estimations on plastic amounts

Reference	Eunomia (2018)	UN Habitat (2019)	World Bank (2018)	JICA (2010)
Solid waste per capita per day		0.64	0.39	0.49
Plastics in % of total waste		12 %	(9.5-12%)	9.5
Total plastic amount in tons	503,000-966,000	1,334,000	644,000-813,000	809,000

5.1.4 Data from Plastic Recycling

Primary data used on the amount of recycled plastics has been researched by Eunomia [2018]. According to Eunomia, **the quantity of recycled plastics stands at 30,457 tons yearly**, based on research undertaken for 2017, data supposed to be relatively accurate given Eunomia's high number of interviews held with plastic recyclers. This assignment's engagements with key stakeholders along the plastic value chain generally verified these findings.

5.2 Plastic Processing

Around 140 formal establishments produce within the Kenyan plastic industry and are involved in the manufacturing of various plastics articles and plastic packaging. The industry has significant linkages to other manufacturing sectors, feeding into about 90% of other locally processed products such as dairy, sugar, bakeries, food and confectionery. The plastic industry also supplies to other sectors such as agriculture, horticulture, hospitality, health and pharmaceutical manufacturers as well as retail outlets up to the single end consumers. Under KAM membership base, 'plastic and rubber' sector is currently comprised of 106 companies (membership list obtained March 2021). The following Table 4 shows a categorization the KAM members organised within the 'plastic and rubber' sector. It is vital to note that a clear distinction is often not possible due to portfolios that cover more than one category. An estimation of market shares, detailed product categories and production volumes – also exceeding KAM membership base – would require a more in-depths study.

Table 4. KAM plastic and rubber sector member categories [own categorization based on membership data at the directory of Kenya Association of Manufactuers]

Category	Number of Companies
Construction material including water tanks, PVC pipes, roof sheets, fibre glass etc.	25
Industrial and agricultural plastic products including agricultural sheets, shoe soles, textiles, etc.	7
Household plastic products including basins, brushes, pens, car mats, etc.	17
Plastic bags including nonwoven bags, garbage bags, etc.	13
Plastic Packaging and single use plastics including PET bottles, caps, lids, films, shrink films, foils, containers, etc.	36
Others including weaves, tyre rethreads, production equipment, etc.	8
Total	**106**

5.3 Plastic Mass Flow

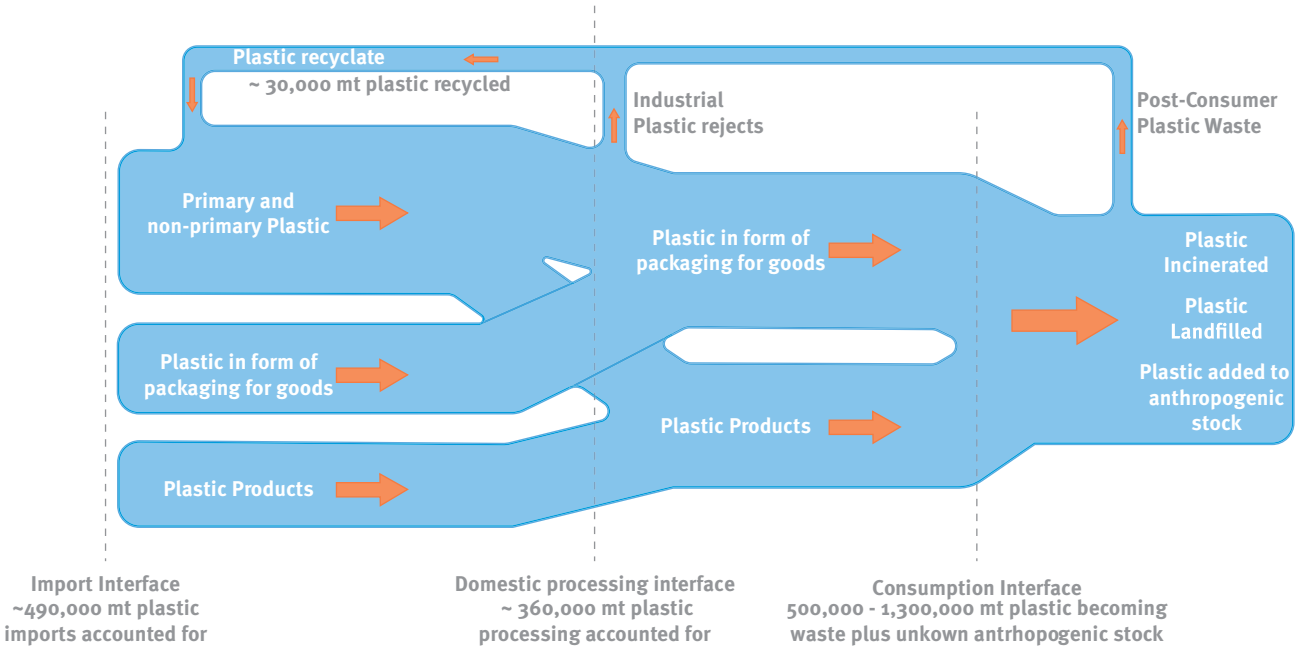
A simplified plastic mass flow is shown in Figure 5. **Detailed elaborations on data sources for imported plastics, domestic processing capacity and recycling are given in Annex 7.2**. Next to existing datasets from previous assignments – the Kenya Plastic Action Plan [2019] and a Business Model for the Kenyan PRO [2020] complemented by other literature review [Eunomia 2018; KNBS 2019; KNBS 2020; World Bank 2018; UN Habitat 2019; JICA 2010; Kenya Business Guide, 2018] the direct liaison with key stakeholders for this assignment allow to draw a reliable range for this simplified plastic mass flow diagram.

The mass flow described below gives *estimations* on the whereabouts of plastic as a resource. Concerning available data, there are more gaps than reliable information. As discussed above, the amount of plastic that becomes waste at the consumption interface can be estimated in a range of 0.5 to 1.3 million MT; the same range should hence apply for the import interface. In any case, **only a small fraction of the plastic that has been used in Kenya is going through a recycling process**, i.e. becomes a resource again. The vast majority of the plastic becomes waste after single use – given the current waste management practices that means either landfilling or littering into the terrestrial and marine environment.

Waste from packaging and single use plastics occurs at two different interfaces, as highlighted within the mass flow diagram: the production interface causing industrial plastic rejects, and the consumption interface causing post-consumer waste. The distinction between these two interfaces is relevant, as the related recycling processes oftentimes differ significantly.

Within modern production processes, a certain portion of the material input becomes waste during the production process. The waste from production interface has significantly different characteristics from that of consumption interface, in that it has not been contaminated and is often accessible in a very pure form, closer resembling to the raw material. As it usually occurs in a homogenous matter at one point, this material oftentimes also has a value that can somehow be exploited. During the assignment for the Kenya Plastic Action Plan [2019] the handling of this pre-consumer plastic waste has by and large proven to not be problematic, rather **the current *plastic* waste management deficiencies are attributed to the post-consumer stage.** This aspect needs to be taken into consideration when assessing measures to reduce plastic leakages into the environment.

Figure 5. Schematic plastic mass flow Kenya showcasing data gaps [own figure]



6

Discussion on measures to reduce leakages from plastic waste specific to Kenya's waste management framework

6.1 Overview

There are several strategies that can be taken to reduce plastic waste leaking into the terrestrial and marine environment – by limiting virgin material usage in packaging and single use plastics as well as improving plastic waste's management. Each strategy has different targets, different effects and come with a certain set of risks. As several strategies can be implemented, it also needs to be carefully examined how they relate to each other, where they potentially could offset each other and where they potentially reinforce each other.

Thus, the suitability of a certain strategy for reducing the plastic leakage of a certain item or items category varies depending on how the waste stream characteristics of the items or items category relate to the strategy. Generally, we distinguish five different strategies, discussed in more detail in **Annex 7.4.**

1. Increase waste management infrastructure (separation at source, collection, ...)
2. Fee modulation (if subject to EPR legislation), otherwise taxation
3. Design change by the means of substitution
4. Design change by the means of increased design for recycling
5. Bans

In addition, we provide an overview and analysis on compostable plastics and using no packaging in the Annex 7.4.

The named strategies are to be understood as holistic concepts that will be split in between the public and private sector. In Kenya, this would mean that **KEPRO and the government take joint action to assess and operationalize the specifically most suitable strategy.**

Recycling infrastructure is crucial to increase the actual recyclability. Some products may be designed for recycling following international best practice. Yet, design for recycling is only a prerequisite when assessing recyclability specific to the context. **The recycling infrastructure present in the concerned region/ country determines whether a product or packaging is recycled or not.** If the technology is not available, the product or packaging will not be forwarded to recycling but treated as other waste streams, which is in Kenya disposing of at a dumpsite or littering (Kenya Plastic Action Plan, 2019).

Actions that target the removal of already littered plastic may complement measures to curb plastic induced pollution, they nevertheless fail to address the original source of the problem, i.e. the lack of a systematic and comprehensive waste collection of plastic waste accompanied by missing or insufficient organisational and institutional structures. Thus, focusing on putting such structures and capacities in place is crucial for any long-term success for reducing plastic leakages. The focus of proposed measures therefore lies on **preventing the littering of waste through incentivising better waste management practices,** based on the legal and technical framework that is currently in place or whose implementation can be foreseen.

The study assessed relevant plastic packaging and single use plastic items used in Kenya regarding their current recycling status and measures that can be taken to mitigate their potential to be leaked into the environment, i.e. improve their management once they have become waste. The inclusion in this list has been based on interviews held for this assignment reflected with our international expertise as well as clear mentioning in laws and regulations in Kenya. Relevance therefore is dependent on three factors:

1. If a plastic item is highly relevant for the Kenyan context, i.e. if it is one of several dominant items used for single use plastics or plastic packaging;
2. If a plastic item has proven highly problematic for recycling processes that are currently common or could become so in the foreseeable future, i.e. if even low quantities of the item adversely impact the management process of other items;
3. If a slight adaptation of existing material composition can effect in significantly better waste management for the said item given the current waste management infrastructure.

All of the above listed strategies should be considered as part of a holistic concept for improved waste management. Existing waste management practices have proven to be able to recycle a limited amount of plastics entirely built on market mechanisms – achieving a

recycling quote of only around 5 to 10% of all plastics released onto the Kenyan market. The applied technologies are often basic and need to significantly develop in order to improve both quantity and quality of recycling.

The analysis of the recyclability of various plastic types in light of existing recycling infrastructure in Kenya is based on authors' network within the waste management sector and the interviews conducted for this assignment. These interviews have partly been granted under the condition that no clear reference is made to the interviewee. With some of the information disclosed also considered confidential, thus no specific companies are referred to.

6.2 Analysis and recommendations on relevant plastic items

6.2.1 Rigid Plastics

Different plastic fractions are transformed into rigid plastic items. Rigid plastics are commonly used for containers, cups, bottles, and so on. Unlike their counterpart – flexible plastics – they are shaped into stable forms like yoghurt cups, edible oil containers, take away food trays, bottles for different liquids and so on.

Rigid plastic items are usually not broken into pieces when becoming waste. They can be identified and extracted from other waste streams relatively easy. They are relatively dense and hence heavy, allowing for relatively much material, i.e. value per single item. **Those rigid plastic items that combine high weight and value, easy handling, clear identification can be forwarded along the value chain and reach high recycling rates in Kenya.**

Injection moulded rigid plastics – 'Kasuku' (HDPE, PP)

Description: A common category among Kenya's rigid plastic is called **'kasuku'**, referring to injection blown hard plastics used to pack, for example, edible oil or bigger containers of detergents. These opaque (i.e. non-transparent) rigid materials – either PP or HDPE – are commonly reused; food containers for example for home-brewing 'muratina' (a liquor produced in the areas around Mount Kenya) or storing and transporting petrol and other fuels. Hence, kasuku's in-use phase in Kenya is generally long, often exceeding the original packaging purpose. Once kasukus become waste, the recycling infrastructure is currently largely able to process them. ***The collection, separation and recycling rate for kasuku plastics is quite high throughout Kenya***, especially in the urban areas. Recycling plants pay within a price range of around 28 to 35 Kenyan Shilling per kg for suitable items.

Recycling: Kasukus are bought off by recyclers that apply a grinding process and sell them to plastic converters that then produce new plastic products. The dominant processing happens via dry grinding, whereas only very few companies are known to use a process of wet grinding, allowing for higher quality output. Besides a few exceptions, the single recycler's capacity usually stands at a few hundred kg per day, if at all. An estimated 60 to 90 active kasuku recycling businesses are operating throughout major hubs of the country including Nairobi and Mombasa, such business includes companies that purchase rigid plastics – kasukus as well as similar items like caps from PET bottles, for examples – to grind them into plastic flakes. On the converter side, the market is much more consolidated with only one company taking up around 90% of the input materials.

One niche application encountered during this assignment is the recycling of kasuku into a flexible plastic layer. This is then used for packing detergent for a multinational consumer good company with manufacturing operations in Kenya. At the current scale, this can rather be considered as a pilot/ trial project.

