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Nicholas O. Oguge

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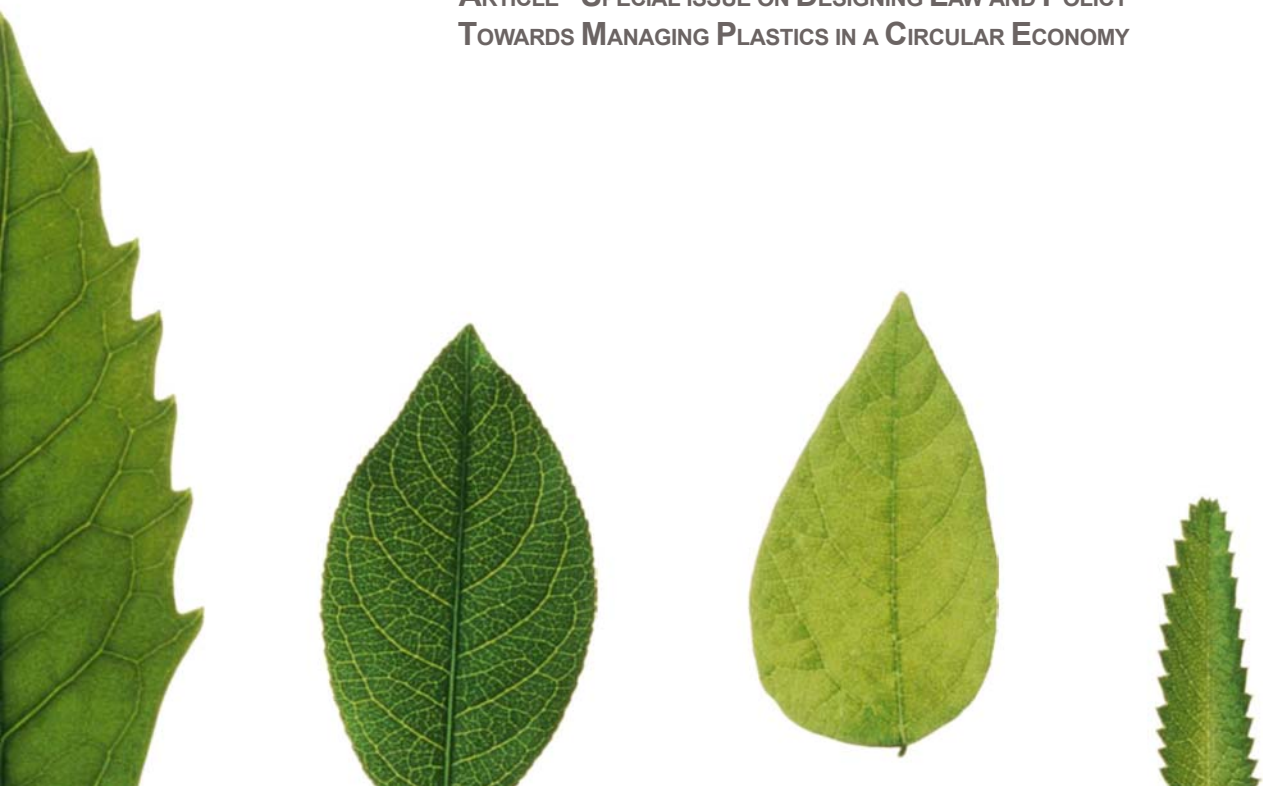

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TABLE OF CONTENTS

1 INTRODUCTION

In recent centuries, the earth has experienced major changes due to human-biosphere interactions leading to alterations in ecosystem dynamics with a number of local and regional tipping points.[1] Indicators of global environmental degradation include climate change, habitat loss, and plastics pollution, which singly or collectively lead to loss of biodiversity and nature's contributions to humankind.[2] Discussing regime shifts at local and regional scales due to human drivers is a big task. This article therefore focuses on plastics waste and specifically on the challenges and opportunities through its governance in the Kenyan context.

Plastic, a general term for a wide range of synthetic or semi synthetic organic solid materials,[3] provides functions that are important for many economies, and the durable ones have delivered many benefits, such as water pipes, medical devices and food packaging. There are environmental and social costs to its production, use and disposal. Single use types and packaging contribute substantial amounts of waste, which are objects with no value or liable owner. However, plastics waste is not only a social, economic and environmental problem, but also of public health concern. Inhaled fibrous microplastic can cause inflammation of the lungs and can desorb, leading to reproductive toxicity, carcinogenicity and mutagenicity; while its associated contaminants such as Polycyclic Aromatic Hydrocarbons (PAHs) lead to genotoxicity.[4]

The problem of waste typifies many of the development problems of most sub-Saharan African countries, namely poverty, poor working conditions and environmental degradation. Plastics waste is forecasted to constitute around 13 per cent of municipal waste in sub-Saharan Africa by 2025,[5] while constituting 9-13 per cent of solid waste in major cities of East Africa.[6] The annual national solid waste generation in Kenya for 2017 was estimated at 9.7 million tonnes and growing at 3 percent.[7] Due to inadequate refuse collection and disposal systems in the country, plastics waste, constituting at least 10 per cent (i.e. 970,000 tonnes for 2017) of the solid waste stream,[8] are commonly found to litter the environment causing severe pollution.[9] Its regulatory reform would need to focus on transformation of the design, production, use and recycling of plastic products hence the importance of the application of circular economy measures.

2 PLASTICS WASTE AND ITS GOVERNANCE IN KENYA

In Kenya, plastic is ubiquitous across most facets of the economy delivering many benefits. However,

1 J Rockström and others, 'Planetary Boundaries: Exploring the Safe Operating Space for Humanity' (2009) 14(2) Ecology and Society 32 <http://www.ecologyandsociety.org/vol14/iss2/art32/>.

2 E Archer and others, Summary for Policymakers of the Regional Assessment Report on Biodiversity and Ecosystem Services for Africa of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services 2018).

3 V Singh and VP Sharma, 'Integrated Plastic Waste Management: Environmental and Improved Health Approaches' (2016) 35 Procedia Environmental Sciences 692.

4 J Gasperi and others, 'Microplastics in Air: Are We Breathing It In?' (2018) 1 Current Opinion in Environmental Science & Health 1.

5 Statistica Research Department, 'Forecast of the Composition of Municipal Waste in Sub-Saharan Africa by 2025' (Statistica, 22 March 2012) <https://www.statista.com/statistics/233483/composition-of-municipal-waste-in-sub-saharan-Africa)>.

