



THE TOXIC PLASTIC WASTE TRADE - A Case Study of Muoroto Slum in Mombasa, Kenya

ABSTRACT

The Toxic Plastic Waste Trade (TPWT) project within the Muoroto slums of Mombasa city in Kenya found out that: 1) Mombasa has a low waste recycling capacity despite being a destination as a key importer of diverse plastic products; 2) There is high level of awareness amongst people on the negative effects of plastic waste but on the contrary there is minimal will power to execute activities aimed at reducing the menace; and 3) The report also found out that approximately 83.3% of the plastic waste collected at Muoroto slum is recycled however artisanal recyclers activities remain uncoordinated and at small scale. Thus, we recommend that both the county and national government, the business community, the general public and the interested stakeholders to envision policies and models that promote circularity in the Kenyan cities going forward.

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Toxics Free SDGs

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Notably, a dedicated team of Eco-Ethics Kenya (EEK) staff and volunteers invested considerable amount of time and expertise to compile all the data that had been collected from the field into this comprehensive report. We are very grateful to these efforts and hope that they will go a long way to overhaul the current situation of plastic waste trade within Mombasa County.

We would also like to thank IPEN for generously availing funds to execute this study.

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Acronyms and abbreviation

BAT	Best Available Technology
BEP	Best Environmental Practices
EEK	Eco-Ethics Kenya
GDP	Gross Domestic Product
GHG	Green House Gases
IPEN	International Pollutants Elimination Network
Mt	Million tons
MT	Metric tons
NEMA	National Environment Management Authority
NGO	Non-Governmental Organization
PET	Poly-ethylene Terephthalate
POPs	Persistent Organic Pollutants
SDGs	Sustainable Development Goals
UNEP	United Nations Environment Program
WEE	Waste Electrical and Electronic

1.0 Introduction

The current linear economic model of take-make-waste has heralded immense planetary crises in terms of climate change, nature loss and pollution. Key to this system is plastic use which has resulted from an increase in consumerism as millions of people were lifted from poverty in the past few decades.

In addition, the international trade in plastic waste for disposal and recycling has seen the movement of the plastic and its toxic additives from wealthy countries to developing countries and countries in economic transition where labor costs are lower, environmental regulation is weak and recycling infrastructure is limited.

Without suitable infrastructure and business models aimed at boosting circularity of plastic products, millions of tons of plastic waste are ending up into the oceans each year, poisoning and threatening critical ecosystems.

This is the case with Muoroto, a large slum found in Tudor Mombasa, Kenya, which has a general poor sanitation and lacks a proper garbage disposal with which plastic waste predominately leads in littering the environment.

Due to this poor waste disposal in the slum, burning and local landfilling or rather burying of plastic waste has been witnessed in the area for some years until recently where few artisanal recyclers have come in to alleviate the problem by coordinating their plastic recycling activities but still at a small scale.

However, data on plastic waste trade and its disposal, which is necessary to push for policy change, remains fragmented. For this reason, Eco-Ethics Kenya, which is an environmental and community development NGO, decided to conduct a baseline survey of plastic waste management in Mombasa city, using a case study of Muoroto Slums in Tudor, by assessing waste recycling activities. This study aimed to create awareness to Muoroto slum artisans on the use of some of the Best Environmental Practices (BEP) and Best Available Technology (BAT) in their recycling activities.

Based on our previous projects we conducted within Mombasa with objectives to mitigate and eliminate production of persistent organic pollutants (POPs) where many lessons were learnt, this report has discussed in detail methods of plastic waste disposal and recycling activities and their related effect to the environment and human health. We laid tremendous emphasis to review the existing infrastructure capable of recycling plastic waste and how it corresponds to thousands of tons of foreign plastic waste imported through the Mombasa Port.

EEK found out that Mombasa and Kenya by extension has a low waste recycling capacity despite its destination as a key importer of diverse plastic products. Although there is a high level of awareness amongst the people on the negative effects of plastic waste, there is minimal will-power to execute activities aimed at their reduction including sorting and segregation.

In addition, there are a few cottage industries that pay waste scavengers to collect waste for recycling. The activities of waste handlers remain uncoordinated and small-scale at best, thus their efforts incapable of causing a noticeable effect in plastic recycling.

We hope that by communicating these findings, we shall cause both the county and national government, the business community and the general public to have conversations around plastic waste trade and how they would envision appropriate policies around circular economy within Kenyan cities going forward.