Recommendation: kasuku is partly being replaced by materials/ fractions less favorable to adequately manage; higher use of kasuku would be favorable. With further advancing of the extended producer responsibility (EPR) system, incentives could foster kasukus' use over other less favorable materials and items. A respective fee modulation should be taken up by the private sector through the PRO.

A potential threat to kasuku recycling lies in the limited offtake of the recycled materials, currently by and large one single company. Further incentives in order to diversify and secure offtake of recyclates may prove relevant over time.

Figure 6. 'Kasuku' items packed in Kenya [© AHK]

Thermoformed rigid plastics – containers, trays; (PP, PS)

Description: Another common category of rigid plastics is made through the **thermoforming** process, usually from PP or, less common in Kenya, from PS. This applies to simple, one-coloured yoghurt cups and coloured trays for vegetables, for example.

Recycling: The challenge is that items made from this material fraction are much lighter and smaller than kasukus; due to the nature of the packed food, the level of contamination is also relatively high. Isolating these items from a mixed waste stream – as generated by a typical Kenyan household due to the lacking separation at source – and cleaning them from contaminations is economically barely viable, i.e. the **costs of recovering respective items are currently not offset by the economic value that can be generated through the recycling process**. This results in no established recycling value chain for post-consumer thermoforming rigids being operational.

In 2021, one company has set up a plant that allows recycling a significant amount of this category. The process is similar to that of kasuku recycling- grinding the rigid plastics into flakes. The plant became operational just recently. While their output adds a new stream of recycled material, it is too early to make an informed statement on this operation. Except for this single example of recycling in Nairobi, **recycling for thermoforming rigid plastics is not undertaken in Kenya**.

Recommendation: One fundamental task for the EPR system is to build incentives for recyclers to bridge the economic gap that currently prevents uptake for recycling. In this way, viable business models can be developed and may result in the setup of relevant organizational and technical infrastructure, similar to the functional one such as the currently only market-based mechanisms of kasuku. Respective financial incentives can be set at different stages of the waste management value chain. Unlike the case of kasuku that is easier to take up as market-based business, fee moduation under EPR system can be adjusted depending on how high the cost is required for recycling and functional recycling infrastructure. A respective fee modulation should be taken up by the private sector through the PRO.

Figure 7. Thermoforming plastic items in Kenya [© Brookside Ltd., Bio Foods Ltd.]

In-mould labeled rigid plastic – containers (PP)

Another rigid plastic category that is often used for similar purposes is called **in-mould labelling.** Oftentimes, in-mould labelling is chosen when aiming at higher quality perception by the customer – it allows for higher quality printing. In this case, the labelling is printed onto the item as an integral part and can't be separated by hand. Common applications are – as thermoforming – yoghurt cups and similar containers.

Figure 8. Recycled injection mould plastic item packed in Kenya [© AHK]

Recycling: As the rationale for injection moulded labelling lies in an attractive print with usually several colours, the recyclates will be of mixed colour with respective lower value for converters. An additional reason for limited uptake is insufficient economic value to cover associated recycling costs, as in the case of thermoforming: relatively low weight and higher level of contamination– due to the nature of the packed products like dairy, etc. Depending on the exact material composition, splitting up the two (or more) components may require sophisticated processing. ***In Kenya, recycling for in-mould labelled rigid plastics is not undertaken.***

Another finding for in-mould labelling is worth to note. In some Kenyan supermarket shelves, yoghurt cups that can be attributed to this category are labelled as made from recycled plastics. A background research for this assignment has verified that the input material is sourced from post-industrial waste streams, i.e. material with a high purity that closely resembles virgin plastics. It does represent an innovative approach to enhance recyclate content for packaging, and particularly food packaging (also refer to inventory of standards in Annex). However, this kind of recycling would not be feasible if sourced from post-consumer waste streams. Requirements on food safety against the current state of recycling technology (both in Kenya and worldwide) cause challenges for the provision of food-grade recycled materials from post-consumer waste.

Recommendation: Recommendations are similar to thermoformed items, however, presumably different recycling process parameters will should be taken into consideration. One fundamental task for the EPR system is to build incentives for recyclers to bridge the economic gap that currently prevents uptake for recycling. Hence, viable business models are enabled and may result in the setup of relevant organizational and technical infrastructure; similar to the functional, currently only market-based mechanisms for kasukus. Respective financial incentives can be set at different stages of the waste management value chain. In comparison to fractions that are taken up more easily – like kasuku – fee modulation within the EPR system can reflect the higher required expenditure to enable a functional recycling infrastructure. A respective fee modulation should be taken up by the private sector through the PRO.

Figure 9. Injection moulded plastic items packed in Kenya [© Bio Foods Ltd, Brookside Ltd.]

Thermoformed rigid plastics – PET trays

Description: Trays made of PET are increasingly common in Kenya against those made of PP as they come with certain advantages on functionality and optics. In order to achieve a certain kind of functionality, e.g. stronger barriers against acids, PET is mixed or coated with certain additives. For plastic trays commonly used for packing meat or vegetables, glycol is added. This sub-category of PET is hence designated PETG, against the amorphous PET or A-PET commonly

used for PET bottles. Products made from PETG retain a high level of transparency and are more shock resistant; in addition to easier processing for the manufacturer/ filler. A third common category is trays that are suitable for being heated in the oven or the microwave: crystallized PET or C-PET builds a stronger barrier against thermal deformation. Currently, C-PET cannot be produced as a transparent product but commonly comes in the form of opaque or black trays.

In Kenya, especially the market for transparent trays is shifting in favour of PET against PP. Currently, around 40% of all plastic trays in Kenya are made of PET already, with an increasing tendency. Common applications are grapes, tomatoes, berries, mushrooms, fresh meat, restaurant to-go-foods and ready-made meals with specific material compositions – as per required functionality. Some of these products are packed in Kenya, others are imported (e.g. grapes are usually imported).

Recycling: The process for recycling thermoformed PET is quite sensitive and with additional process steps (e.g. mechanical removal of coats) and higher difficulty to handle. It requires specialized machinery and a high level of process control– in addition to a waste stream with low levels of impurities. Also, in Europe – with a more established recycling infrastructure – the uptake of PET used in thermoforming processes is rather in the pilot stage and not done at significant scale, yet. Therefore, i**n Kenya, plastic trays made from PET are not recyclable**. PP trays, on the other hand, can be recycled technically more easily, allowing for easier scaling; refer to thermoformed rigids.

Recommendation: Worldwide, the use of PET for packaging is rather in the stage of acceleration than retrieval. This is due to generally higher functionality in comparison to traditional plastic fractions like HDPE, PP or PS. For specific applications and material compositions as used for thermoformed PET trays, the recycling technology is to be developed along the increased usage. The application of recycling technology for thermoformed PET will likely to become more available also in Kenya in the long run. Nevertheless, **due to the currently unavailable recycling technology in Kenya, substitution of PET trays by material fractions that are easier to recycle**, e.g. PP trays, should be fostered e.g. through fee modulation within the EPR system. This would cause a competitive advantage for materials that are more compatible with the recycling infrastructure that is existing or that can be set up within a reasonable timeframe. Through this, usage of currently non-recyclable PET trays could be shifted towards applications where the functional advantages outweigh the fee disadvantage.

Figure 10. Common PET trays packed in Kenya [© Zucchini Greengrocers Ltd., Isinya Feeds Ltd.]

PVC rigids – pipes, cables

Description: PVC is of little relevance as a post-consumer waste fraction in Kenya; it is mainly used for construction material like pipes with a long in-use time.

Recycling: Two to three smaller recyclers do process waste from PVC into construction materials. Recycling plants purchase PVC within a range of 15 to 20 Kenyan Shilling per kg.

Recommendation: The actual significance of PVC should be monitored. If the status quo is maintained; beyond generally improved waste management practices, no PVC-specific action is recommended for the reduction of plastic leakages into the environment. If a shift of packaging products towards PVC occurs, specific measures to either assure its adequate recycling or limit its use should be discussed.

6.2.2 Flexible Plastics

Flexible plastic describes all malleable items. They are made from different plastic material fractions and are represented through foils, films, pouches, blisters and more. By nature, flexibles have a low weight. As consumer waste, they are often occurring in even smaller pieces – ripped, perforated, torn, etc. – than initially used. Commonly, they are also highly contaminated with other waste fractions. It is practically impossible to distinguish in between different plastic material fractions when extracting flexibles from post-consumer waste streams as they occur in Kenya. More often than rigid plastics, they are used jointly with one or more different materials, forming multilayer composites to enhance functionality. Separating several layers of different plastics from each other can usually not be done manually. Due to the combination of these factors, the current recycling rate is very low. Most active recycling operations concentrate on industrial rejects and are barely targeting post-consumer waste. Improved management of flexible plastics is also considered as the field prioritised most by the Kenyan government. According to sector stakeholders, the EPR funds collected and administered by the PRO (refer to section 2.5) are meant to initially focus on an increased recycling infrastructure for flexible plastics.

Monolayer foils and films (HDPE, PP, PVC, PET)

Description: A flexible item like a film, a foil, a label, etc. may consist of one layer made from one plastic fraction, usually, LDPE; but also, PP, PVC, PET as common material fractions possible. These foils represent extremely light-weight material used in a number of consumer products as well as industrial packaging. Hardly any packaging alternative can meet the functionality of flexible plastics. Reduction potentials may particularly be realized for industrial applications. In Kenya, the most commonly used material fraction for flexibles is LDPE. Items like nonwoven carrier bags have partly substituted the banned thin layered plastic bags. These items usually consist of HDPE monolayer flexibles.

Recycling: *Transparent* monolayer LDPE foils and films are currently recycled by around ten companies throughout Kenya. These are mainly based in Nairobi and Mombasa. Each of these companies works with a production capacity of barely several hundred kg per day. Most of the input material is sourced from commercial generators like supermarkets or shops that buy goods in bulk – for example transport packaging. The input is sourced to a much lesser, likely negligible extent from post-consumer waste. Before being melted, the materials may be washed, in the simplest form even in a river. If the material is barely contaminated, this washing step may even be skipped. Currently, the recycling process mainly results in construction material. Depending on the source (post-consumer versus industrial) and the available purity of the material, other recyclate usage up to food grade recycling is technically possible.

Coloured monolayer LDPE foils/ films may be processed similarly. Mainly for the reason of more likely originating from post-consumer waste – but also due to less versatile use for the coloured recyclate – recycling rates are significantly lower.

Those monolayer LDPE foils and films that can be extracted from other waste streams with minimal levels of contamination are currently recycled in Kenya; this mainly applies to production waste that is bought by recycling plants within a price range of around 10 to 20 Kenyan Shilling per kg, depending on the quality of the flexibles. Post-consumer flexibles reach 8 to 12 Kenyan Shilling per kg at most, if supplied at an acceptable level of contamination. Flexibles derived from post-consumer waste in general only reach extremely low recycling rates in Kenya.

Nonwoven carrier bags from **HDPE monolayer flexibles are currently recycled at very low, negligible rates**; dominantly from industrial rejects and less from post-consumer waste. All other flexible plastic items – namely foils and film made from PET, PP, as well as so called Bio-PP distort the recycling process and can't be distinguished from others – adversely affecting those flexibles that can be recycled.

During the course of this assignment, it was reported that one company invested on a new recycling line for different fractions of flexible plastics. This recycling plant should start its operation in the first half of 2021, targeting monolayer plastics as well as certain multilayer composites.

Recommendation: Similar to all fractions that can technically be recycled in Kenya but lack market uptake thus far: One fundamental task for the EPR system is to build incentives to bridge the economic gap that currently prevents uptake for recycling. Hence, viable business models are enabled and may result in the further setup of relevant organizational and technical infrastructure. Respective financial incentives can be set at different stages of the waste management value chain. In comparison to fractions that are taken up more easily – like kasuku – fee modulation within the EPR system can reflect the higher required expenditure to enable a functional recycling infrastructure. A respective fee modulation should be taken up by the private sector through the PRO.

Certain material fractions that are technically more difficult to recycle and incompatible to the current infrastructure should be avoided, where possible. This is concerning multilayer flexibles (refer to below) as well as flexibles made from PVC or PET. Fee modulation within the EPR system may prove as a viable measure to foster the use of flexibles that can be taken up by the recycling value chain.

Figure 11. Kenyan LDPE food packaging and HDPE nonwoven bags [© KSL Ltd., Ecobag Ltd.]

Plastic multilayer (multi-material) and composite foils and films

Description: Some products or their packaging require a functionality that is better fit by a multilayer material than a monolayer, from view point of price, logistics, food safety, shelf life or mixture thereof. In this case, multilayer packaging either consisting of different (flexible) plastic fractions or composites of plastics and other materials – most commonly aluminium – are used.

Recycling: Multilayer and composites cannot be separated manually and hence require specialized recycling equipment. The different materials' properties may additionally distort the recycling process of the other fraction. Certain recycling processes *may* allow for recycling of one of the layer fractions but rule out recycling processes for the other(s).