6 J Okot-Okumu, 'Solid Waste Management in African Cities—East Africa, Waste Management—An Integrated Vision' (2012) InTech Open <https://www.intechopen.com/books/waste-management-an-integrated-vision/solid-waste-management-in-african-cities-east-africa>; L Oyake-Ombis, BJM van Vliet and APJ Mol, 'Managing Plastic Waste in East Africa: Niche Innovations in Plastic Production and Solid Waste' (2015) 48 Habitat International 188.

7 T Elliott and others, 'Plastic Packaging Waste Flows in Kenya' (Report, Danish Environmental Protection Agency, 2018).

8 ibid.

9 NW Mukui, 'Mass Balance of Plastics: Case Study for Nairobi City' (Doctoral Thesis submitted to University of Nairobi, 2015).

environmental and social costs to its production, use and disposal are yet to be determined. Plastics packaging is widespread in the consumer sector in Kenya and include any material 'made of any plastic type or a combination of plastics, which is used to contain, protect, handle, deliver or present items'.[10] The range of plastics products covered in this description would include 'plastic shopping bags, drinks bottles, disposable cups and plastic bags or boxes sold with food, consumer products, or other goods, whether they can be reused or not'.[11] Notably, plastic packaging is manufactured from a wide variety of different types of polymers that can either be post-industrial (PI) or postconsumer (PC). Whilst post-industrial (PI) wastes are usually clean, as they have no organic residues and are of known composition, postconsumer wastes (PC) are often mixed polymer wastes with many organic and inorganic impurities.[12] Plastics waste typically are derived from four polymer types – high density polyethylene (HDPE), low density polyethylene (LDPE), polypropylene (PP) and polyethylene terephthalate (PET) – that dominate the plastic waste derived from PC packaging.[13]

Disposal of plastic packaging is an obvious environmental, health and social concern,[14] contributing to substantial amount of municipal solid waste and clogging drainage systems among other problems.[15] Single use dissipative plastics (packages, straws, etc.) litter are the foremost menace due to deliberate or inadvertent disposals and 'fugitive' losses into the environment leading to pollution. In rural Kenya, they are strewn on trees, hedges and on the ground. Livestock death and quality of livestock products is affected and ultimately results in marine pollution.

Kenya has a plastic packaging consumption of 259,252 tonnes/year characterized by importation of raw plastics (184,708 tonnes/year), plastics packaging importation (44,086 tonnes/year) and recycled secondary plastics (30,475 tonnes/year) of which only 18 per cent (46,988 tonnes/year) are recycled.[16] Approximately 38,565 tonnes/year are managed in landfills or through incineration and 173,698 tonnes/year find their way into the environment or illegal dump sites.[17] Recognition of this problem and the need for a governance structure was discussed in a paper analyzing the political–economic roots of plastic bags waste and implications for environmental justice.[18]

Despite above challenges, there are no national or county policy frameworks specific to the plastics problem in the country. In Kenya, policies are documents of national or county commitments to address an issue of public concern clearly articulating its goals, objectives, values, issues, statements addressing the issues, implementation mechanisms, and a monitoring and evaluation plan. Such documents originate in the Government and are subjected to stakeholder consultations before presentation to National or County Assembly for debate and adoption as sessional papers. Therefore, policy documents are different from laws and regulations as they address only the intent. Sessional papers then require legislations and institutions to be operational. Management of plastics in the country is therefore based on the Kenya Gazette Notice No 2356 of 14 March 2017 and broadly on a number of legislations addressing solid waste management (SWM). The Gazette notice was a ban specific to plastic carrier bags and flat bags, hence other plastics waste is therefore generally managed as other solid wastes. This necessitates discussions on plastics waste as a nested issue within issues surrounding SWM in Kenya.

A systematic analysis of the evolution of solid waste management (SWM) in Kenya,[19] shows that from 77

10 Elliott and others (n 7).

11 ibid.

12 O Drzyzga and A Prieto, 'Plastic Waste Management, A Matter for the 'Community'' (2019) 12(1) Microb Biotechnol 66 <https://onlinelibrary.wiley.com/doi/full/10.1111/1751-7915.13328?af=R>.

13 ibid; Elliott and others (n 7).

14 B Horvath, E Mallinguh and C Fogarassy, 'Designing Business Solutions for Plastic Waste Management to Enhance Circular Transitions in Kenya' (2018) 10 Sustainability 1664.

15 CM Aurah, 'Assessment of Extent to Which Plastic Bag Waste Management Methods Used in Nairobi City Promote Sustainability' (2013) 1(4) American Journal of Environmental Protection 96. 1

16 Elliott and others (n 7).

17 ibid.

18 J Njeru, 'The Urban Political Ecology of Plastic Bag Waste Problem in Nairobi' (2006) 37 Geoforum 1046.

19 Tilahun Nigatu Haregu, Blessing Mberu & Abdhalah K Ziraba, Evolution of Solid Waste Management Policy Landscape in Kenya: Analysis of Evolvement of Policy Priorities and Strategies (Urban Africa Risk Knowledge, Working Paper No. 47, 2016) 21.

statutes of environmental concern between 1948 and 2015, policies have shifted chronologically in focus. The primordial focus was on 'what not to do' by making it illegal to vitiate the environment. The focus shifted to vesting powers to responsible bodies, that is 'who will control'; then to 'what needs to be done' in the enactment of the framework law on environment.[20] The proximate policy approach emphasizes on 'how to manage or address' the challenges. The paper brings to fore that '… only little indication is given about the ultimate focus – 'how can solid wastes be maximally used as resources' to drive economic development that is compatible with the environment'.[21]

One might argue that there is adequate regulatory mechanism to deal with plastic waste under the general SWM policies and legislations. This article, however, stems from the critical conclusion from analytical studies on the lack of focus on use of wastes as a resource.[22] I hereby suggest a governance approach that will maximally use waste as a resource with a focus on plastics. I build my arguments from the constitutional provisions, through development blueprints, national policies and strategies, legislations and regulations. This is in conformity with the governance structure in Kenya that is cascaded from the Constitution, policies, legislations, governmental institutions (national & sub-national (counties)), the civil society and the public. It is important to recognize that national policies and legislations are directly or indirectly influenced by global, continental and regional frameworks.