2.0 Plastic pollution, management and disposal in Kenya

In Kenya, plastic waste currently constitutes a big challenge to solid waste management in the country. Poor plastic waste management contributes to poor air quality, ocean toxicity, and ecosystem disruption. For example , plastic is poisonous and some of its ingredients such as bisphenol-A and phthalates have been proved to cause cancer, birth defects, impaired immunity, endocrine disruption and other ailments.¹

¹ <http://www.greenbeltmovement.org/>

In Mombasa, those living near dumpsites, like Mwakirunge dumpsite in Mombasa have been reported to be suffering from major diseases among them include malaria, diarrhea and respiratory related infections.²

Mombasa generates about 700 tons of solid waste per day. The general solid waste collection is about 30% and plastic waste as proportion of solid waste is about 10.2%.³

More strategies need to be put in place to increase the amount of plastic waste collection and recycling as majority of this waste ends littering the environment and get washed by rain water into the Indian Ocean that is proximate to the County and some blocks drainage systems.

2.1 A case study of plastic management at Muoroto slum in Mombasa

This study presents the findings of a survey to investigate the process of plastic waste disposal and its associated pollution in Muoroto slum area, located in Tudor, Mombasa.

The research adopted a descriptive survey design and the study was conducted for 4 consecutive days by Eco-Ethics staff members who visited the premises of waste collectors and recycling companies.

Data was collected through administering questionnaires, key informant interviews, observations and photography with the final day being used for focus group discussion. A total of 12 respondents handling solid waste were reached through a questionnaire and the results presented in tables, graphs and photographs.

² [http://ir-library.ku.ac.ke/bitstream/123456789/12914/1/Environmental%20and%](http://ir-library.ku.ac.ke/bitstream/123456789/12914/1/Environmental%20and%20)

³ <http://www.erepository.uonbi.ac.ke>

A google map of Muoroto slum Tudor area in Mombasa

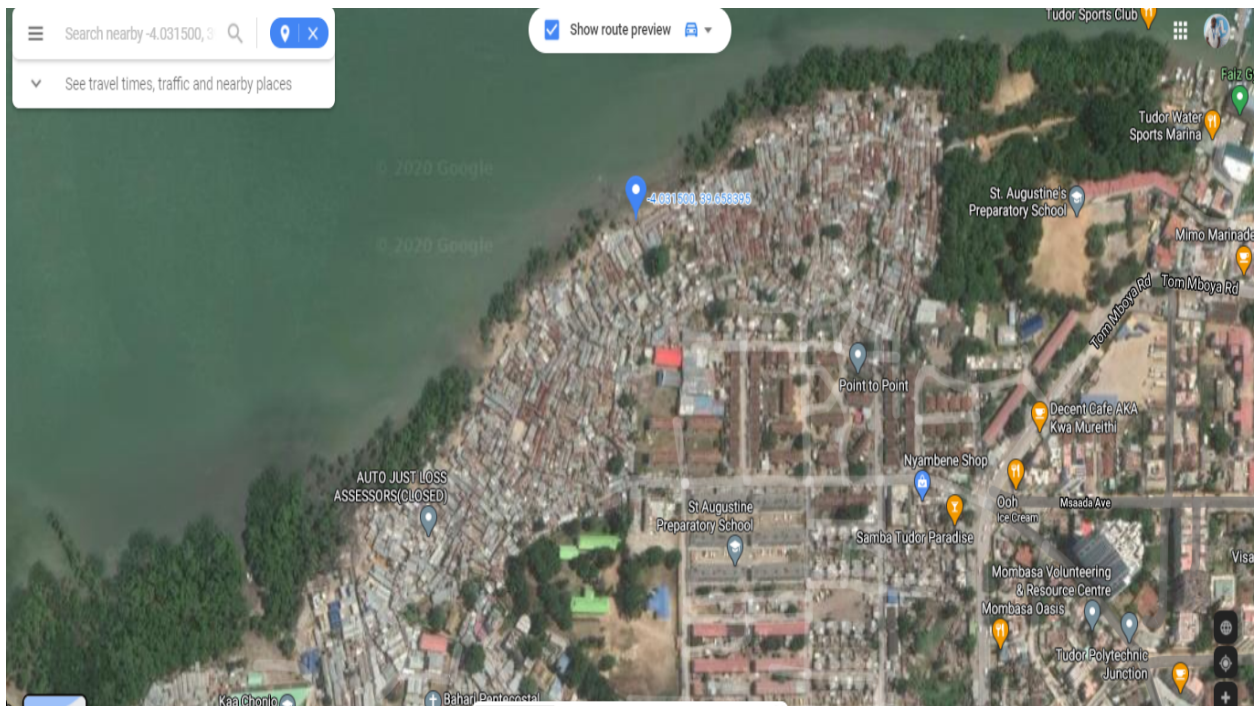


Figure 1: Above shows a google map of Muoroto Slum in Tudor Mombasa, Kenya.