Recommendation: Generally, in line with other flexibles and other materials difficult to recycle, the EPR system may introduce financial incentives to bridge the economic gap that currently prevents uptake for recycling. Specifically, for certain multilayers and composites, recycling technologies are technically sophisticated and may not be viable due to the limited volumes in Kenya. **Substitution by monolayers (where possible) should be incentivised** e.g. through fee modulation within the EPR system. This would result in a competitive advantage for materials that are more compatible with the recycling infrastructure that is existing or that can be set up within a reasonable timeframe. Through this, usage of currently non-recyclable multilayer and composite flexibles could be steered into applications where the functional advantages outweigh the fee disadvantage.

6.2.3 Others

PET Drinking bottles

Description: The most iconic application for PET are bottled drinks. Nevertheless, the term "PET-bottle" usually describes an item made from three different fractions – the transparent or coloured PET bottle itself, the cap made from HDPE or PP and the label, commonly consisting of an LDPE film but theoretically also made from other flexible plastics. The light-weight materials have proven viable to store carbonated and non-carbonated drinks and mature technology allows for easy logistics of raw materials and enables business models at different scales. All three material components are produced at scale outside Kenya. Within the bottling process in Kenya, the materials are combined into the PET bottle; small volumes of already bottled drinks (premium range/ specialties) are also imported directly.

Figure 12. PET bottles filled in Kenya [© Kevian Kenya Ltd., CocaCola Sabco Ltd.]

Recycling: The current recycling infrastructure in Kenya is able to take up PET bottles. The three fractions can usually be separated within the process (e.g. applying a swim-sink separation process). PET bottles are washed, grinded and then sold – usually exported – as PET flakes. Worldwide, PET from drinking bottles is currently the only fraction that is recycled into food grade packaging at scale (then designated rPET). Nevertheless, such a process requires a sophisticated collection process allowing for high purity of amorphous PET (A-PET) material. PET recyclates produced in Kenya are therefore used for non-food purposes, such as fibre and yarn. Currently, two companies take of PET and recycle it into domestically used products such as sticks for brushes or strappings for bulk packaging/ handling. Another ten to twelve companies recycle for export – representing the vast majority of the PET throughput. Coloured PET has a lower market value against clear PET, making the recycling by and large unviable at current market prices.

The HDPE or PP caps are usually forwarded to the recycling facility together with the PET bottle. The material attributes are the same as kasuku items and can hence be fed into the respective recycling processes (refer to above). In the more and more rare case the label is made of other materials than LDPE, it would distort the recycling process. The dominantly used LDPE labels are extracted and can be fed into the flexibles recycling processes (refer to above).

The daily volume of PET bottles released onto the Kenyan market stands at around 100-120 tons according to interviews conducted within this assignment. Out of this, **slightly more than half of the PET bottles placed in Kenyan market are somehow fed into a recycling process**. Further processing of the resulting recyclates is majorly undertaken abroad (mainly India). The viability of the business model is therefore determined by the world market for PET flakes. As the market value of PET is relatively low, collection and sorting costs currently do not justify the logistical costs for feeding a higher portion of bottles throughout the country into the recycling process. Recycling plants pay within a price range of around 16 to 19 Kenyan Shilling per kg for suitable PET bottles.

Figure 13. Recycled plastic flakes (transparent input material) from Kenya [© cyclos/ AHK]

Recommendation: Certain PET bottles' design causes incompatibility with current recycling facilities in place in Kenya. As PET bottles for beverages closely resemble each other, a uniform

design may be adequate to mitigate these challenges. This standard could stipulate a defined material composition (e.g. A-PET bottle, HDPE cap and LDPE label), as well as certain other elements (e.g. transparency, slim label that can be removed mechanically). Private and public sector combined would be in charge of developing such a KEBS standard. Ultimately, uniform design – combined with a selective collection system and other organizational and technical processes – allow for 'bottle to bottle' recycling and hence true circularity.

According to experiences in Europe, the highest collection and recovery rates can only be achieved through a deposit refund system – a solution that is also named as a potential form of EPR within the Kenyan EPR regulations. Such a nation-wide deposit refund system on single use items requires a highly complex setup. This has by and large not been trialed outside highly industrialized countries (e.g. in Europe or Australia). Other measures, like design uniformity and advancing the current mechanisms of the EPR system seem therefore be more suitable to the current state of the Kenyan waste management framework.

As with all plastic material and as outlined before, the further advance of the EPR system would allow to address the shortcoming that currently prevent higher recycling uptake of PET bottles. The fees could be specifically modulated in order to account for the required economic gap to recover PET bottles from all over the country.

The substitution of PET bottles by single use glass bottles is not recommended. Glass is recycled at lower rates of around 25% in Kenya and comes with a less favorable energy consumption during production. Promotion of *single-use* glass should be avoided items.

Using bottles or containers several times – operationalized within a deposit refund scheme – is beneficial from a waste management perspective. It nevertheless comes with logistical requirements that may be challenging to implement as a substitution for single use bottles in Kenya. Yet, specifically two companies – the biggest soft drink manufacturer and brewery, respectively – reuse their glass bottles in a nation-wide system with characteristics of deposit refund. In Germany, for example, multi-use deposit refund systems for specifically designed, more durable PET bottles, are in place as well.

Figure 14. Multi-use PET bottles in Germany [© Genossenschaft Deutscher Brunnen]

The status of the Kenyan deposit refund systems has not been analyzed in detail for this assignment, yet it is assumed to having come under pressure by increased usage of single use items. A specific point of concern is also the requirement for septic cleaning of the bottles before being refilled. Such a cleaning plant requires high investment at a certain scale. The usage of single-use glass bottles is therefore often economically advantageous, particularly for smaller companies.

Further advancing the EPR system would support a more level playing field and potentially favor the existing deposit refund schemes. Further incentives to promote multi-use deposit refund systems are recommended. For example, in Germany as well as in Kenya, these multi-use deposit refund systems are operationalized as industry-driven solutions with a limited role of the government. A detailed analysis of these is outside the scope of this assignment.

Figure 15. Multi use glass bottles in Kenya [© CocaCola Sabco Ltd.; Kenya Breweries Ltd.]

Plastic paper composites – liquid packaging board

Description: A material composition consisting of several layers made of paper, plastic and aluminium, or sometimes without aluminium depending on shelf life requirements. The cap is usually made from HDPE. Liquid beverage cartons are commonly used for juice, dairy products and, to a lesser extent, for soups or sauces. The paper portion is used for stability, whereas the plastic layers protect the content against external influences. For drinks with a longer shelf life (e.g. UHT milk, juices), Aluminium is added as an additional layer. Three European companies supply practically all liquid packaging boards as well as the associated filling machinery.

Figure 16. Common liquid packaging board packed in Kenya [© New KCC Ltd., Kevian Kenya Ltd.]

Recycling: The different layers can not be separated manually. The paper fraction from liquid packaging board can generally be recycled – as done in some specialised plants in Europe. Nevertheless, in the recycling process, liquid packaging boards are generally incompatible with other paper fractions. A separation of liquid packaging board from other paper is therefore a necessary requirement for any recycling step. **In Kenya, the paper recycling infrastructure is currently unable to process liquid packaging board**. One company in Kenya has set up a plant that can process liquid packaging boards into construction material; currently it is still in the pilot phase. Currently, it seems premature to state on its viability to take up recycling of liquid packaging board from post-consumer waste.

Figure 17. Building materials recycled from liquid packaging board [© AHK E.A. Ltd.]

Recommendation: The discussion about ecological advantages and disadvantages of liquid packaging board against other bottles is vast and shall not be taken up for this assignment. One potential alternative to liquid packaging board are PET bottles. Depending on the exact material composition, advantages concerning their recycling are possible. Yet, as certain applications require a functionality that is usually met by PETG (refer to discussion on thermoformed PET), these bottles may be incompatible for the PET recycling infrastructure. In addition, opaque PET bottles, as currently used by one dairy company in Kenya, may not be taken up by the recycling value chain.

Depending on the exact scale, **a specialized paper recycling process for liquid packaging board may be viable**. The fees earned through the EPR system in connection to specific recycling quota could create a viable business case and hence attract the required investments. The EPR fees should concentrate on enabling higher recycling rates in Kenya. The currently piloting recycling plant may play a role for this. **If alternatives to liquid packaging board have proven to reach higher recycling rates in Kenya, substitution may be incentivised** e.g. through fee modulation within the EPR system. This would cause a competitive advantage for materials that are more compatible with the recycling infrastructure that is existing or that can be set up within a reasonable timeframe. Through this, usage of liquid packaging board could be directed into applications where the functional advantages outweigh the fee disadvantage.

Expanded Polystyrene – trays, transport packaging (EPS)

Description: Polystyrene especially in its expanded form (EPS) is sometimes used for fresh food packaging like vegetables, meat or cheese as well. Another common application is for transport packaging, e.g. for imported electronics.

Recycling: Recycling for EPS is undertaken on a small scale. Nevertheless, **EPS is of little relevance as a post-consumer waste fraction in Kenya.**

Recommendation: With the currently negligible importance of EPS, no immediate need for action has been identified.

Plastic Strappings

Description: Used for logistics purposes in Kenya, dominantly for handling of bulk goods. Therefore, strappings rather unusually occur as post-consumer waste. Common materials are PP and PET. Some strappings are produced from recycled PET in Kenya.

Figure 18. Plastic strapping [© Adobe stock]

Recycling: The materials commonly used are incompatible concerning their recycling processes and need to be kept separate. The material composition cannot be detected within the currently existing waste management infrastructure. Currently, **plastic strappings are not recycled in Kenya.**

Recommendation: A KEBS *Standard* on uniform material for plastic strappings can enhance recycling and build local value chains. This standard could stipulate a defined material composition (e.g. PET) and therefore enable recycling. Private and public sector combined would be in charge of developing such a KEBS standard. PET would, against PP, potentially be the preferred standard for Kenya – as it would build upon existing value chains. One company in Kenya currently recycles PET from bottles into strappings.

Fruit/ vegetable nets

Description: A light weight and see-through flexible plastic material. Used for self-service of fruits and vegetables in supermarkets; also, as substitution of banned plastic bags in Kenya. Commonly used for potatoes and onions.

Figure 19. Fruit/ vegetable net [©Naivas Ltd.]

Recycling: Fruit nets cannot be recycled in Kenya. Furthermore, they have the potential to distort other recycling processes as they are prone to entanglement in the recycling machinery. Also in Europe, value extraction potential from fruit nets is usually too low to justify recycling.

Recommendation: From a perspective of recycling, removing the fruit net's process distortion would be desirable. Reusable nets (e.g. made from textiles) as well as (potentially locally manufactured) paper bags may be viable alternatives. An extension of the plastic carrier bag ban onto fruit nets would be desirable from a perspective of waste management. This statement excludes an assessment of the life cycle cost or the ecological footprint of paper bags as potential alternatives.

6.3 Conclusion

The current waste management practices in Kenya can be described as nascent. The current deficiencies have historically grown and are based on a combination of political, economic, social, and technical reasons. **The current waste management system is significantly evolving and needs concerted action from different government levels, private companies as well as the civil society**.

Waste management is a mounting challenge with existing deficient practices Kenya and a new system setup is required. Further operationalization of the initiated Extended Producer Responsibility system is a key aspect of that. Assuming that the private and public sectors' EPR initiatives further advance, **KEPRO as the initiator of the Producer Responsibility Organization (PRO) for plastics would be in the best position to facilitate implementation of most of the discussed strategies**. Hence, in the Kenyan context, KEPRO as the generally consented PRO for plastic packaging should take up the role to foster better plastic waste management through value chain, with modulated fees to incentivise design changes for substitution and better recyclability. The public sector through either the Ministry of Environment and Forestry or NEMA will continue fulfilling a pivotal roleas certain measures such as bans or standards issuance are outside the PRO's and the private sector's scope.

The public sector gazettes binding waste management goals, and the private sector through the PRO should develop and implement strategies suitable to reach the goals by addressing current gaps. For example, if the government sets a binding target higher waste collection rate, the PRO identifies ways to reach these and raises the required funds from its members. The same goes, as another example, for a binding target on the recycling of flexibles. If the identified bottleneck proves to be lacking economics of recycling, the PRO can support the process by subsidizing the recycling process; hence create an economic incentive to recycle fractions that are not within the given system. **Currently, KEPRO's discussion on how to improve recycling rates revolve around a subsidy for recycling, particularly for items with low recycling rates**. This follows the rationale that and business models secured by the EPR framework would stipulate the required investment in recycling and collection infrastructure. The Kenya Plastic Action Plan [2019] presents a detailed outline on a PRO's role and its interplay with other actors within the waste management system.

6.4 Suggested future research and analysis

This research touched upon several aspects related to reducing plastic litter and concluded the most suitable strategies for littering prone plastic items. Yet, there are several aspects that could not be examined as part of this research thus focus is placed on future projects. In particular, this concerns the **systematic identification of key players in the value chain** including market size, players, and type of plastics both *before* products and packaging are sold to consumers as well as *after* the sales. Such identification requires a thorough research on stakeholder mapping. Obtaining this kind of information is often difficult as it touches upon confidential data and requires the identification of many stakeholders (several hundreds), sometimes mingled with informal economies.

While this research focused on strategies on the fraction-level for the entire Kenyan context, it is worthwhile to further **explore more innovative and potentially item-specific innovations to reduce plastic usage**, through design changes in packaging and reuse models. This could be done in particular through feasibility studies and pilot projects.