Plastic governance can therefore be traced to the Constitution, particularly through Articles 42, 43, 69 and 70, with Article 72 addressing legislation relating to environmental protection. Article 42 of the Constitution of Kenya focuses on environmental rights and states that:

> Every person has the 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.[23]

This constitutional provision was influenced by the Stockholm Declaration that was the first formal recognition of the right to a healthy environment emerging from the pioneering global eco-summit in 1972:

> Man has the fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality that permits a life of dignity and well-being, and he bears a solemn responsibility to protect and improve the environment for present and future generations.[24]

In Kenya, all laws, regulations, and policies must be consistent with the Constitution. Hence the inclusion of environmental rights (Article 42) to the country's constitution provides an opportunity for remarkable impact on plastics waste governance, ranging from stronger laws and capacity for landmark court decisions (Article 72) to building interventions that addresses economic and social rights (Article 43).

Article 69 of the Constitution addresses obligations in respect of the environment. Of interest here are the provisions that encourage public participation in the management, protection and conservation of the environment; espouse the elimination of processes and activities that are likely to endanger the environment; and obligate all to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.[25] The above constitutional provisions are enforceable through Article 70 on enforcement of environmental rights.

The country's long-term development strategy, Kenya Vision 2030, sets out a development path aimed at creating a prosperous country with a high quality of

20 Environmental Management and Co-Ordination Act, 1999.
21 ibid.
22 Haregu and others (n 19).
23 Constitution of Kenya 2010.
24 Declaration of the United Nations Conference on the Human Environment, Stockholm, 16 June 1972, UN Doc A/CONF.48/14/Rev.1.
25 Constitution of Kenya 2010, ss 1(d), 1(g) and 2.

life. Actions required to achieve stated development ambitions in this Vision would require a low-carbon pathway, purposing lower GHG emissions than are at business as usual (BAU) practices, but without compromising sustainable development goals.[26] This strategy, however, lacks a mention of plastics as resources or challenges posed by their wastes. Several other national strategies were subsequently developed towards achieving the Vision 2030 goals. Key relevant ones include the Kenya's Climate Change Action Plan,[27] the Kenya Green Economy Strategy and Implementation Plan (GESIP),[28] and the Medium-Term Plan III (2018-2022) – 'Big Four' Plan.[29]

The Kenya's Climate Change Action Plan was developed in 2012 with adaptation and mitigation strategies. While the mitigation strategies analyze the low-carbon options in six mitigation sectors set out in the United Nations Framework Convention on Climate Change,[30] namely energy, transport, industry, agriculture, forestry and waste management; it fails to bring in the component of plastics in the industry or waste management. Industrial processes mitigation strategies focus on charcoal production, while waste management is on methane capture from landfills.

The Kenya Green Economy Strategy and Implementation Plan (GESIP), developed through a participatory and consultative process, recommended five building blocks, namely promoting sustainable infrastructure development, building resilience, sustainable natural resource management, promoting resource efficiency, and social inclusion and sustainable livelihood. Key sectors identified included waste management with a strategic objective of promoting integrated waste management in all the counties by 2020. The strategic actions include the:

1. Roll out pollution prevention programs across manufacturing and service industries
2. Roll out recycling and industrial symbiosis projects through private public partnerships.[31]

The Kenya GESIP does not address plastics as a resource or plastic waste as a challenge but its strategic actions on integrated waste management offers opportunities through circular economy measures.

The third phase of implementing Vision 2030, Medium-Term Plan III, is the government's strategic agenda over a five-year period (2018-2022) and marketed as the 'Big Four' plan. Focusing on four sectors, the idea is to implement projects and policies that will accelerate economic growth and transform lives by creating jobs, enabling Kenyans to meet their basic needs, improve health standards, improve living conditions, lower the cost of living and reduce poverty and inequality.[32] The Big Four revolve around enhancing manufacturing, food security and nutrition, universal health coverage, and affordable housing. Focusing on manufacturing, the Government's objective is to enhance the sector from its current contribution of 9.2 per cent of the Gross Domestic Product (GDP) to 20 per cent by 2022. This is to be realized through 8 sub-sector enablers, namely textile/apparel/cotton, leather, agro-processing, construction materials, oil, mining and gas, iron & steel, ICT, and fish processing. The country is extracting oil and given that plastics constituted 6 per cent global oil consumption in 2014 projected to rise to 20 per cent by 2050,[33] it is plausible that plastics and plastics wastes be planned for as a critical component of the manufacturing sector.

Shifting from development blueprints to policy frameworks, the National Environment Policy, 2013 contains policy statements on waste management, and calls on the government to develop an integrated national waste management strategy. This policy is, however, not explicit in addressing the plastic issue but rather views it as a consequence of poor consumption and production patterns. It thus states that:

> [t]o achieve a clean and healthy environment, unsustainable patterns of production and

26 Government of the Republic of Kenya, Kenya Vision 2030 (2007).

27 Government of the Republic of Kenya, Kenya's Climate Change Action Plan: Mitigation (2012).

28 Ministry of Environment and Mineral Resources (Kenya), Kenya Green Economy Scoping Study (2012).

29 Parliamentary Service Commission and Parliamentary Budget Office (Kenya), 'Eye on the 'Big Four'' (2018).

30 UN Framework Convention on Climate Change, New York, 9 May 1992, 1771 UNTS 107, art 4(1).

31 Government of the Republic of Kenya, Green Economy Strategy and Implementation Plan 2016-2030 – A Low Carbon, Resource Efficient, Equitable and Inclusive Socio-Economic Transformation (2016).

32 Parliamentary Service Commission (n 29).

33 World Economic Forum, 'Future Oil Demand Scenarios' (Report, April 2016) <http://www3.weforum.org/docs/Future_Oil_Demand_Scenarios.pdf>.

> consumption should be discouraged, and intensified awareness instituted.[34]

Perhaps the only aspect attributable to plastic is where the policy calls for creating awareness on environmental impact of using non-biodegradable materials, such as plastics.

It is notable that the country is currently in the process of developing a National Sustainable Waste Management Policy, the draft of which has a provision for 'generating new business and economic opportunities and providing broad environmental and social benefits to all Kenyans' and 'reducing plastic pollution in the marine environment'.[35] The lack of a clear framework for managing plastic waste in current and planned policies is a case for rethinking its governance.