2.2 Project Findings

During the survey, EEK visited more than 10 waste collection and sorting points, interviewed the key respondents and surveyed the entire environment in Muoroto slum area and observed the following.

From the study, about 83.3 % of the respondents reached accepted that they handle plastic waste in their collection and recycling activities with the rest handling other waste such as metals and paper. This showed that plastic waste contributes a bigger chunk of the entire wastebasket. The study further revealed that e-waste is currently not recycled in Mombasa as all the respondents did not handle it and therefore not collected because of high transportation cost required since there is only one e-waste recycling company that is located in Nairobi. This implies that, e-waste generated in Mombasa is either burned, landfilled or dumped and hence it is a threat to the environment and human health as it is the source of POPs and other toxic chemicals production especially when

burned. Burning plastic produces very toxic fumes including POPs, which are very harmful to human health and are sources of greenhouse gases contributing to global climate change. Burning of plastic waste was evident in Muoroto area as the team observed and took some photos.



Figure 1: Burning site for waste including plastic waste and other waste in Muoroto slum, Tudor area in Mombasa, Kenya. Photo by Eco-Ethics Kenya.

There is local land filling or rather burying of plastic waste mainly car tyres and plastic bags filled with soil within some parts of Muoroto slum areas in order to create level ground for the slum dwellers to construct their houses structure. These wastes could be leaching out additives to the groundwater thereby contaminating the sea water nearby. Such effects poison aquatic life which causes food contamination affecting human health.



Figure 2: Car tyres and other plastic waste being used for landfilling in Muoroto area. These plastics with time leach out additives to the nearby sea which causes food chain contamination through fish. Photo by Eco-Ethics Kenya.



Figure 3: Workers in a plastic recycling factory sorting out the plastic waste before it could be grinded into pellets. Lack of appropriate protective gears during plastic recycling process exposes workers to injuries like cuts, respiratory related diseases among others. Photo by Eco-Ethics Kenya.

Table 1. Where do you take your waste you handle?

Waste handling Method	Participants	Proportion (%)
Recycling	10	83.3
Dumpsite	2	16.7
Total	12	100.0%

From the table above, it shows that about 83.3% of waste collected by the artisanal recyclers and waste pickers is sold for recycling while the rest is rejected. Depending on polymer type, it ends up in dumpsite where it is burned becoming source of POPs production or is used for local landfilling where chemical additives are leached out⁴ and with time contaminate underground water and the sea nearby ⁵(figure 2 above). Most of the waste recyclers we interviewed mainly collected and recycled PET bottles. These have a good market as they can be re-purposed for packaging or smelted locally to manufacture plastic cups. However, more investment needs to be done in the process of plastic waste management in order to eliminate or minimize burning of plastics or even the use of local landfills or burying plastics in order to promote increased plastic waste recycling which also if not handled cautiously can be a source of pollution affecting human health and the environment.

From the survey, it found out that there are about 10 premises of waste collectors in the entire of Tudor area where Muoroto slum is located. On average each waste collector gathers around 500kg of plastic waste after every two weeks which can be approximated to a total of 120 tons per year where 83.3% of it is sold for recycling.

2.3 Number of people handling plastic waste and e-waste

⁴ <https://www.ciel.org/wp-content/uploads/2019/02/Plastic-and-Health-The-Hidden-Costs-of-a-Plastic-Planet-February-2019.pdf>