Furthermore, it is recommended to engage with local stakeholders from industry and waste management institutions to develop more tailored actions based on the recommendations outlined in this study. Additional recommendations to increase knowledge and know-how related to (plastic) waste management and litter prevention are:

1. **Scoping mission** of Kenyan experts/ decision makers from public and private sector to a jurisdiction/ country with an established waste management scheme and clearly assigned responsibilities, thus being enabled to assess learnings from this context.

2. Eco-design standards should be context specific. European standards and labels may be applicable in the original context but may address the specific Kenyan situation inadequately. A single/ uniform label tailored to the Kenyan context can be used by government, the PRO, the producers and also the consumers on the quality of the recyclability. The research undertaken during this assignment should be continued to develop a **catalogue of criteria for eco-design and recyclability, specific to the Kenyan context** as a next step, which serves as the base for discussion among Kenyan stakeholders. This can include a **blueprint for an eco-label**. It could also support standardising EPR fees. This would go in line with the draft legislation's target that the PRO shall „(i) Guide members on eco-design standards of their products and recycler-friendly packaging. "

3. **Capacity building and exposure** of the different regulatory bodies such as NEMA and KEBS.

4. **Training targeted at the County Environment Committees** to enable them to effectively support waste management within their jurisdiction.

7
Annexes

7.1 Detailed outline of the Regulatory Environment for waste management, particularly plastic waste management in Kenya

7.1.1 Laws in force

The Constitution of Kenya

The Constitution of Kenya provides the overarching legal and regulatory framework for environmental conservation, including plastic waste management to curb plastic pollution to the environment.

1. The Constitution, in its preamble, states that the 'People of Kenya' are 'RESPECTFUL of the environment, which is our heritage, and determined to sustain it for the benefit of future generations'.

2. At **Article 10**, the Constitution provides that sustainable development as one of the national values and principles of governance. Given the inherent link between sustainable development (including the UN's Sustainable Development Goals) and environmental pollution, it is clear that waste management, including reducing plastic waste is one aspect in the sustainable development agenda.

3. **Article 42** provides that every person has 'a right to a clean and healthy environment, which includes the right (a) to have the environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in Article 69; and (b) to have obligations relating to the environment fulfilled under Article 70'.

4. **Part 2 of Chapter 5 of the Constitution**, titled '*Environment and Natural resources*', provides at **Article 69** that the State is obligated to, among others, ensure sustainable exploitation, utilisation, management and conservation of the environment, and to encourage public participation in the management, protection and conservation of the environment.

5. **Article 70** provides that a person who alleges that his/ her 'right to a clean and healthy environment recognised and protected under Article 42 has been, is being or is likely to be, denied, violated, infringed or threatened, may apply to a court for redress'.

The Environmental Management and Co-ordination Act (EMCA)

The Environmental Management and Co-ordination Act (EMCA) of 1999 is the primary and most comprehensive legal and institutional framework legislation prescribing environmental management in Kenya. Under EMCA, among others, the National Environmental Management Authority (NEMA) is established, whose objective and purpose are to exercise general supervision and co-ordination over all matters relating to the environment as the principal instrument of Government in implementing policies relating to the environment. EMCA defines the entitlement to a clean and healthy environment (provided by the Constitution) to ensure access by any person in Kenya to the various public elements or segments of the environment for recreational, educational, health, spiritual and cultural purposes. It provides a general framework for **waste management** in Kenya and a guide for licensing, transportation and **disposal of waste**.

Section 2 of EMCA defines 'waste' as 'any matter prescribed to be waste and any matter whether liquid, **solid**, gaseous or radioactive, which is discharged, emitted or deposited in the environment in such volume, composition or manner likely to cause an alteration of the environment'. In relation to plastic, we surmise that it is waste by virtue of its non-degradable nature hence altering the environment. It is however unclear, from the definition, at what point in the plastic life-cycle manufactured plastic becomes 'waste', as the definition could encompass plastic once manufactured or imported into the country. It may be helpful to distinguish between waste destined for disposal versus waste destined for recovery, with the ultimate aim of eliminating from the environment (manufacture and importation) of residual waste that can no longer be used.

Section 86 of EMCA gives the Cabinet Secretary (Minister) in charge of environment matters, upon recommendation of NEMA, the power and authority to prescribe the **standards of waste under the EMCA,** specifically to:

1. identify materials and processes that are dangerous to human health and the environment;

2. issue guidelines and prescribe measures for the management of the materials and processes identified in (a) above;

3. prescribe standards for waste, their classification and analysis, and formulate and advise on standards of disposal methods and means for such wastes; or

4. issue regulations for the handling, storage, transportation, segregation and destruction of any waste.

These 'standards' are to be distinguished from standards prescribed by the Standards Body in Kenya, the Kenya Bureau of Standards (i.e. the term standards as used in EMCA is different from standards under KEBS).

Invoking the general powers conferred upon her under the above section, the then Cabinet Secretary for Environment and Natural Resources, Dr. Judy Wakhungu, in a **Gazette Notice number 2334 and number 2356** both dated 14th March 2017, banned the **use, manufacture and importation of all plastic bags used for commercial and household packaging** ('carrier bag' and 'flat bag'). The ban took effect on 28th August 2017.This ban on plastic carrier bags is perhaps the most widely publicised legislative actions to be taken by Kenya in environmental matters.

Section 87 of EMCA and the Environmental Management and Co-ordination (Waste Management) Regulations, 2006 (**"the Regulations"**) provide that any person (both natural and juridical person):

1. whose activities produce waste is required to 'collect, segregate and dispose such waste in a manner provided in the Regulations';

2. who produces waste is required to **minimize the waste generated** by adopting 'cleaner' production methods that, among others, eliminate use of toxic raw materials, enabling the recovery and re-use of the product where possible and reclamation and recycling.

3. who transports waste is required to obtain a waste transportation licence from NEMA, and shall deliver such waste to the designated disposal site or plant.

4. requires a licence from NEMA to operate a **waste disposal site**, which is defined as any area of land on which waste disposal facilities are physically located and **includes a final waste discharge point without the intention of retrieval but does not mean a re-use or re-cycling plant or site.**

A person who contravenes the provisions of **section 87 of EMCA** is liable to imprisonment for not more than 2 years or a fine of not more than one million shillings or both. **The provision on recycling is however couched in general terms, without imposing an outright requirement to recycle particularly for recyclable waste[5] (e.g. plastics, glass). Any distinction in between the types of waste that can be disposed at a waste disposal site and waste to be taken to a recycling plant is missing**. The Regulations also provide for particular rules for discharge and disposal of industrial waste, hazardous and toxic waste, pesticides and toxic substances, biomedical waste and radioactive substances.

[5] NEMA Director for Compliance and Enforcement is quoted as saying that Kenya recycles 15% of the plastic waste it produces.

Wildlife Conservation and Management Act, 2013

Section 116 of the Wildlife Management and Conservation Act (WMCA) gives the Cabinet Secretary in-charge of wildlife matters, the Cabinet Secretary for Tourism and Wildlife, on recommendation of the Kenya Wildlife Service, power to make regulations in respect of activities in National Parks, National Reserves, conservations areas, wildlife conservancies and sanctuaries. In legislating the President's Vancouver directive this power was used through **Gazette Notice No.4858**, sought to ban single-use plastic as follows:

'In exercise of the powers conferred under section 116.2 (d) of the Wildlife Conservation and Management Act, 2013, I give notice of the ban of use of **plastic bottles, straws, and related products within the protected areas in the National Parks, National Reserves, conservation areas** and

any other designated wildlife protected areas[6]. The ban shall take effect from 4th June, 2020.'

A literal interpretation of the text of the notice is to the effect that the ban is on any/ all plastic within the stated areas. However, this ban has been implemented as a ban on single-use plastic (in line with the President's address). The general stakeholder consensus[7] is that the ban applies to the following: Cotton buds; Cutlery, plates, straws and stirrers; Sticks for balloons and balloons; Food containers (some fractions of plastics); Cups for beverages (some fractions of plastics); Beverage containers (PET bottles); Cigarette butts; Bags; Crips packets, sweet wrappers, bread bags and confectionery wrappers; Wet wipes and sanitary items.

Under WMCA, among the prescribed penalties for the offences relating to pollution, are a fine of not less than two million shillings and or imprisonment of not less than five years, while a person who undertakes an activity contrary to WMCA is liable to a fine of not less than Kenya Shillings to hundred thousand and or imprisonment of not less than two years.

[6] Protected areas are defined in the WCMA 2013 and the WCMA (ACTIVITIES IN PROTECTED AREAS) REGULATIONS, 2015 as 'a clearly defined geographical space, recognized, dedicated and managed through legal or other effective means, to achieve long term conservation of nature with associated ecosystem services and cultural values'. Kenya has gazette protected areas (23 terrestrial National Parks, 28 terrestrial National Reserves, 4 marine National Parks, 6 marine National Reserves and 4 National Sanctuaries) managed by the Kenya Wildlife Service, as well as over 140 private-run conservancies.

[7] Listed on the tourism website www.tourism.go.ke and also confirmed in our interview with an official from NEMA.

7.1.2 Petitions/ Judge made Law

ELC Petition No. 50 of 2012

In the Environmental Law Court (ELC) Petition No. 50 of 2012, African Centre for Rights and Governance (ACRAG) and 3 others versus County Government of Nakuru[8] ("the Nakuru County case"), was a case concerning the operation of a dumpsite in Naivasha. The Petitioners argued that the continued operation of the dumpsite violated their right to a clean and healthy environment, and evidence showed that the dumpsite, operated by the County Government of Nakuru, was poorly managed and a clear health and environmental hazard and was not licenced by NEMA. Plastic waste dotting the dumpsite and its surroundings was one type of waste discussed. Among the key issues for determination was whether to immediately stop the dumpsite's operations without an alternative dumpsite or without a solution to waste management.

The Respondent in the case, the County Government of Nakuru, told the court that the County did not have sufficient funds to purchase or hire machines to adequately maintain the dumpsite including recycling, further stating that there is a need to have the national government intervene in this regard. He told the court that the national policy on plastic waste management is outside the control of the County government.

In its **judgement**, delivered on **31st May 2017**, the Court helpfully held as follows in the *ratio decidendi*:

'...This case has brought forth an important element touching on the management and conservation of our environment. I honestly do not know whether NEMA has conducted an audit of the manner in which all County Governments manage solid waste. I however doubt if NEMA has done so given what has revealed itself in this suit. I believe it is time that NEMA considered a countrywide audit and proceed to embark on measures to ensure that only licenced dumping facilities operate as required by law. NEMA also needs to introduce rules and regulations on the operation of such facilities and have mechanisms to ensure that these rules are followed. The aspect of licencing of transporters of waste also has to be considered. Rules need to be made and to be followed. The National Government also needs to get involved and work together with County Governments and NEMA so that solid wastes are properly managed. Funding will always be an issue and this should be looked at by both County and National Governments. We cannot continue risking the health and lives of Kenyans by failing to have properly managed solid waste management systems. The time to act is now if we have to safeguard a good future for this and the future generations. I therefore order that

[8] Petition 50 of 2012 - Kenya Law

this judgment be served upon NEMA so that they can proceed to ensure compliance with the orders issued herein, and to report to this court as earlier directed. I also order that this judgment be served upon the Cabinet Secretary of the Ministry of Environment and Natural Resources and the Council of Governors to consider issues of policy, compliance with EMCA on the subject of solid waste management, cooperation, funding, and all other matters touching on this topic, so that countrywide and in the shortest time possible, we will have waste management systems that we can all be proud of.'

While the above case was heard and determined prior to the ban on plastic bags in Kenya, it nevertheless paints the picture of the **uncontrollable level of plastic pollution in towns in Kenya,** and **the inability of County government to adequately manage this waste even in the face of apparent degradation to the environment,** both from a financial as well as policy perspective.

ELC Petition No. 32 of 2017

In the Environment and Land Court (ELC) Petition No. 32 of 2017, Kenya Association of Manufacturers (KAM) & 3 others (**"the Petitioners"**) versus Cabinet secretary, Ministry of Environment and Natural Resources & 3 others (2018), the Petitioners challenged the ban on plastic carrier bags effected by Gazette Notice number 2356. Among the arguments propounded by the Petitioners in this case were sustainability of the 'sudden and unexpected' ban, given the economic and job losses, and changes that the manufacturers were required to make. Unfortunately, no environmental arguments were propounded by the Petitioners, and it is likely that this factor, along with the State's Constitutional obligations towards citizens in respect of a clean and healthy environment and in absence of other successful regulatory frameworks to reduce plastic pollution in Kenya, persuaded the Court in upholding the ban.