A legal framework for managing plastic wastes developed by the East African Community (EAC) establishes a regional approach for the control and regulation of use, sale and manufacture and importation of polythene materials and products.[36] The ban to all plastic carrier bags and flat bags used for commercial and household packaging in Kenya was influenced by the EAC Bill. It is, however, situated in the Environmental Management and Co-ordination Act, 1999 presumably based on the precautionary principle.[37] Since there is no legislated sessional paper to back this regulation, it remains a stand-alone strategy for subsequent integration into broader national strategies.

Legal frameworks enacted to address the problem of solid waste management in Kenya (SWM) since 1948 has created institutions and systems at different levels of governance that evolved over the years.[38] The Environmental Management and Co-ordination Act, 1999 provided on enforcement an opportunity for a structured approach. Notably, it did not supersede sectoral laws regulating waste, such as the Public Health Act, 1986 which makes provision for securing and maintaining health with respect to sanitation and housing.[39] Other segmentation of legislation on SWM are summarized in Table 1 while regulations and guidelines developed through the Environmental Management and Co-Ordination Act, 1999 to address pollution issues, including SWM are summarized in Table 2.

Table 1: A list of legislations addressing solid waste management (SWM) that may have plastics components in different sectors in Kenya.[40]

Acts (year)	**What the law addresses**
The Factories Act (1987)	*Generation of waste in factories: E*very factory owner to ensure that the factory environment is kept in a clean state, and free from effluvia arising from any drain, sanitary convenience or nuisance. Subsection (a) and (b) include accumulations of dirt and refuse shall be removed daily.
Building Code (1987, 1995)	*Handling construction and demolition waste: S*tates provision on dealing with the depositing of debris on streets. Building Code 1995 serve as an enhanced framework and Revised Building Regulation.
Food, Drugs and Chemical Substances Act (1992)	*Disposal of Solid Waste:* Makes it an offence to use or dispose of any chemical substance in a manner likely to cause contamination of food or water for human consumption or in a manner liable to be injurious or dangerous to health.
Physical Planning Act (1996)	*Waste disposal sites:* Physical Planning Act makes provision for development control and as such provided for waste disposal at designated sites only.
The Occupational Safety and Health Act (2007)	*Operation of plant machinery and incinerators:* Act deals with chemical safety and the securing of dangerous parts of machinery.
The Environmental Management and Co-Ordination Act (1999) (Cap. 387). Kenya Gazette Notice No 2356 (2017)	*Ban on the use, manufacture and importation of all plastic bags used for commercial and household packaging*: (a) Carrier bag- bag constructed with handles, and with or without gussets; (b) Flat bag- bag constructed without handles, and with or without gussets.

34 National Environment Policy 2013, s 5.4.3.

35 Draft National Sustainable Waste Management Policy (September 2018) 4.

36 East African Community Polythene Materials Control Bill, 2016 <http://www.eala.org/documents/view/the-east-african-community-polythene-materials-control-bill2016>.

37 National Environment Management Authority (NEMA), 2006; Environmental Management and Co-ordination (Waste Management) Regulations, 2006 <http://www.nema.go.ke/documents/>.

38 Haregu and others (n 19).

39 ibid.

40 This table is modified from Haregu and others (n 19).

Table 2: A list of regulations under the Environmental Management and Co-Ordination Act, 1999 addressing pollution and SWM.[41]

Legal Notice Number	**Year**	**Issue addressed**	**Description**
121	2006	Waste Management	*Procedure & criteria of handling categories of waste*: Establishes a number of rules for the management of municipal waste.
73	2007	Controlled Substances	*Disposal of controlled substances*: Describes classification of controlled substances and provisions on licensing and permit provision as well as monitoring provisions for manufacture, packaging, import and export of controlled substances.
60	2007	Hazardous Substances	*Disposal of hazardous wastes*: Requires among other things that all unused, obsolete or expired chemicals must be disposed of in an environmentally sound manner.

Despite the existing regulatory framework on SWM, there is a gap as regards sustainable plastic waste management in Kenya. The existing ban has addressed the liability in production and use of limited plastic types, but not the legacy. Coupled with the lack of policy, this means that plastics already in use continue to litter the environment and hence impair quality of life, increase pollution, and potentially impact tourism. One of the problems is that no alternative to various plastics uses has been provided, for instance, for food packaging. Hence continued release of plastic wastes into the environment that may persist, unless whatever is packaged is eliminated.

Plate 1. Dumping of solid wastes, including plastics, in drains emptying into the Nairobi River

41 This table is modified from Haregu and others (n 19).

3 A CASE FOR INNOVATIVE GOVERNANCE APPROACHES TO MANAGING PLASTICS WASTE

Plastic waste mitigation strategies in Kenya, as indicated earlier, is dependent on regional and national drivers characterized by lack of adequate human, financial and technological resources, a poor organization of operational processes,[42] and tendency for political elites in national and sub-national governments to pass self-serving laws that inhibit innovative solutions. Aside the selected plastics banned under the legal notice, the rest end up with other solid wastes in the environment or landfills with a proportion on post-consumer recycling.[43]

Recycling has been practiced in Kenya by private actors since the 1980s by individual waste pickers, yard shop owners and small-scale traders.[44] Lack of policy or strategy has, however, ensured that informality is sustained bringing to fore social issues, health and safety concern, issues of livelihood resources (social capital) and strategies (recycling, reuse). Actors tend to be socially and economically marginalized groups, and depending on where and how material are recovered, may be categorized as itinerant waste buyers, street waste pickers, municipal waste collection crew, or waste pickers from dumps.[45] The social-environmental system of informal waste management depicts a hierarchical value system (Table 3).

Table 3: Hierarchy of informal sector recycling.[46]

Highest value	Manufacturing industries
	Brokers, wholesalers and other processors
	Craftsmen, middlemen
	Recycling micro and small enterprises and scavenger co-operatives
	Family type units involved in waste collection or scavenging/picking
Lowest value	Individual waste scavengers/pickers

The social environment for individuals in informal waste recycling, typically referred to as scavenger system,[47] tends to be deplorable with notable exposure to hazardous, contaminated and toxic materials. They also suffer harassment, social stigmatization, political exclusion and other injustices in the environments in which they operate.[48] This is an adaptive response to chronic poverty and often composed of rural immigrants to urban environments. While scavenging may provide economic and environmental benefits as they supply raw materials largely to either artisans or industry, they often incur social costs.[49] In Kenya, plastics waste recovery at the

42 Oyake-Ombis and others (n 6).
43 Horvath and others (n 14).
44 Oyake-Ombis and others (n 6).
45 DC Wilson, C Velis and C Cheeseman, 'Role of Informal Sector Recycling in Waste Management in Developing Countries' (2006) 30 Habitat International 797.
46 ibid.
47 This table is modified from Nas and Jaffe, 'Informal Waste Management: Shifting the Focus from Problem to Potential' (2004) 6 Environment, Development and Sustainability 337.
48 I Mumuni, 'Examining the Roles and Challenges of Informal Waste Pickers in the Solid Waste Management of the Tamale Metropolis of Northern Ghana' (Unpublished Thesis, International Institute of Social Studies, The Netherlands, 2016) 76.
49 Nas & Jaffe (n 47).