⁵ . <https://ipen.org/documents/toxic-ash-poisons-our-food-chain>

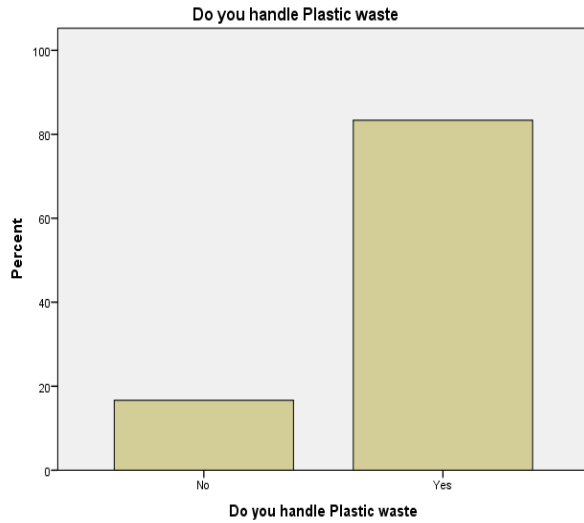


Figure 4. Responses on the number of people who handled plastic waste and e-waste

The graph above and the table below depicts the responses obtained during the survey for the number of people who handled plastic waste and e-waste.

Table 2. Responses on handling plastic waste

Do you handle plastic waste?	No. Participants	Proportion (%)
No	2	16.7
Yes	10	83.3
Total	12	100.0

Table 3. Types of wastes handled

Statistics for types of waste handled by people we visited.					
	Do you handle Plastic waste	Do you handle glass waste	Do you handle e-waste	Do you handle paper waste	Do you handle metallic waste
YES	10	0	0	2	9
NO	2	12	12	10	3

2.4 Implication of tables and graphs above

From the tables and graph above it show that a larger percentage about 83.3% of artisanal recyclers handle plastic waste in Mombasa County. This shows that plastic waste generation is produced in larger quantities and therefore presents more challenges to manage it as compared to other waste such as paper waste, glass and metal waste. In addition, plastic waste resists natural biodegradation and therefore exists for longer periods in the environment whereby it contaminates the soil, water and air with time when these additives are leached to the environment and when plastic is burned becomes a source of POPs production.

Table 4. E-waste

Do you handle e-waste?	No. Participants	Proportion (%)
No	12	100.0

Also, from the table above it is evident that e-waste is neither collected nor recycled as none of the respondents visited in Mombasa admitted to handle e-waste. This therefore implies that, such waste once generated ends up been open burned, landfilled or incinerated. The majority of e-waste is recycled informally in Kenya where waste is majorly burned to extract the copper wires and other valuable metals, leading to emission of POPs mainly dioxins and furans ⁶. In addition, the country has only one recycling company based in Nairobi that recycles e-waste called WEE Centre which is said to have processed approximately 200 tonnes of e-waste in 2016 and is about 1% of Kenya's total e-waste production.

⁶ <https://ipen.org/documents/weak-controls>

3.0 Levels of plastic pollution and plastic waste

According to ComTrade data, Kenya imported a total of 4.2 Mt (million tons) of plastics between 1992-2017 most of which was in primary form as opposed to finished products. Specifically, those with HS Code of 3901- 3914. This implies that the capacity for plastics processing in the country is high using imported polymers. From the data we reviewed, there was no evidence of imported plastic waste.

A study, “Ensuring the sustainability of plastics use in Africa”,⁷ analyzed plastics consumption and demand in 33 African nations and still found that about six countries represented 74% (approximately 87.7Mt) of polymers and plastic consumption. The total volume of plastic importation according to the same study for the 33 African nations surveyed was approximately 117.6 Mt (translating to \$194.6 billion). The plastics consist of approximately 86.14Mt of polymers (primary forms of ethylene, propylene, styrene, vinyl polymers, Acrylic and Polyether) and 31.50 Mt of plastic products (plastics of tile and wall covers, baths. Washbasins, lavatory seats and plastics scraps and parings. This data spans a period from 1990-2017 (approximately 27 years) especially from African countries that plastic waste import records of more than 10 years within the period.

This information assists us to create plastic waste trade supply chain and flow within Africa and ultimately in individual country of interest, in this case Kenya and follow them to their end-of-life (EOL). Geyer et al.⁸ in a 2017 study tried a similar approach of global material flow of virgin polymers and plastics ever produced up to year 2015. They observed that an estimated 30% are in current use; while of the remaining quantities that have reached their end-of-life, 12% were incinerated, 9% were recycled, and 79% were discarded and have accumulated in landfills or in the natural environment especially marine ecosystems where land-based pollution end up.

Although waste management proportions in different nations differ, the above study captures a common scenario in most countries that our survey affirms of localized city like Mombasa, Kenya.