The arguments and submissions, particularly by the Kenya Association of Manufacturers, are useful to assess what the Association's membership considered to be alternative legal and institutional mechanisms to reduce plastic waste and plastic leakages to the environment. Among the notable submissions and arguments by the parties and judges in the Petition were the following:

1. Plastic bags were 'easily replaceable' with environmentally friendly alternatives (argued by the Respondents);

2. Plastic is an extremely cost effective, versatile and durable synthetic product made from oil by-product used in various sections such as packaging, construction, transportation, health care and electronics;

3. Unless handled properly, plastic produces waste that would potentially cause significant environmental degradation (though the Petitioners argued that plastic *per se* is not the problem, rather the absence of an effective waste management policy or framework, including recycling, to minimise the amount of plastic reaching disposal stage is);

4. Plastic waste management schemes have been successfully developed and implemented in other jurisdictions;

5. Paper made from trees preferred by the Respondents may not be a suitable alternative to plastic as this would have a negative impact on the country's forest cover;

6. Plastic for domestic use is recyclable in countries like the United Kingdom (UK);

7. Polyethylene terephthalate (PET) and High-density polyethylene (HDPE) bottles in the UK were collected by 92% of the Councils while the low-density polyethylene carrier bags were only collected by some supermarkets and recycled into low grade uses such as bin bags. The report indicated that the carrier bags were not generally collected from households for recycling although it was expected that mixed plastic recycling would soon be underway in the UK;

8. Excise Duty levies could augment the Government's funds to specifically address plastic waste management;

9. What poses a challenge to the environment is the plastic litter and the "*throw away culture*" of Kenyans;

10. NEMA had ignored less restrictive means to achieve the intended objective (of reducing plastic waste in the environment).

In summary, the judges, finding for the Respondents and therefore in favour of the plastic bag ban held:

'We have considered the able arguments by the counsels for the petitioners on the social and economic benefits of plastic and the approaches the respondents should have taken in dealing with plastic waste. ***We are not persuaded that the benefits to be derived from plastic outweigh its negative effects on the environment****. We are also not persuaded that the approach that was taken by the (Cabinet Secretary) and (NEMA) in dealing with the threat that plastic poses to the environment was unreasonable. To the contrary,* ***we are persuaded by the arguments by the respondents that the ban on plastic bags will work positively to protect the environment from plastic waste****.'*

7.1.3 Directives for reducing plastic waste in Kenya

On 19th September 2017, the then Cabinet Secretary for Environment and Forestry Dr Judy Wakhungu **pronounced a ban on single-use PET (PET) bottles** in Karura Forest and the Nairobi National Park. However, this restriction was not legislated. We surmise that the effectiveness of this ban, notwithstanding lack of legislative backing, was on account of existence of **enforcement mechanisms within the forest referred to (by Kenya Forest Service),** and the generally **narrow geographical scope and area of application of the ban (and consequently the persons targeted by the ban).** The Minister's pronouncement was subsequently followed by Kenya's President, while addressing the 'Women Deliver 2019 Conference' in Vancouver, Canada, on 4th June 2019, issued **a directive banning the use of single-use plastics in protected areas including National Parks, beaches, forests and conservation areas with effect from 4th June 2020**[9].

7.1.4 Tax Incentives in respect of recycling plants

Via an amendment to the Value Added Tax Act 2013 (**"VAT Act"**) introduced by section 21 of the **Finance Act, No. 23 of 2019**, the **First Schedule to the Value Added Tax Act, 2013** was amended to exempt from VAT any **'Plant, machinery and equipment used in the construction of a plastics recycling plant'**. Further, the same Finance Act of 2019 amended the **Third Schedule to the Income Tax Act** so as to reduce the income tax of a **'company operating a plastics recycling plant'** from the ordinary corporation tax rate of **30% to 15% for the first five years** of its operations.

These tax incentives, which became effective on **7th November 2019**, are likely the most significant fiscal incentives to date in Kenya in to invest in plastic recycling business models, indirectly and remotely reducing plastic leakages into the environment in Kenya.

7.1.5 Strategies, Policies, and institutional mechanisms for reducing plastic waste in Kenya

Policies represent strategic documents which then guide the legislation around any particular area. A policy document in itself however has no force of law and no legal enforcement mechanism. The **National Environment Policy 2013** has as an objective to ensure sustainable management of unique terrestrial and aquatic ecosystems through the use of innovative environmental management tools such as incentives, disincentives, total economic valuation, indicators of sustainable development, Strategic Environmental Assessments (SEAs), Environmental Impact Assessments (EIAs), Environmental Audits (EA) and Payment for Ecosystem Services (PES) and the 'polluter pays' principle. To achieve a clean and healthy environment the policy seeks to discourage and eliminate unsustainable patterns of production and consumption while instituting intensified awareness creation on the impacts of using non-biodegradable materials such as single use plastics.

Under EMCA, each County should have a **County Environment Committee** in place. This Committee is responsible for the proper management of the environment within the County. However, there exists a low priority to waste management efforts, either through low budgetary allocations or inadequate plastic waste disposal techniques, leading to poor institutional infrastructure in implementing what the law provides.

[9] President Uhuru Kenyatta's speech on 5th June 2019 at Vancouver Conference Center addressing a plenary session of the Women Deliver 2019 Conference: "*As you are aware, Kenya is hosting to the global environment programme, and has remained a campaigner for a sustainable environment. In light of this commitment, two years ago we banned the use, manufacture and sale of environmentally harmful plastics, polythene bags and packaging materials,*" the President said. "*Building on this, today we are announcing another ban on single use plastics in all our protected areas, including: National Parks, beaches, forests and conservation areas, effective 5th June, 2020.*"

Further, EMCA mandates NEMA and each County government to prepare an **environment action plan**, which among other matters, should identify and recommend policy and legislative approaches for preventing, controlling or mitigating specific as well as general adverse impacts on the environment. While some County governments have taken a lead in developing action plans and implementing them, there is certainly a **need for County governments to develop and harmonize County legislations on plastic waste management**. This process would need to involve public participation, as provided in the Constitution, bringing into fore industry players who would have the technical capabilities to suggest and develop technological solutions to curbing plastic waste pollution. The implementation process, once laws and regulations are passed, would need to be approached with openness and not with intolerance to the establishment of new plastic waste management facilities by host communities. Currently, only the **County Government of Makueni** has developed such a plan, an **'Environment and Climate Change Policy' approved by the County in September 2020** for the coordination and management of environment and natural resources in Makueni County. Among the policy objectives and stipulations is the adoption of appropriate technology on waste management.

NEMA developed the **National Solid Waste Management Strategy[10] in 2014** in line with Kenya's Vision 2030's necessary policy, legal and institutional reforms, aimed at creating a 7R -oriented society by industry players: Reducing, Rethinking, Refusing, Recycling, Reusing, Repairing and Refilling their waste. The National Solid Waste Management Strategy is based on the zero-waste principle, where not more than 10% of solid waste generated should go to the landfills. It has five key strategic objectives, that is, to formulate policies, legislations and economic instruments to reduce waste quantities; To inculcate responsible public behaviour on waste management; To promote waste segregation at source; To promote resource recovery for materials and energy generation; To establish environmentally sound infrastructure and systems for waste management. We understand that NEMA is keen to and has been implementing the Strategy, whose implementation, based on the achievement of the strategic objectives, currently stands in the region of 20%. In addition, as far as we are aware, NEMA's offices, including headquarters in Nairobi and in all the other 46 Counties, are a 'plastic free' zone from 31st July 201711, and with all waste from the offices to be sorted into waste streams and binned accordingly. We are not aware of any systematic assessment that would allow to judge on the effectiveness of this internal order.

The Kenya Association of Manufacturers, in its Petition in ELC Petition no. 32 of 2017, made reference to existence of a **joint policy framework between the Kenya Association of Manufacturers (KAM) and the Government of Kenya**, in collaboration with other stakeholders, aimed at developing an 'appropriate policy framework (for) the management of plastic waste', the collaboration culminating in the parties signing a **joint implementation plan for sustainable management of plastic waste in the country on 29/6/2007 committing the parties thereto to specific key deliverables**. KAM contended, in the said ELC Petition no. 32 of 2017, that the Government of Kenya failed to discharge its obligations under the Plan, resulting in a 'regulatory and policy vacuum' whereby the envisaged national strategies and policies necessary for sustainable plastic waste management have not been effective.

7.1.6 Draft Laws and Policies

The draft **Extended Producer Responsibility (EPR) Regulations 2021** ("EPR Regulations"), currently awaiting Parliament approval, mainly introduce and address mandatory extended producer responsibility (EPR) schemes for all products and packaging in order to 'reduce pollution and environmental impacts of the product'. Plastic products and packaging (without further reference on which items are covered exactly) are included in the first schedule to the EPR regulations, making them subject of the EPR compliance schemes.

The Draft **Environmental Management and Co-ordination (Plastics Bags Control and Management) Regulations, 2018** ("Plastic Regulations")[12] submitted by the Ministry of Environment and Forestry, are currently awaiting tabling in Parliament for debate and approval. If passed, the Plastic Regulations will be the first plastic waste-targeted regulations in Kenya. The Plastic Regulations provide for plastic alternatives including the promotion of alternative biodegradable packaging materials. They also provide for licensing of

[10] National Solid Waste Management Strategy.pdf (nema.go.ke)

[11] National Environment Management Authority (NEMA) - NEMA declared plastic Free Zone

[12] Draft_Plastic_Management_Regulations-_05.11_2018_1.pdf (nema.go.ke)

plastic bags manufacture, import, export, use or offer for sale by NEMA. The Plastic Regulations supplement Gazette Notices No 2334 and 2356 on the ban of plastic bags, which left the substance of implementation, exemption procedures etc to NEMA's technical enforcement team. These Plastic Regulations aim to legislate the processes that NEMA established after the plastic bag ban, as well as promote alternatives to plastic, and refer to the two gazette notices.

The draft **National Sustainable Waste Management Policy, 2020**, prepared by the Ministry of Environment and Forestry, seeks to commit the government to establish legal frameworks and take actions that will enable Kenya to harness and incentivize large scale investment in the waste recovery and recycling industry in Kenya. The Policy proposes to create the necessary regulatory environment that will enable Kenya to effectively tackle the waste challenge, through systematic collection of waste sorted at source and disposal, processing activities aimed at re-using, recycling or composting waste materials into useful products or sources of energy.

The draft **National Sustainable Waste Management Bill 2019** seeks to establish an appropriate legal and institutional framework for the efficient and sustainable management of waste in the framework of the green economy, the realization of the zero-waste goal, the Constitutional provision of the right to a clean and healthy environment for all, and for connected purposes. The Bill proposes to establish a National Waste Management Council which would co-ordinate and oversee the implementation of national zero waste plans, policy and laws and report on the achievement of target goals, strategies and activities.

Concerning the interplay of the two above mentioned documents, the draft Sustainable Waste Management Policy 2019, which is more recent, was developed by the Ministry of Environment and Forestry, while the former document, the Solid Waste Management Bill 2019 was prepared by NEMA. However, both policies essentially outline and commit the government to take sustainable actions to deal with all waste.

The County Assembly of Nairobi City legislated the Nairobi City County Solid Waste Management Act, 2015. The Act provides a County legal framework for solid waste management and encourages public participation in the management, protection and conservation of the environment. Further, there is impostion of an environmental levy of not more than two per cent of the property rates payable in respect of a rateable property to be applied in waste management and to deal with environmental nuisances.

The draft Mombasa County Solid Waste Management Policy, 2019 aims to minimize waste generation and promote re-use, recovery and recycling of waste materials and sustainable waste disposal in the County. The policy incorporates guiding principles in the solid waste management framework, such as: *Proximity principle*, which implies that waste should be managed close to where it is generated; *Polluter pays principle*, whereby those who generate waste should bear the cost of managing the waste to minimize risk to human health and the environment; and *Intra-generational equity* which implies that waste management resources and services should be equitably accessible to all citizens or residents in the same generation.

7.1.7 Further Assessment of the current (draft) EPR regulations

Generally, there are different possibilities of transposing the EPR principle into any national legislation:

1. **Implementation in a superordinate legislation** (general waste legislation) specifying which product or waste streams are regulated under it with reference to a specific legislation for each product or waste stream (e.g. specific for EEE / WEEE and packaging / packaging waste in different specific legislations as known in many European countries). In many cases, this is done through a brief paragraph in the superordinate legislation with the explicit indication that a specific EPR legislation will give further regulations. Thus, the superordinate legislation does not further elaborate on any EPR related aspects.

2. Implementation of a so-called **umbrella EPR law or regulation**, which determines responsibilities and regulations in the context of EPR for several products or waste streams in parallel (this approach is used in several countries that currently implement EPR legislation).

While option (1) is tailored to the specific waste stream in each case, option (2) is on a higher level and requires further elaboration and regulation of each product/waste stream to account for the differences in financing (different life cycles and stakeholders), collection (e.g. different points of origin) and recycling (different recycling and recovery processes).

The present Kenyan proposal on EPR regulations corresponds to an umbrella EPR law.

Based on this, a further need for regulation (e.g. via gazettes) arises in each individual case, which, for example, relates specifically to packaging. Only in such a form, the specific requirements can be free of interpretation and the implementation can be verifiable and controlled.

As an example: For a concrete implementation, detailed binding set of rules for **"Extended Producer Responsibility for packaging,"** or packaging regulation under the umbrella EPR law or a separate packaging law are required. These detailed rules must at least contain specific elements for the following areas that specifically relate to packaging:

1. Principles and definitions (e.g. what constitutes sales packaging, service packaging, composite packaging, industrial packaging, reusable packaging, EPR System-relevant packaging, obliged companies, post-consumer, material recycling, recycling rate, involved packaging, ...).