Dandora dumpsite is one of the economic activities that supports the livelihoods of informal waste recyclers.[50] Recent studies in South Africa have shown that individuals in scavenging system for livelihood are 3 per cent more likely to suffer ill-health than those who do not.[51] Hence, waste picking is a health concern requiring pragmatic actions to improve the working conditions of those involved by integrating innovative measures into the informal waste recycling system.

A sustainable solution entails integration of systems, including informal and formal, for social and economic inclusion as well as environmental justice. Socially innovative initiatives in solid waste governance in the informal waste sector has been observed in Nigeria.[52] Such a system should synchronize plastics waste management and plastics production since circularity would increase value of plastics waste, keeping it from the environment for longer while turning it into profitable raw material.[53]

The suggested innovative approach includes the application of circular economy models to inform solutions to the plastics waste challenge by creating new revenue opportunities for industries and inclusive jobs for the vulnerable members of the society, particularly the youth, women and physically challenged. The concept is viewed 'as an operationalization for businesses to implement the much-discussed concept of sustainable development'.[54] Since reducing the adverse interactions between the economy, the environment and its natural resources is key to safeguarding the well-being of future generations in a society, a possible tool for achieving this primary goal of enhancing sustainable well-being is the circular economy.[55] Since the Constitution recognizes sustainable development as a principle of governance, opportunities for applying such measures to the plastic problem abound.

The circular economy is a paradigm that suggests a redesign of the current linear economic system, largely based on linear resource flows, towards closed-loop resource flows that can preserve the embedded environmental and economic value in products over time.[56] It has the potential to lead to increased resource efficiency and generate environmental gains through reduced raw material extraction and waste generation. Its governance entails ownership, positive values and liabilities. As an upstream measure, Kenya needs to create an environment for resilient strategies that take circular economy as the foundation for action on plastics.

The concept of circular economy typically revolves around the 4R framework (reduce, reuse, recycle, recover), with literature showing that reuse, recycling and recovery entails most common applications in this respect.[57] A systematic analysis of literature on circular economy demonstrated that most authors and practitioners applied or referred to recycling (79 per cent), reuse (74 per cent–75 per cent) and reduce (54 per cent–55 per cent) most frequently.[58] The framework and associated aims of circular economy from that analysis are summarized in Table 4. Application of the concept to plastics waste management in Kenya has been attempted through a circular model for recycling plastics waste collected by both public and private solid waste handlers across towns and placed at selected locations for the next process.[59] The model envisages waste sorting into a 95 per cent or more pure and segregated plastics waste types that can be recycled physically; and a less than 95 per cent pure non-segregated plastic waste version considered to have attained end-of-life hence subjected to chemical

50 Kenya National Cleaner Production Centre (KNCPC), 'A Comprehensive Plastic Waste Management Strategy for the City of Nairobi' (2006) 38.

51 K Omotoso, 'Informal Waste Recycling Activities: Implications for Livelihood and Health' (2017) 9(6) African Journal of Science, Technology, Innovation and Development 785.

52 TC Nzeadibe and R Anyadike, 'Solid Waste Governance Innovations: An Appraisal of Recent Developments in the Informal Sector Niche in Urban Nigeria' (2010) 4(9) Geography Compass 1284.

53 Oyake-Ombis and others (n 6).

54 J Kirchherr, D Reike and M Hekkert, 'Conceptualizing the Circular Economy: An Analysis of 114 Definitions' (2017) 127 Resources, Conservation & Recycling 221.

55 European Academies' Science Advisory Council (EASAC), 'Circular Economy: A Commentary from the Perspectives of the Natural and Social Sciences' (German National Academy of Sciences, 2015) 18.

56 J Nußholz, 'Circular Business Models: Defining a Concept and Framing an Emerging Research Field' (2017) 9 Sustainability 1810.

57 Kirchherr and others (n 54).

58 ibid.

59 Horvath and others (n 14).

recycling.[60] It is their conclusion that the ban of plastic bags in Kenya has led to a decrease in consumption, however, a technological gap exists to effectively recycle plastics waste.[61]

4

ANALYSIS OF KEY POLICY FRAMEWORKS ENHANCING CIRCULAR ECONOMY MEASURES IN KENYA

Since the aim of circular economy measures is sustainable development,[62] in this section I appraise policies and strategies in Kenya that addresses environmental quality, economic prosperity, social equity and temporal dimensions for posterity with relevance to plastics manufacturing and waste management. These measures are anchored in the Constitution, which states that '[t]he national values and principles of governance include sustainable development'.[63] Impetus is further provided by specific articles in the Constitution relating to people's rights to enjoy a clean and secure environment, live a good quality life and participate in governance – including the formulation of policies, laws and development programmes. The economic development blueprint for Kenya, Vision 2030, also entrenches sustainable development through a sustained economic growth of 10 per cent and creation of a just, cohesive and equitable social development in a clean and secure environment.[64] Downstream to these are four key policies and strategies critical for mainstreaming tenets of circular economy measures captured in the constitution and Vision 2030 at sector levels.

Table 4: The 4R framework in relation to sustainable development framework.[65]

Core principles	Aims	
Reduce: Includes refusing, rethinking, redesigning (including prolonging the lifespan of products), minimization, reduction, prevention of resource use and/or preserving of natural capital. **Reuse:** Includes reusing (excluding waste), closing the loop, cycling, repairing and/or refurbishing of resources. **Recycle**: Includes remanufacturing, recycling, closing the loop, cycling and/or reuse of waste. **Recover**: Includes incineration of materials with energy recovery.	Sustainable development	**Environmental quality**: Includes aims of circular economy to maintain, protect and/or restore the environment and/or resource efficiency/enable the transition towards a low carbon economy. **Economic prosperity**: Includes aims of circular economy to maintain, protect, transform and/or strengthen the economy. **Social equity**: Includes aims of circular economy to protect, transform, strengthen and/or develop the society, human well-being and/or jobs. **Future generations (time dimension)**: Future generations and/or the long- term perspective of circular economy.