⁷ <https://enveurope.springeropen.com/track/pdf/10.1186/s12302-019-0254-5.pdf>

⁸<https://advances.sciencemag.org/content/3/7/e1700782>

Considering these proportions are true in Africa, then out of 117.6 Mt consumed from 1990-2017 in 33 African nations, 35.3 Mt are in current use, while 82.4 Mt of plastic waste has so far been generated or at their end-of-life. Most plastic waste in Africa either ends up in dumpsites with frequent open burning or in animal guts. An analysis by NEMA found that three out of ten animals taken to abattoirs in Nairobi had plastic in their guts. However, this number has gone down to one since Kenya introduced plastic bag ban in 2017.⁹ In addition, the accumulation of plastic in areas of severe littering such as Kibera slum in Nairobi have been proven to create several million habitats for mosquito breeding, accelerating spread of malaria.

4.0 Imports and export

Despite that Kenya implemented a ban on single-use packaging plastic bags, plastics still form a huge proportion of waste stream in urban areas especially emanating from plastic bottles and food wrappings. The yearly per capita plastic consumption in Kenya for 2009-2015 is in the range of 4.4-8 kg/year¹⁰ a direct effect from an increase in the middle-income population as a result of GDP growth.

Since Kenya currently lacks a crude oil refinery, it's forced to import every plastic material in the country most of which consist of resins and raw materials for resins.

A 2018 study by Eunomia¹¹ estimated that 567,000 MT of primary and non-primary plastics was imported to Kenya in 2017. Another study by Ipsos reported 453,781 MT of imported primary plastics in the same year and 469,400 MT in 2016¹². The huge differences in data points to the uncertainty of the industry which makes it difficult to obtain reliable data and thus researchers resort to estimations and projections.

⁹ <https://www.theguardian.com/world/2018/apr/25/nairobi-clean-up-highs-lows-kenyas-plastic-bag-ban>

¹⁰ <https://www.pagder.org/images/files/euromapproview.pdf>

¹¹ https://eng.mst.dk/media/189822/kenya-plastic-packaging-report_final.pdf

¹² <https://www.ipsos.com/en/throwaway-world-challenge-plastic-packaging-and-waste>

Considering that only 27% of waste is properly disposed in a city like Nairobi while the close to 69% is improperly disposed of¹³, additional imports of plastics will definitely add into this complexity.

At Eco-Ethics, we used key informants at Kenya Ports Authority and desktop research to verify the validity of these estimates.

The main countries from which plastic material is imported are China, India and United Arab Emirates. However, China and India are the primary exporters of plastic material to Kenya as 86% of imported PET have their origin there (Ipsos, 2019).

5.0 Human Exposure to plastic pollution

Most of the discarded plastic waste in Kenya ends up in landfills or natural environment where it causes negative effects to human and the environmental. In most of the dumpsites we visited in Mombasa City, they were operated unsystematically and highly unsanitary posing a health risk to waste scavengers. In addition, due to open burning of waste in these dumpsites, the atmosphere around was always covered in a thick cloud of smoke an indication of air pollution.

Although green-house gas emissions from post-consumer waste and wastewater are a small contributor (3%) to total global anthropogenic GHG emissions, methane (CH₄) from landfills and wastewater collectively account for over 90% of emissions from the waste sector, or about 18% of the global methane anthropogenic emissions¹⁴.

The problem of human exposure to plastic waste is significantly aggravated in informal settlements where there are dysfunctional waste management systems. Take a case of Nairobi city which produces 2400 tons of waste per day where only an approximate 33% of the waste produced is collected and disposed of legally¹⁵. The rest of the waste ends up being heaped next to houses and hundreds of illegal dumpsites ultimately leading to health and environmental complications.

¹³ <https://global-recycling.info/archives/2309>

¹⁴ <https://journals.sagepub.com/doi/10.1177/0734242X07088433>

¹⁵ <https://openjicareport.jica.go.jp/pdf/12005443.pdf>

Nairobi's largest dumpsite, Dandora which sits on a 43 hectare expanse of land has always been viewed as a ticking time bomb due to its poor management by authorities. Despite presenting health threats to thousands of people living nearby in housing estates and slums, the Nairobi River runs through the dumpsite soaking all manner of toxins which later ends up in people's plates as the river's water are used for irrigation and drinking purposes downstream.