2. Who exactly is responsible for financing, organising, controlling.

3. How to register the obliged companies and their packaging (amounts, materials, recyclability, etc.)

4. Who has to be member in the Producer Responsible Organisation (PRO), who will be the supervisory body and what are the tasks of the PRO (registering, collecting fees, collecting, sorting, recycling, cooperating with municipalities/ Counties, documentation, reporting, fulfilling recycling rates, communication, education, ...)

5. What will be the collection system and collection targets to increase the system step by step (gradual increase of collection points or gradual increase accessibility (rate) of households to separate collection...)

6. What will be the recycling targets (in relation to the collecting amount, only material recycling or also energy recovery, what about export of waste if there is no recycling plant in the country, what about non-recyclable packaging, ...)

7. How to cooperate with the municipality/ County (what are the tasks of the municipalities/ Counties?)

8. What is necessary for communication, education, information and to include the civil society, research and development.

9. How will the obliged companies and the PRO be controlled and what will happen when the obliged companies will not pay and the PRO does not fulfil the tasks (what penalties and fines are provided).

10. How will the obliged companies and the PRO be controlled and what will happen when the obliged companies will not pay and the PRO does not fulfil the tasks (what penalties and fines are provided).

7.2 Inventory of Standards

Table 5. Inventory of Standards

KEBS Number	Designation	Relevance
KS 2364:2012	Guide on choice of plastics for food packaging	High
KS 2319:2011	Determination of overall migration of constituents of plastics materials and articles intended to come in contact with foodstuffs – Method of analysis	Medium
KS ISO 14855-1:2012	Determination of the ultimate aerobic biodegradability of plastic materials under controlled composting conditions-Method by analysis of evolved carbon dioxide-Part 1: General method	Medium
KS ISO 16103:2005	Packaging-Transport packaging for dangerous goods-Recycled plastics material.	High
KS ISO 11299-1:2011	Specifies requirements and test methods for plastics piping systems for use	Medium
KS ISO 177: 1988	Plastics Determination of migration of plasticizers	Medium
KS ISO 527-1:2012	Specifies the general principles for determining the tensile properties of plastics and plastic composites under defined conditions.	Medium
KS ISO 527-2: 2012	Plastics Determination of tensile properties pt. 2: Test conditions for moulding and extrusion plastics	Medium
KS ISO 527-1:2012	Plastics Determination of tensile properties pt. 1: General principles	Medium
KS ISO 178: 2010	Specifies a method for determining the flexural properties of rigid and semi-rigid plastics under defined conditions.	Medium
KS ISO 15270:2008	Plastics - Guidelines for the recovery and recycling of plastics waste.	High
KS ISO 17088:2012	Specifications for compostable plastics	High
KS ISO 178: 2010	Plastics - Determination of flexural properties.	Medium
KS ISO 8256: 2004	Plastics - Determination of tensile-impact strength.	Medium
KS 2359:2012	Polystyrene (crystal and high impact) for its safe use in contact with foodstuffs, pharmaceuticals and drinking water-specification	High
KS ISO 15360-1:2000	Recycled pulps - Estimation of Stickies and Plastics - Part 1: Visual method	High
KS 1610:2000	Specification for road marking materials - Drop on material - Glass beads, antiskid aggregates and mixtures of the two.	Medium
KS ISO 17088:2012	Specifications for compostable plastics	High
KS EAS 154:2018	Baby Napkins - Specifications	Medium
KS 2881:2019	Disposable maternity pads-Specification	Medium
KS ISO 18605:2013	Specifies the requirements for packaging to be classified as recoverable in the form of energy recovery and sets out assessment procedures	High
KS ISO 18601:2013	Packaging and the environment - General requirements for the use of ISO standards in the field of packaging and the environment.	High
KS ISO 18604: 2013	Packaging and the environment - Material recycling.	High
KS ISO 18603:2013	Packaging and the environment - Reuse.	High
KS EAS 882:2018	Packaging — Flexible carrier bags — Specification	High
KS ISO/TS 22002-4:2013	Prerequisite programmes on food safety - Part 4: Food packaging manufacturing.	High
KS 1146:2013	Specification for woven polyolefin sacks for packing fertilizers.	High
KS 511-3:2001	Specification for plastic containers Part 3: Plastic bottles (up to 5 litres)	High
KS 2924: 2020	Personal protective equipment — Face masks — Masks for public use —	Medium
KNWA 2884:2019	Non-woven polypropylene bags-Specification	High
KS ISO 18604: 2013	Packaging and the environment - Material recycling	High
KS ISO 18606: 2013	Packaging and the environment - Organic recycling.	High
KS ISO 18605:2013	Packaging and the environment - Energy recovery.	High
KS ISO 18603:2013	Packaging and the environment - Reuse.	High
KS ISO 16103:2005	Packaging-Transport packaging for dangerous goods-Recycled plastics material	High
KS EAS 859:2017	Paper bags-Specification	High
KS EAS 932:2019	Paper plates and cups for food packaging-Specification	High
KS EAS 866:2017	Paper sacks for packaging of cement-Specification.	Medium
KS 511-3:2001	Specification for plastic containers Part 3: Plastic bottles (up to 5 litres)	Medium
KS EAS 354:2007	Plastic containers for up to 5 litres capacity - Specification	High
KS ISO 6590-2:1999	Packaging - Sacks - Vocabulary and types - Part 2: Sacks made from thermoplastic flexible film.	High
KS ISO 15360-1:2000	Recycled pulps - Estimation of Stickies and Plastics - Part 1: Visual method.	Medium
KS 2362:2012	Specifies the requirements and methods of sampling and test for polyvinyl chloride (PVC) and its copolymers for the manufacture of plastic items used in contacts with foodstuffs, pharmaceuticals and drinking water	High
KS 1435:1999	Specifies requirements for 2 types of PVC fabrics for use as shoe uppers	Medium
KS 1667:2001	List of pigments and colorants for use in plastic in contact with foodstuffs, pharmaceuticals and drinking water	Medium
KS 2172:2008	Consumer goods - Criteria for assessment of fitness for purpose and safety.	Medium
KS ISO 14024:2018	Environmental labels and declarations - Type I environmental labelling - Principles and procedures	High
KS ISO 14020:2000	Environmental labels and declarations - General principles.	Medium
KS ISO 14050:2009	Environmental management - Vocabulary.	Medium
KS ISO/TR 14047:2012	Environmental management - Life cycle assessment - Illustrative examples on how to apply ISO 14044 to impact assessment situations.	Medium
KS ISO/TR 14049:2012	Environmental management - Life cycle assessment -Illustrative examples on how to apply ISO 14044 to goal and scope definition and inventory analysis.	Medium
KS ISO 14040:2006	Environmental management - Life cycle assessment - Principles and framework.	Medium
KS ISO 14006: 2011	Environmental management systems Guidelines for incorporating eco-design	Medium
KS ISO/TS 14067:2013	Greenhouse gases - Carbon footprint of products- Requirements and guidelines for quantification and communication	Medium

7.3 Outline of the Government's management and enforcement system as well as the general, country-specific procedures and requirement on developing and implementing standards in Kenya

7.3.1 Introduction

The creation and implementation of a technical standard is a complex process that may need between several months to a number of years to be accomplished, depending on the level of detail and the regulations already in place. For a successful standard development process, it is important to lay out a strategy that is tailored to the demands and expectations of the Kenyan public sector, the current and future framework conditions as well as the acceptance from the private sector stakeholders.

The time required to create a standard depends on various factors:

1. Complexity of the topic
2. Number of stakeholders
3. Process for coordinating responsibilities
4. Evaluation of existing rules and regulations
5. National/ Regional Requirements/ Peculiarities
6. Available resources (time) of the participants of Technical Committee
7. Etc.

The time required to establish the standard can therefore vary widely. Often the increased time requirement only becomes apparent during the actual creation of the standard. The expectation that the planned time schedule will be adhered to should therefore not be set too high. Table 6 shows an example of a timetable for the creation of a standard using German experiences.

The involvement of all relevant stakeholders is of crucial importance in the creation of standards. Otherwise, there is a risk that standards and requirements are not suitable for practical use (lack of practicability) and will not be implemented in practice. The actors involved must also have enough time to understand the requirements and implement them in practice. For this reason, it is particularly advisable to **involve associations and industry representatives intensively form an early stage of appropriate standardization activities.** With the increasing acceptance of these groups, the degree of implementation of a standard also increases.

In this context, associations have the particular challenge of translating the possibly complex requirements of a standard into comprehensible recommendations, clarifying user questions and reflecting them back to the body/ entity in charge of creating the standards. This results in an interaction between the creators and users of standards that can generate a high degree of acceptance.

In order to successfully implement a standard, the **enforcement authorities must also be closely involved in its development.** It is therefore also recommended to inform the local authorities responsible for the implementation of a standard before publication and to clarify all questions.

Table 6. Exemplary time schedule for the creation of a standard

	Milestone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31 + xx
1	Analysis of needs																															
2	Clarification of competence																															
3	Procedure and planning																															
4	Decision to create a standard/project description																															
5	Publication/announcement of the planned standard creation																															
6	Constituent meeting of the TC																															
7	Creation of a preliminary version often the standard of publication																															
8	Collection and discussion of objections to the preliminary version of the standard																															
9	Preparation of a final version of the standard and publication																															
10	Revision of published standards																															

During implementation and enforcement, particular attention must be paid to **uniform implementation and interpretation nationwide across all Counties**. Furthermore, these experts need to be regularly updated and given the opportunity to discuss their experiences. Associations may offer a forum for the exchange on related topics.

As the level of detail of a standard increase, so does the need for regular revision. In the case of technical standards and regulations, the creation and publication of a standard already results in a further development of the state of the art, since users frequently look for (alternative) solutions. These developments sometimes take place faster than the publication of a standard requires. Therefore, it is always recommended to formulate a standard that is as technologically open as possible and to concentrate on underlying goals. It should also be clarified how to deal with a changing state of the art/ state of experience, referring to the periods and intervals during which a revision of the standards is taking place.

In 2010, Kenya developed a standard of "Standard for standards[13]", a document that details the development of Standards in the country. It is meant to be the guide for technical Committees within the creation of Standards. According to this guideline, standards are developed within the Kenya Bureau of Standards (KEBS), following the Kenya Standards development procedure to ensure that a certain harmony is maintained in preparing the standards.

The development of standards at national and international level often follows a similar proven procedure (see Figure 20). Concrete implementation can be adapted to national and thematic needs.

Within the process of Standards development (Figure 21), certain terminologies and definition of responsibilities have been described by KEBS, as outlined in section A, Part 1 of "A Standard for Standards".

[13] ‹https://www.kebs.org/index.php?option=com_content&view=article&id=255:standards-for-standards&catid=90&Itemid=507›

Figure 20. Stages of Standards Development, [Kenya Bureau of Standards]

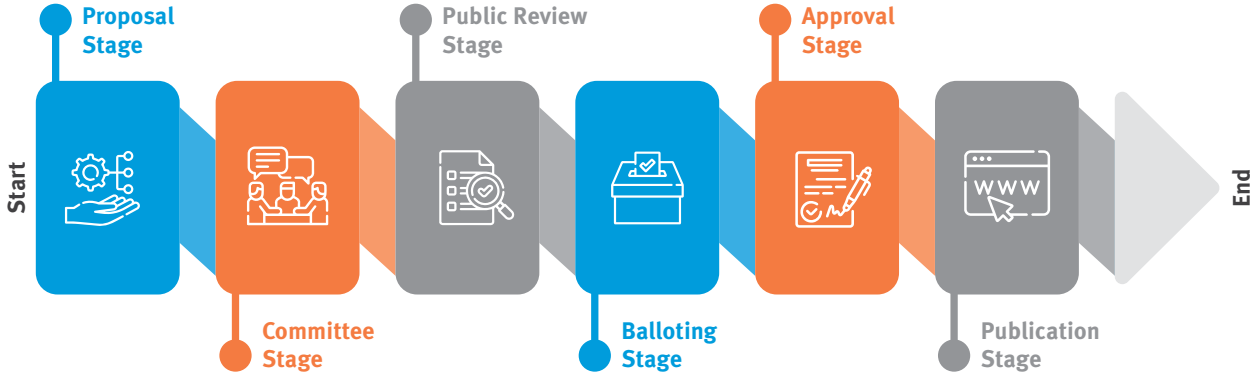
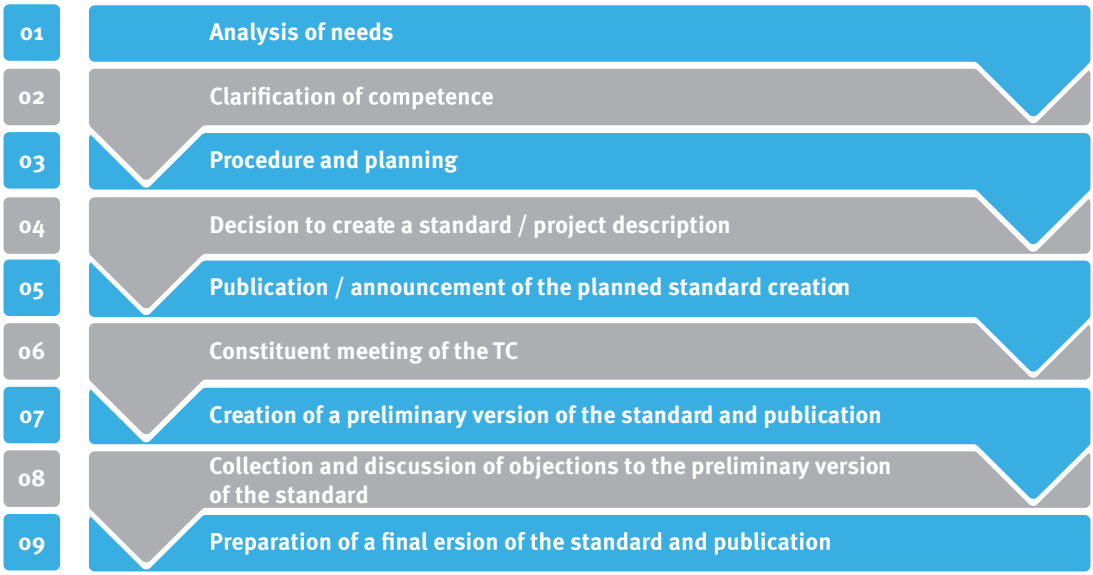


Figure 21. Milestones to develop a standard



A **Technical Committee (TC)** is group consisting of public and private sector representatives concerned with standardization in the affected sector. It is responsible for identifying the need for, and the preparation of Kenya standards in a defined field.