60 ibid.
61 ibid.
62 Kirchherr and others (n 54).
63 Constitution of Kenya 2010, art 10(2)(d).
64 Government of the Republic of Kenya, Kenya Vision 2030 (2007).
65 This table is modified from Kirchherr and others (n 54).

The Kenya Green Economy Scoping Study indicated that contribution of the manufacturing sector to GDP had stagnated at about 10 per cent for many years, implying limited industrial transformation.[66] Trade and manufacturing generate wastes, yet there is a lack of systematic monitoring of different waste streams resulting from various industries. This would suggest that protection of the environment and resource use efficiency, necessary to enable the transition towards a low carbon economy, is challenged and hence a policy issue.

Social protection was also identified as an important means of reducing poverty and vulnerability in Kenya. It is defined as 'policies and actions, including legislative measures, which enhance the capacity and opportunities for the poor and vulnerable to improve and sustain their lives, livelihoods, and welfare; enable income-earners and their dependents to maintain a reasonable level of income through decent work; and ensure access to affordable health care, essential services, and social transfers'.[67] Upholding this value is critical to attain social justice in innovative and sustainable solutions in plastics waste management.

A number of national policies and strategies may enhance circular economy measures in solid waste management:

The National Industrialization Policy Framework for Kenya, 2012 was formulated 'to provide a stronger and more robust institutional framework within which to synchronize and coordinate the various policies, strategies and activities that underpin Kenya's continuing quest for industrialization'.[68] The policy has 11 core values, including the need to promote sustainable industrial development that upholds environmental protection, management and efficient resource utilization. The policy recognizes polymer production for plastics as key to the petrochemical industry. Although the policy recommends waste recycling as a policy intervention, there is no intervention specifically targeting waste from plastics. It espouses waste as a resource that can be tapped into in order to spur industrial growth. It identifies challenges in the management and disposal of wastes in Kenya to include prevalence of inappropriate modes of transportation, lack of disposal sites, low utilization, poor recycling and treatment technologies, and requirement of high capital outlays in the event of investment in the sector. Hence there is a need to grow the recycling materials industry. This framework has a number of strategies to embrace a 4R approach such as the promotion of the utilization of wood waste for production of chip boards, the production of paper from other raw materials such as bagasse, sisal waste, straw and waste paper, and use of solid waste arising from industrial processing and manufacturing industries, municipal, residential and service waste is a resource.[69] Here the policy advocates for the development of a waste utilization and recycling policy, and promotion of a waste minimization in industry through cleaner production technologies.

The National Environmental Management Policy, 2013 identifies unsustainable land use practices, poor soil and water management practices, deforestation, overgrazing and pollution as the main human activities contributing to environmental degradation in Kenya.[70] Having identified poor waste management as major causes of urban pollution and poor health, the policy suggests a number of strategies to address the problem none of which is specific to plastics waste. These include the high and increasing trends of waste generated despite the efforts to encourage reuse, recycling and recovery, attribution of excessive waste generation to inefficient production processes and unsustainable consumption and production patterns, and the need for enhanced environmental research, training and dissemination of environmental management tools in Kenya. The framework proposes a suite of approaches to address this gap, including the promotion of resource efficient and cleaner production technologies, such as best available techniques and applications, adaptation of the cleaner production concept in all energy production and consumption activities, provision of appropriate incentives to attract the under-represented gender and other vulnerable

66 Ministry of Environment and Mineral Resources (Kenya), Kenya Green Economy Scoping Study (2012).
67 ibid.
68 Government of the Republic of Kenya, 'Transforming Kenya into a Globally Competitive Regional Industrial Hub' (Sessional Paper No.9, National Industrialization Policy Framework for Kenya 2012-2030, 2012).
69 ibid, s 3.6.1(3), 3.7, 3.16.
70 National Environment Policy 2013.

groups into environmental management careers, occupations and programmes, mainstreaming of gender and equity in all sustainable development policies, development of an integrated national waste management strategy, the use of economic incentives to manage waste, establishment of facilities and incentives for cleaner production, waste recovery, recycling and re-use, and support research and development programmes and projects that transfer knowledge and technologies for environmental management and sustainable development.[71]

The National Solid Waste Management Strategy espouses the idea of guiding sustainable solid waste management in Kenya to ensure a healthy, safe and secure environment for all.[72] It identifies challenges with waste management in the country to problems associated with waste management systems, limited knowledge, attitude and practices, political will, technical and financial resources. Although a key policy issue identified is the need to assist the public and institutions to be a 7R oriented society (reducing, rethinking, refusing, recycling, reusing, repairing and refilling their waste), the interventions suggested remain generic with none addressing plastics waste specifically. These include guiding sustainable solid waste management in Kenya to ensure a healthy, safe and secure environment for all, and assisting the public and institutions involved to be a 7R oriented society, by reducing-rethinking-refusing-recycling-reusing-repairing-refilling their waste. To be achieved through eight strategic approaches:

- explore market opportunities for the recovered and recycling materials;
- promote the use of recycled and recovered materials;
- promote modern technologies on recovery and recycling;
- promote public private partnerships in waste management;
- introduction of incentives in the waste management cycle (generation, segregation, collection, transportation, treatment and disposal);
- introduction of extended producer responsibility and public awareness campaigns and education;
- establishment of efficiency and value addition in the waste management cycle; and
- upscaling the activities of the informal sector to link up with the existing formal recycling industries.[73]

The Green Economy Strategy and Implementation Plan (GESIP) is a framework for action towards a low carbon, resource efficient, equitable and inclusive socio-economic transformation.[74] Perhaps the two innovations in its strategies are the push for polycentric governance in transitioning to green economy; and increase in the attractiveness of green jobs by increasing access to social protection benefits and better working conditions. Broadly, it identifies a development path that promotes resource efficiency and sustainable management of natural resources, social inclusion, resilience, and sustainable infrastructure development; and a framework for action towards a low carbon, resource efficient, equitable and inclusive socio-economic transformation. The five strategies to achieve the above include minimising waste and materials, rolling out recycling and industrial symbiosis projects through private public partnerships, promoting resource efficiency at different levels of the economy including the production supply chains, developing a polycentric governance in transitioning to green economy, and increasing attractiveness of green jobs by increasing access to social protection benefits and better working conditions.[75]

The above policies and strategies do set a base from which circular economy measures may be built in addressing plastics waste. The zero-waste strategy, suggested in the National Solid Waste Management

71 ibid, s 5.5.3(5), 5.9.2(2), 5.12.1(1), 5.12.1(2), 6.3.1(1), 6.3.1(2), 6.3.1(3), 7.1.1(4).
72 National Environment Management Authority (NEMA), 2006.
73 ibid, s 4.1.
74 Green Economy Strategy (n 31).
75 ibid, s 4.1.1, 4.1.4, 5.2.

Strategy Zero prioritizes waste prevention and focuses on conserving resources and building a circular economy. This will entail keeping all plastics in the economy and out of the environment. The following section will therefore appraise the gaps needed to attain such a strategy and recommend the need to focus on the 4R framework. Of course, a wide range of enabling activities will be necessary for the strategy to be successful. These would include but not limited to consumer education, research, regulations and market-based instruments.[76]

Reduce: Factors contributing to disincentives to reduce plastics waste emanates from the challenges in taking action that would reduce the waste, particularly among businesses and institutions, whose contribution to the waste stream is significant. Innovative solutions will be required and key to this is public participation in decision making. Some critical knowledge requirement may include:

- analytical work to determine the scope of a legislative initiative on single-use plastics;
- cross-industry agreements to reduce the release of microplastics in the environment;
- adoption of cleaner production by industries as a strategy to reduce waste and emissions flows;
- the economic benefits arising from symbiotic exchanges in industrial zones to be costed and shared with industries, such as - revenues from selling by-products, reduced costs from avoided discharge fees or disposal costs, reduced costs deriving from substituting virgin energy and materials with alternative feedstock obtained at lower prices, etc.;
- framework for domestic action to reduce the leakage of plastics in the environment, prevent plastic waste and increase recycling;
- reduce the quantity of waste that need to be treated and or/disposed of, thus also decreasing the related environmental impact;
- reducing what is produced or consumed in absolute terms (eco- sufficiency strategies);
- reducing all environmental impacts in the life cycle of a product (eco-design).

Recycling: There is a clear opportunity for recycling since recyclable material forms a significant component of solid waste that end up in dump sites. However, studies in Finland show that the thinness and composition (mix of polymers) of plastic carrier bags makes them harder and more expensive to recycle and collect compared to other plastic products.[77] For this to be undertaken sustainably, there will be need for closed-loop recycling of plastic wastes requiring a separate collection system.

Such a strategy has been developed by the European Commission through the European Strategy for Plastics in a Circular Economy and provides a good reference point from which Kenya may draw its own vision for new plastic economy.[78] Key components for consideration would be in targeting manufacturing or importation of plastics designed for recyclability, boosting markets for recycled plastics, upscaling the concept of waste separation, sorting and collection, driving innovation and investment towards circular solutions, and developing a clear roadmap for addressing plastics waste in the country.

Reuse: Integrating reuse and recycling considerations into the design of plastic products is necessary to reduce the costs of bringing these materials back into the economy. It also opens the door to new and innovative products and business models that maximize the usefulness and value of durable products through reuse, repair and refurbishment.[79] The strategy should strive for design of plastics and products containing plastics that allow for greater durability and reuse. Knowledge base here would include:

76 Canadian Council of Ministers of the Environment (CCME), 'Strategy on Zero Plastic Waste' (2018).

77 BIO Intelligence Service, 'Assessment of Impacts of Options to Reduce the Use of Single-Use Plastic Carrier Bags' (Final Report prepared for the European Commission – DG Environment, 2011).

78 European Commission, 'European Strategy for Plastics in a Circular Economy' (2018) 23 <http://ec.europa.eu/environment/circular-economy/pdf/plastics-strategy-brochure.pdf>.

79 CCME (n 76).

- strategy to educate and encourage reuse of plastic packaging;
- regulation on production of plastic packaging that can cost effectively be reused;
- develop public procurement that favour reuse applications of plastic products as opposed to dumping.

Recover: Recovery would include all activities at the end of life that recover value from plastics waste, rather than disposing of them in landfills or through incineration without energy recovery. Recovery activities may be prioritized from high to low value and desirability as per waste management strategy in use.[80] The Kenya's Climate Change Action Plan postulates that mitigation actions can contribute to low-carbon pathways in the six sectors set out in the UNFCCC including waste management.[81] One of the strategies in the action plan is to mainstream low-carbon development opportunities into planning processes including planning of waste landfills so that they are well managed and compatible with methane capture. Although the plan provides another enabling framework for circular economy measures, it fails to address plastics waste specifically whose durability, combined with inadequate incentives and infrastructure to recover, nonetheless present challenges as well as opportunities. The knowledge base here would include evidence base for, among others:

- developing standards and tools that inform economic operators on the presence, distribution, concentration of hazardous chemicals in products and materials recovered from waste;
- addressing a transitional period to enforce recycling;
- product life cycle necessary for design, and hence optimization of recovery;
- design of products for dismantling and end-of-life management to maximize the recovery of resources.

80 ibid.

81 Government of the Republic of Kenya, Kenya's Climate Change Action Plan: Mitigation (2012).

5 OPPORTUNITIES AND CHALLENGES IN CIRCULAR APPROACHES TO PLASTICS WASTE GOVERNANCE IN KENYA

The conceptual rationale and business model for application of circular economy measures for plastics waste in Kenya has been comprehensively discussed.[82] This article's focus has been on opportunities, barriers, and enablers for creating a circular economy governance ecosystem from a policy framework perspective. We find from discussions above that despite the lack of a single policy framework dedicated to plastics waste governance, there are several frameworks that would form a pedestal. These are, however scattered in different sectors and a nexus approach would be necessary to harmonies the fragmentation.

That opportunities exist in plastics waste for the development of a circular economy in the country is not in doubt. It is imperative that some empirical information be provided to support such evidence. it is also imperative to bring to forth challenges that will arise from the technical arena while discussing how that may provide further opportunities in the sector. Since packaging material loses their original purpose the moment the products are consumed, in Kenya most such plastics are discarded hence the waste as end-of-life option of practice. Invariably, 71 per cent of such products end up in the environment, 15 per cent in landfills or are incinerated, and only 15 per cent provide for recycling as an end-of-life option.[83] This compares poorly with Europe where up to 69 per cent is either recycled (30 per cent) or used in energy recovery (39 per cent). This suggests that a large resource base of 212,000 tonnes/year of plastics material, currently considered as waste, is potentially available as a resource base in the production system. This present an untapped opportunity for a circular system for plastics waste in collection, sorting, recycling, and energy recovery as an industry. But also, opportunity for robust deposit return system.