A **Working Group (WG)** is defined as a group of experts selected by a Technical Committee or Subcommittee to deal with a particular project or with a particular aspect of a project.

A **Standards Approval Committee (SAC)** is described an internal committee within KEBS, responsible for approval of all new work items, standards, revisions, amendments and withdrawals on the basis of duly defined process.

A Standards Projects Committee (SPC) is an internal committee of KEBS, responsible for approval of New Work Items, new TCs and general supervision of standardization process.

New work item: any work leading to the development, revision or amendment of a Kenya Standard.

7.3.2 Stages of Standard Development

There are five stages of Standard development outlined in Kenya, which are briefly described in the following section.

1. **Proposal Stage:** At this initial stage, a new work item is adopted by the Technical Committee. It is also approved by the concerned SPC.

2. **Committee Stage:** Preparation of preliminary draft and TC discussions. Sources used by the TC could be obtained from international, regional or foreign standards, and also sources from other relevant professional organisations and institutions. Here, a working group can be formed to study a specific area of the standard as it is being developed. The preliminary draft prepared at this stage will be sent by the TC Secretary to the TC who will meet to discuss. Thereafter it will proceed to the Public Review Stage.

3. **Public Review Stage:** Here, the Draft Kenya standard (DKS) is submitted to the public for review. Here the TC Secretary will communicate this to organisations and departments who are likely to have interest in the standards, and whose comments will be collected. The technical and ad hoc comments are then reviewed by the TC.

4. **Balloting Stage:** This is the stage of reviewing public comments of the draft by the TC. This is the phase of commitment of formally accepting or rejecting a Draft Standard. The TC Secretary prepares a ballot draft including new members. During this period, members have a 21-day period to respond and if it is accepted, this passes over to the Approval stage by the Standards Approval Committee (SAC).

5. **Approval Stage:** In this stage, the SAC approves or rejects the draft standard. This stage entails discussions with the TC for any required changes.

6. **Publication Stage:** Once the standards are approved, the standard is proof headed and forwarded to the Head of Publishing to be gazetted.

Once standards have been developed and published by KEBS, they are owned by KEBS and accessible through a fee. They however can be distributed free of charge within a working group or committee for the purposes of revision.

7.4 Strategies to reduce leakages from plastic packaging and single use plastics

7.4.1 Investments in waste management infrastructure

Main target of the strategy: is to address the context specific recyclability, i.e. allow for better recycling of previously problematic materials. A reliable, holistic and nation-wide waste management infrastructure is an essential pre-requisite for a sound waste management throughout Kenya covering all steps from waste segregation and disposal at the household level to collection, sorting, recycling and recovery and eventually sanitary disposal. Through such a comprehensive waste management infrastructure, waste will be kept within the waste management through proper treatment and sufficient capacities thus significantly reducing the waste leaking to the environment. Moreover, waste infrastructure also includes potential technologies for removing litter from the environment, such as litter traps in rivers for instance.

Connection to the issue of plastic litter: Litter in general (regardless of the material) exists because it has not been collected and/or kept within the waste management system, which is why it leaks into the environment and is potentially further distributed through water and wind. Since the lack of proper waste management is the main cause for litter, investing into a proper management at all steps from proper disposal at the household level to eventually sanitary landfilling is also the most effective step to significantly combat litter.

Plastic items that are technically recyclable but lack the respective facilities on site are to be considered as not recyclable in Kenya. Without any economic incentive to separate them from other waste fraction, they also lack incentive to be properly managed, resulting in littering or – at best – landfill or incineration.

Risks can result in case of insufficient or improper operationalisation, as people will lose their trust into their system and will not participate in the system, e.g. as correctly segregating and/or disposing of their waste. As consequence, littering levels will remain high and the contamination from a lack of segregation impairs what eventually becomes recycled due to contamination of recyclable material.

The kickback effects at the treatment stage are by and large limited. A business model for the recycling facility only becomes viable if all related costs of extracting the specific materials from other waste fractions are covered. Market mechanisms alone may not enable this business model; given the fluctuating nature of raw material prices, the business model may also become less viable over time.

Relation to other strategies: Generally, this infrastructure strategy is well compatible with all others and is an important element for increasing the recyclability. The simple reason is that for recycling plastics it is important to keep contamination – for instance from organic waste – as low as possible. From a waste management perspective, this means the plastics should be segregated from other waste, such as organic and residual waste. In turn, this requires a matching infrastructure with which the segregated waste streams are kept separated.

Operationalization: Directing EPR fees towards recycling infrastructure has already proven possible in Kenya through first initiatives by KEPRO. It is one of the PRO's key task to enable business models that allow to feed currently non-recyclable plastic items into a recycling process. This may be reached through direct financial contributions, guaranteeing a certain amount of input material, fostering design changes and substitution strategies in favour of certain materials, among others.

7.4.2 Fee modulation and taxation

Main target of the strategy: To incentivise recyclable design and reduce the amount of poorly-recyclable plastic packaging and products, modulated fees for packaging and products subject to EPR are proposed: packaging and products, a bonus can be granted. Given the present infrastructure/ technical capabilities, rigid PE, PP and transparent PET bottles are example of sutiable for the bonus. This bonus is equivalent to a reduced EPR fee paid by the obliged company. Moreover, a bonus can be given to recyclate usage in order to increase the demand for recycled polymers. Respectively, a malus can be given to packaging which are not possible or difficult to recycle, (multilayer packaging and sachets, for example). This malus is equivalent to an increased EPR fee. The modulated fees thus provide a monetary steering function on the packaging and product design

towards more recyclable products where possible. At the same time, the malus EPR fee supports the set-up of new recycling capabilities being able materials that, so far, are not recyclable in Kenya. For any plastic packaging or product not subject to EPR, it is possible to implement the bonus/malus mechanisms through taxation.

Connection to the issue of plastic litter: The plastic items (packaging an products) that are prone to littering and make up the predominant part of the litter are the ones that have no economic value either because they cannot be recycled at all or no recycling possibilities exist in Kenya. Thus, fee modulation or taxation intends to impact the abundance of the low and non-value plastic items before they are put on the market for consumption: Through monetary incentives or disincentives brand owners and producers are influenced how they design their product or decide on which packaging they want to sell their product in favour of more recyclable ones.

Risks: Crucial to avoid double payments. An item should be subject to fee modulation as part of the EPR system or taxation, not both.

Relation to other strategies: This strategy is complementary to increasing recyclability as well as substitution in case using another material is cheaper due to the bonus. However, also undesired substitution effects can occur if not properly designed and implemented. Moreover, this strategy dependends on developments in the waste management infrastructure as the bonus and malus must always reflect was is actually recyclables: In case no recycling possibilities are established for a formerly not recycled item, then this must be reflected in the modulation/taxation.

Operationalization: Stipulated in the EPR draft regulations: "The Producer Responsibility Organisation shall be responsible for modulation of EPR fees according to established environmental criteria on product design, useful life and end of life management as set out in the membership registration requirements and as reviewed during the annual members' general meeting."

In this model, plastic items would be subject to a fee that covers the associated waste management cost. 'Good' waste management depends on a set of factors along the value chain of generation, collection, sorting and treatment of waste. Most EPR systems – including the current draft regulations in Kenya – follow the waste hierarchy and favour recycling over other ways of treating or disposing of waste. Within a functional EPR system that aims at achieving high recycling rates, a fee for a specific item follows its ease of recycling. Easily recyclable items will be subject to a relatively low fee. Through this fee modulation, companies are incentivised to favour more recyclable products and packaging.

For Kenya, the fee modulation could partly be limited through different PROs for different material fractions. For example, paper and plastic packaging are treated as different categoreis under the current draft legislation. In order to actively steer substitution and product design in between the two material categories, EPR fees and the two PROs' activities need to be synchronised.

7.4.3 Design changes: Material substitution

Main target of the strategy: To avoid negative effects of plastic litter, conventional plastic is substituted with an alternative material that causes less challenges. The substitution could either be biodegradable plastics or a completely different material like paper, metal or glass. It is also possible to use composites, such as paper with a thin plastic film. It could be sutiable for single-use plastic items that may not be feasible to recycle, while impact of these substitutions would require more assessments on its feasibility and sustainability.

Connection to the issue of plastic litter: Conventional plastics do not biodegrade when littered into the environment, which leads to environmental pollution and degradation, threatens wildlife and human health and is source to microplastic pollution, which again contributing to environmental and health problems. To avoid these effects, substituting plastics with another biodegrdable material will result in less accumulation in the environment.

Risks: Litter – regardless of which material it is made of – is an environmental and health threat and thus should be prevented at all costs. This strategy alone does neither address the original source causing the littering issue nor fully reduces the harmful effects of litter but only the one exclusively associated to conventional plastics. Moreover, by claiming that substitution is an

effective solution to the problem – without any other measure taken – could potentially even trick consumers into believing that littering is not a serious issue and thus make it even more difficult to address the littering issue at a consumer behaviour level. Certain substitution materials may also result in less favourable environmental effects. For example, a material like a plastic-paper composite may cause less harm once littered. Yet, it may become less suitable for recycling, negatively affecting a different part of a functional waste management system.

Relation to other strategies: As explained above, substitution as an only strategy is not very effective and thus should always be implemented along other strategies – most importantly improving waste management infrastructure. However, substitution should always be very carefully considered: Some materials like certain forms of composites, especially paper/plastic composites, or biodegradable material cannot be recycled, but can only be incinerated (ideally with energy recovery through heat or electricity production) or landfilled – whereby the two latter options raise the question if there is much benefit to that compared to non-recyclable, conventional plastics, that is subject to the same treatment process. Particularly the substitution with biodegradable plastics needs to be considered carefully: these plastics can only be degraded under certain temperatures, oxygen availability and humidity, and in the presence of certain microorganisms. These conditions cannot be guaranteed either during conventional composting (in countries with well-developed waste management systems) or at landfills (in countries without well-developed waste management, such as Kenya). If biodegradable plastics are not collected together with organic waste for composting but with other recyclables in countries with waste segregation and an associated sorting and recycling infrastructure, they need to be sorted out to prevent a contamination of the various recyclable fractions that are separated in the sorting process. However, this is quite challenging as it is very difficult in both manual and highly automated sorting processes.

Operationalization: The public sector is able to foster product substitution through enacting and enforcing standards. The underlying processes have been outlined within this study. Also, fee modulation – as outlined before – can foster design changes towards substitution.

7.4.4 Design changes: Increasing design for recycling

Main target of the strategy: As mentioned earlier, particularly the plastic which have no or only a low economic value is very prone to littering. Their value can be increased through increasing their recyclability, which comprises both the design as well as the actual recycling possibilities present in the country concerned. Actual recycling of a material is dependent on several factors, one of them being the final treatment stage, others to be found along the whole waste value chain. Processes of generation, collection and sorting need to allow for the item to be procured in the right quality and quantity for the treatment stage to uptake it for recycling, although the end market for this recyclate need to exist.

Connection to the issue of plastic litter: Through increasing their economic value, both formal as well as informal actors have an increased interest to keep the plastics within the waste management system and reduce littering as this negatively impacts their recyclability.

Risks: The economic value of recyclable plastics is always subject to fluctuations as the recyclates are competing with virgin material on a global market. Especially in times when the virgin price is very low, recyclates are not very competitive, which significantly reduces their economic value. In case there is no economic value, the self-interest to keep them in the system is also reduced. In addition, all recyclates require a demand on the manufacturing side in order to be economically viable in the long term.