82 Horvath and others (n 14).

83 Elliott and others (n 7).

Agreeably, attending to recycling as an end-of-life of goods reveals networks as complex as those in primary production and constitute not only webs of governance, but also entail material flows and transformations.[84] In Kenya, this is particularly true given that the 38,000 tonnes per year of recycled plastics waste are based on un-formalized waste collection systems.[85] That there exists a dearth of technological capacity to seize the opportunities for the circular economy in plastics waste space is not in contention,[86] but in addition, an enabling environment with a clear framework and incentives is also necessary. The technological challenges particularly the complications of recycling postconsumer plastics waste due to their chemical composition is equally a barrier but would require interrogation elsewhere.[87] Available data for Kenya would suggest that recycling of plastics waste is largely or entirely mechanical with operations based on cleaning, shredding or pelletising plastic waste.[88] Mechanical recycling has further challenges of significant degradation of polymers in an uncontrolled manner under certain heat, oxidation, radiation, hydrolysis and mechanical shear conditions; in addition to differences in the melting points and processing temperatures of the different polymers involved.[89] This opens up another opportunity for innovative approaches to plastics waste recycling using chemical and biotechnological recycling technologies. Such an approach was also discussed and notably, the lack of ease in the process of acquiring the necessary technology forms another barrier.[90]

Aside from the paucity on the technological front, enabling environments challenges form a key barrier. Barriers here include but are not limited to lack of a single framework (national and county) to guide efforts purposively to promote a circular economy; overlapping, duplicated and contradicting legislations under different sectoral mandates that complicates compliance and enforcement requirements – obscuring circular economy opportunities; overall (Public & Private) inadequate or lack of awareness of the Circular Economy concept, their applications and benefits in the country; inadequate capacity implementation of Circular Economy measures; and lack of appropriate financing mechanisms.

That consumer attitude can be influenced through expansive learning would suggest that transparency and sharing lessons from users in the value chain may be beneficial towards adjusting behaviour and developing a polycentric governance ecosystem.[91] It would create conditions for new revenue opportunities for industries, and inclusive jobs for the youth and women. This would also directly address eight sustainable development goals concerning poverty, health and wellbeing, gender equality, decent work and economic growth, sustainable cities and communities, responsible consumption and production, climate action and partnerships to achieve goals.[92] The growing of a sustainable circular governance ecosystem would require development and implementation of appropriate policy frameworks with a collective purpose for long term commitments of all stakeholders, clear leadership, communication strategy, and engagements with all networks.

6 CONCLUSION

The medium-term development agenda for Kenya dubbed 'the big 4', lays out immediate priorities and actions of which manufacturing is a key component. However, of the eight manufacturing sub-sectors identified, plastics is omitted despite the potential in the growth of petrochemical sub-sector being an oil exporting country, and its proportion in the waste

84 MA Crang and others, 'Rethinking Governance and Value in Commodity Chains through Global Recycling Networks' (2013) 38(1) Transactions of the Institute of British Geographers 12.
85 Elliott and others (n 7).
86 Horvath others (n 14).
87 O Drzyzga and A Prieto, 'Plastic Waste Management, A Matter for the 'Community'' (2019) 12(1) Microb Biotechnol 66.
88 Elliott and others (n 7).
89 Drzyzga & Prieto (n 87).
90 Horvath and others (n 14).
91 ibid.
92 Sustainable Development Goals and Targets, in UN General Assembly Resolution 70/1, Transforming our World: The 2030 Agenda for Sustainable Development, UN Doc. A/RES/70/1 (2015), goals 1, 3, 5, 8, 11, 12, 13, 17.

sector. Since manufacturing is anticipated to grow from 9.2 per cent of the GDP, as recorded in 2016, to 20 per cent in 2020, and with plastics and rubber anticipated to contribute 5 per cent to the sector, the concomitant waste stream inevitably grows.[93] Hence, in order to achieve prosperity while sustaining a healthy environment, there is need for a paradigm shift towards an innovative, system that would strive for sustainability. A circular governance strategy would aim for zero waste, sustainable management of natural capital, biodiversity conservation, critical ecosystem restoration, and enhanced society resilience to climate change. A key component of such a system will be plastics waste governance based on the 4R framework analyzed above. The long-term goal being a safe and sustainable society in Kenya. This article, aside not being prescriptive, has pointed out some key elements required in a framework to grow a circular economy governance ecosystem around plastics waste in Kenya. Such a governance ecosystem would allow for improving the economics and quality of plastics recycling, design for recyclability, create demand for recycled plastics, develop a harmonized separate collection and sorting system for waste. The anticipated outcomes would include change in consumer behaviour leading to reduced plastics waste littering and waste in the environment. The opportunities will drive innovation and investment towards circular solutions, and harness citizen action towards curbing plastics waste. Ultimately, it will address the issue around how solid wastes can be maximally used as resources to drive economic development that is compatible with the environment.[94]

With the above background, it is important for Kenya to develop a policy framework that would embrace available evidence to seize social, economic and environmental opportunities linked to higher quality waste plastics processing. The framework will need to redefine value with stakeholders for the purpose of preventing plastics waste from arising. This would create a nexus bringing together a host of stakeholders including:

(i) National Government to create conditions for success and provide leadership on policies (economic instruments and incentives, green procurement), legislations, institutions, regulations, guidelines;

(ii) County governments as owners of land, to provide the necessary infrastructure in partnership with private sector developers and to enable county policies, legislations, institutions, regulations, and guidelines;

(iii) Private sector to provide the necessary investment as drivers of the economy;

(iv) System thinkers, such as academic, research institutions, entrepreneurs to trigger change by introducing new concepts and knowledge, for instance, new science, technology, innovations and business approaches; and

(v) Consumers and civil society required in active engagement for ideas, form networks, communication approaches, feedbacks and expansive learning platforms.

93 Kenya Association of Manufacturers, 'Manufacturing in Kenya Under 'the Big 4 Agenda': A Sector Deep-Dive Report' (2018).

94 Haregu and others (n 19).

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