Relation to other strategies: As described above, the success of this strategy is critically dependent on improving the waste management infrastructure since no theoretically recyclable plastics will be eventually recycled without the respective recycling possibilities. In addition, this strategy can be positively reinforced through a bonus/malus-system through fee modulation or taxation to shift to a more recyclable design as other critical constituent of recyclability.

Operationalization: stipulated in the current EPR regulations draft: “environmentally friendly or eco-design” means the practice of reducing environmental degradation and pollution by making products that comply with environmental

sustainability that includes but not limited to minimal waste production, reusability, recyclability, compost ability, biodegradability and safe disposability.

The public sector is able to shape product design through enacting and enforcing standards. The underlying processes have been outlined within this study.

7.4.5 Bans

Main target of the strategy: Reducing plastic litter, distorted recycling processes and particularly harmful effects through banning problematic plastic items altogether.

Connection to the issue of plastic litter: If problematic plastic items are not available for consumption, they cannot become litter.

Risks: If it is not designed well, bans can result in undesired material substitutions, which are not banned with (other) negative consequences.

Relation to other strategies: As mentioned, bans are closely associated with material substitutions and thus should always be carefully considered in light of them. It is also possible to use bans as a last resort options if the other strategies are not proving to be successful enough.

Operationalization: The stipulated ban on plastic bags has proven the general viability and political willingness to enact and enforce bans. With the ban on certain thin-layered plastic bags, certain substitution effects have taken place, e.g. towards thicker bags. This has caused a discussion about the environmental benefit of the ban among various stakeholder groups if the substitution may have adverse effects. Nevertheless, the government has enacted modification to the original specifications of the ban and demonstrated. The government has therefore proven to be able – at least to a certain extent – to continuously adapt the ban avoiding undesired substitution effects.

Another frequesnt disucsssion point brought among various stakeholders concerns the limited enforcement capacity, which allegedly causes a disadvantage for abiding businesses. Certain plastic bags seem to find their way into certain applications despite the ban.

7.4.6 Compostable Plastics

Availability: This segment of plastic is available in the market through informal means. Despite having a standard, importation using regular legitimate means is constrained.

Price: The price for the input (resins) can be as high as 4 times compared to conventional plastic materials. However, during production process, the difference gets slightly levelled. Companies marketing compostable plastics in Kenya state a price difference that go down to as low as 20% surcharge on compostable plastics.

Suitability/ adequacy to substitute: Even with a relatively low price premium, the sensitivity for large parts of the Kenyan population is quite high. A higher price without an obvious benefit for the end use may be difficult to justify and make more expensive products unviable or at least limit them to an insignificant niche. From the perspective of the ongoing EPR initiatives, products' prices are already artificially lifted through upcoming EPR fees. A further increase through materials substitution might be met with opposition.

Implication from Kenyan context: From a technical perspective, a functional waste management system can – in theory and also proven in other countries/ jurisdictions – take up organic waste separate from non-organic and non-recyclable waste fractions. Organic waste with few impurities is then forwarded to controlled composting facilities. In Kenya, such a separate collection of organic, i.e. compostable waste is incompatible with the current waste management system in practice. Currently, the waste is collected as a mixed stream with no segregation at source apparent. Informal workers pick out valuable items from the mixed post-consumer waste. The remaining waste stream is subsequently disposed of at a dumpsite or burnt on site predominantly in rural areas. Few waste management operators undertake sorting processes that extract organic waste from other fraction for composting it. The applied technologies are currently basic and the volumes are minimal.

Within the currently observed waste management practices, biodegradable plastics would distort the current recycling process of plastic. At the stage of sorting, biodegradable plastics

cannot clearly be distinguished from other plastic fractions. Nevertheless, if they are processed together with recyclebale plastics, they have the potential to adversely affect the resulting recyclate products. Therefore, **any application of biodegradable plastic must be strictly separated from the plastic recycling chain**. This results in a number of aspects that severely limit the use of biodegradable plastics

If companies would substitute certain plastic items with biodegradable ones, this plastic item would be mixed with similar items made of non-degradable plastics during the waste generation and along the value chain over transport and sorting. During treatment, it distorts the process and therefore effectively limits the recyclability of a similar item. **Substitution of recyclable plastic items through biodegradable plastics would have a negative effect on the waste management and therefore should be limited by the EPR scheme and the public sector.**

Full substitution of certain plastic items: Political action is needed for a successful enactment, e.g. through standards or through a very strong PRO. In this case, certain plastic items would be biodegradable. Such a solution does not distort the recycling process if the substituted plastic item is not recyclable currently or potentially in Kenya. The effect on plastic waste management would be net zero. If current composting technologies would be able to effectively dissolve the biodegradable plastic is questionable given the current, basic standards. A technical assessment about the actual feasibility, i.e. if the items would biodegrade under actual conditions, would be necessary. Nevertheless, **against the introduction of a biodegradable item, the substitution of a non-recyclable plastic item through a recyclable one would yield a more positive effect and should hence be favoured.**

Potential to address harmful effect: As biodegradable plastics are incompatible with the current waste management system, potential to address currently harmful effects could not be identified within this assignment. Littering is one of the most prevalent challenges for the Kenyan waste management sector. Political action to improve waste management needs – regardless of all other measures – target the reduction of littering. Choosing material fractions that reduce harm to the environment once littered does not contribute to better waste management practices.

Controlled/ industrial composting is undertaken at a minimal scale with home composting being unviable in urban areas. In order to change this, the current waste management system would need to be radically overhauled. This would require separation at source as well as incentives or obligations that allow for viable business models through composting. At the moment, therefore, compostable plastics would barely find their way into the compostable waste stream – as it simply does not exist at scale. The potential to address harmful effects from post-consumer waste is minimal.

Apart from post-consumer plastic waste, certain applications that foresee plastics to remain in the soil/ in a composting environment, may present viable avenues for biodegradable plastics – i.e. horticultural or agricultural applications.

Other Factors: according to the assignment's engagement, the discussions about biodegradables have currently stalled with the government as well as the nascent PRO against an uptake of them. Standards on biodegradable plastics as alternatives to current materials have been stopped following political discussions. The Ministry of Environment and other public and private bodies have prioritised to advance the current waste management system towards enhanced recycling before introducing biodegradable plastics.

7.4.7 No Packaging

Availability: The question is less about the availability of packaging materials but more about the specific availability of the product itself – one of the core functions of packaging is transport, another one protection from external influences. If packaging is removed, both functions are limited, hence requiring immediate access to the product. The question of availability is therefore highly context specific.

Price: goods that are not packed are generally cheaper as the packaging doesn't need to be paid. As the shelf life is generally reduced, particularly for food, the amount of waste that needs to reflected in the products' price may rise higher.

Suitability/ adequacy to substitute: depending on lifestyle and exposure to consumption practices that target 'convenience". Certain experiences towards this approach are undertaken in informal settlements, e.g. through milk dispensing units.

Implication from Kenyan context: Given Kenya's economic development and ongoing urbanization – factors that usually lead to consumption patterns that require more packaging - the general trend seems to lead into the opposite direction. Due to partly extremely low labour costs, the margin of splitting up smaller quantities from buying in bulk seems to justify respective business models.

Potential to address harmful effect: a packaging that hasn't been produced can't be littered and can't contribute to inadequate waste management practices. This distribution model allows for quick and easy reuse of the packaging material, particularly apparent with kasuku. Where controls are stringent, this point of interaction with the customers can serve as a deposit refund point and work for "stubborn materials" such as LDPE. Bringing back the LDPE packaging, and a discount is granted on the product dispensed. This model had been trialled by a local manufacturer and proven to work however the constraints of transporting the waste materials resulted in the model being dropped.

Other factors: Major multinationals and large local producers have invested heavily in branding. This aspect of no-packaging might not fit into their model of differentiation. Furthermore, different efforts need to be made to ensure non-adulteration of the products.

Glossary

Bio- Based Plastics

Plastics which are manufactured from renewable sources; for instance, sugar cane (as opposed to fossil-based plastics, which are derived from fossil fuels). The term bio-based doesn't necessarily imply bio-degradability.

Biodegradable Plastics

Plastics which can be degraded or composted by microorganisms under specific, environmental conditions. Biodegradable plastics can be made both of bio-based as well as fossil-based plastics.

Circular Economy

The circular economy is defined as an economic model in which resources like plastics are used more efficiently through the three guiding principles of "reduce, reuse and recycle" to close the loop.

Shifting to such a system has economical as well as social and environmental benefits through reduced import dependency, employment creation, reduced littering, less resource extraction as well as improved human health conditions.

Deposit-Refund System (DRS)

A surcharge which is placed on certain products and containers by manufacturers. When consumers return quantities of these containers or products, the surcharge is refunded.

Disposal

Refers to any operation which is not defined as recovery; this also applies if the operation later results in a secondary consequence for the reclamation of substances or energy.

Extended Producer Responsibility (EPR)

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, i.e. when a product turns into waste. Already during the production and sale (and export), producers are responsible for disposal of their packaging. Producers/importers pay a fee for later disposal of the packaging (before)when their packed goods are placed on the market. The contribution/fee is used for collecting, recycling and disposing of the packaging waste and other costs arising from maintaining the system. It is not used as a contribution to the general public budget of a state.

Free riders

Producers/manufacturers and importers that enjoy the benefits of the EPR system without paying the corresponding fees, including those that under-declare their volumes.

Material Recycling

Describes a recycling process in which waste materials are mechanically reprocessed into products, materials or substances with equivalent properties – also referred to as closed-loop recycling – or a product which requires lower properties.

Manufacturer / Converter

Companies which produce plastic packaging or plastic items by converting raw material.

Landfill

A location where most generated municipal solid waste is disposed. In the Kenyan context, there are no sanitary landfills that include proper ecological precautionary measures like wastewater treatment or landfill sealing. In many cases, it cannot be distinguished whether the disposal site is a landfill or dumpsite.

Life Cycle Analysis

Life cycle analysis (also called Life-cycle assessment or LCA) is a technique to assess environmental impacts associated with all the stages of a product's lifespan (from raw material extraction through materials processing, manufacture, distribution, use, repair and maintenance, to disposal or recycling).

Obliged Companies

Companies which are obliged to pay a fee within a running EPR system.

Oxo-fragmentable Plastics

Plastics which quickly fragment into micro-particles in the presence of warmth, light and oxygen but do not degrade in the environment, thereby becoming a source of environmental pollution in the form of microplastic.

Packaging

The materials in which a product is wrapped or covered in to protect it before being sold or transported.

(Packaging) User

Companies that use packaging for their products when placed on the market. In literature, often referred to as "producer" instead of "user".

(Packaging) Filler

Companies that fill empty packaging with their products before placed on the market.

Polluter Pays Principle

The waste producer or owner is the potential polluter and carries responsibility (including financially). The "polluter pays" principle creates the necessary incentives for environmentally-friendly conduct and the required investment.

Producer

See "(Packaging) user".

Waste Prevention

Measures taken before a substance, material or product has become waste, which reduces quantities of waste and also includes re-use of products and the extension of the lifespan of products. Also reduces amounts of hazardous substances being used and the adverse impacts of the generated waste on the environment and human health.

Producer Responsibility Organisation (PRO)

The central element for the organisation of all tasks associated with the EPR system. Allows producers/users to assume responsibility by combining their efforts and jointly managing the arising waste through collective responsibility. The PRO is the most important stakeholder (organisation) and is responsible for setting up, developing and maintaining the system as well as the take-back obligations of the obliged companies.

Recyclables

Materials that still have useful physical or chemical properties after serving their original purpose and therefore can be re-manufactured. Some are of positive economic value as well (e.g. rigid PE, PET bottles).

Recyclates

A product which has passed through a life cycle and subsequently a recycling process, which means it is made from used materials (e.g. plastic re-granules).

Recycler

Companies that recycle pre-processed waste streams (e.g. sorted rigid PE plastics) by washing, flaking, agglomerating and re-granulating. With these actions, an economically marketable output product is reached.

Reducing

The practice of using less material and energy to minimize quantities of generated waste and preserve natural resources. Includes ways to prevent materials from becoming waste before they reach the recycling state. Also includes re-using products.

Re-use

The repeated use of a product in the same form for the same or a different purpose. In this case, the product does not become waste.

Rigid plastics items

Plastic items that are stable in form, e.g. PET-bottles, PP cups, plastic pipes (in contrast to flexible plastic items such as film).

Single-use Plastics Products

Are used only once and then thrown away, includes items like plastic cutlery, straws or coffee stirrers.

Solid Waste Management (SWM)

The storage, collection, transportation and disposal of solid wastes. Also describes a practice by which several waste management techniques are used to manage and dispose of specific components of solid waste. Waste management techniques include avoidance, reduction, reuse, recycling, recovery and disposal.

Source Separation

The segregation of specific materials at the source for separate collection.

ton

Metric ton, i.e. 1,000 kg

Waste Hierarchy

Describes a ranking of waste management options according to what is best for the environment. It gives top priority to waste prevention; if waste is generated, the priorities lie within preparing for re-use, then recycling, then recovery and lastly for final disposal.

Waste Management

The term waste management describes characteristic activities include (a) collection, transport, treatment and disposal of waste, (b) control, monitoring and regulation of the production, collection, transport, treatment and disposal of waste and (c) prevention of waste production through in-process modifications, reuse and recycling.

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