A 2007 study by UNEP that examined 328 children living close to Dandora dumpsite found out that half had blood lead levels equal to or exceeding the poisoning threshold of 10 micrograms per deciliter of blood. Exposure to such high levels of lead causes damage to the nervous system and brain. This corroborated a similar investigation by the "Daily Nation" titled the *Toxic Flow* that revealed how Nairobi river passing through the dumpsite had high concentration of heavy metals among them; lead, copper and selenium¹⁶. This investigation also discovered 10 dangerous metals in samples of fish, crabs and river sediments along the Nairobi River on its 400km trek to the Indian Ocean. Women, in particular, suffer from plastic-related toxicity risk due to high aggregate exposure to plastics at home and in feminine care.¹⁷

¹⁶https://beyondtheframe.shorthandstories.com/toxic_flow_two/index.html

¹⁷ <https://news.un.org/en/story/2021/03/1088712>

6.0 Environmental impacts of plastic pollution in Kenya

Plastic waste has become a menacing pollution issue around the globe. From visible plastic litter on land and in ocean to invisible micro-plastics in lakes, mountains, rivers and rain, the planet is gradually being blanketed with the petrochemical remnants of plastic production. Consequently, micro-plastics are breaking down further into smaller and smaller pieces. Plastic microfibers, meanwhile, have been found in municipal drinking water systems and drifting through the air¹⁸. With the massive production of plastics by the petrochemical companies, the amount of plastic waste is set to climb exponentially and so its negative effects to the environment and human health if the waste is not well managed.

Plastics often contain additives making them stronger, more flexible, and durable. But many of these additives can extend the life of products if they become litter, with some estimates ranging to at least 400 years to break down¹⁹. Throughout the life of the plastic product some of the additives leach and migrate into the surrounding environment. In particular, the plastic that become waste and is not recycled, ends up releasing toxic additives into the environment from incineration, when used as fuel, dumped or open burned. Furthermore, activities such as burning can release far more dangerous chemicals such as POPs when plastic, or fuel made from it is burned.

Mismanaged plastic waste which include plastic left uncollected, openly dumped, littered, or managed through uncontrolled landfills, is much more likely to become pollution than waste managed through a controlled treatment facility. The majority of mismanaged plastic waste is believed to have polluted land-based ecosystems, and 80 per cent of ocean plastics are estimated to come from land-based sources²⁰.

Plastic waste that is mismanaged has many negative impacts on the environment, human health and economies.

In Kenya, plastic waste currently constitutes a big challenge to solid waste management in the country. From air quality to ocean toxicity, plastic waste contributes to ecosystem disruption. For example, plastic is poisonous and some of its ingredients such as bisphenol-A and phthalates have

¹⁸ <https://www.nationalgeographic.com/environment/habitats/plastic-pollution/>

¹⁹ <https://www.nationalgeographic.com/environment/habitats/plastic-pollution/>

²⁰ European Topic Centre Waste and Materials in a Green Economy report (2019), (<http://europa.eu>).

been proved to cause cancer, birth defects, impaired immunity, endocrine disruption and other ailments²¹

Millions of animals are killed by plastics every year, from birds to fish to other marine organisms. Nearly 700 species, including endangered ones, are known to have been affected by plastics as nearly every species of seabird eats plastics²². In Kenya at the beginning of 2017, before the plastic bags ban came into effect, plastic bags were widespread in many environments of Kenya on the ground and shrubs that serve as grazing fields for livestock. This made the livestock that ingested these plastic bags suffer depression, reduced milk yield and bloat²³. In addition to plastic threatening wildlife, it is also a pollutant of groundwater. According to the international Association of Hydrological Sciences, cases of groundwater pollution have been reported worldwide and toxic leachates from landfills are among the major groundwater quality risk.²⁴ Kenya has large amounts of littered plastics seen all over the environment. According to World Economic Forum Report, this plastic waste primarily ends up in landfills which leave 90 percent of land in a non-sanitary condition. Landfill has caused both air pollution and water pollution over the years. Also, people living near landfills increase the likelihood of health problems like low birth weight, birth defects and certain types of cancers²⁵ In Mombasa, those living near dumpsites, like Mwakirunge dumpsite in Mombasa have been reported to be suffering from major diseases among them include malaria, diarrhea and respiratory related infections.²⁶

Mombasa has a solid waste generation of about 700 tons per day. The general solid waste collection is about 30% and plastic waste as proportion of solid waste is about 10.2%.²⁷

This means, more strategies need to be put in place to increase the amount of plastic waste collection and recycling as majority of this ends littering the environment and get washed by rain water into the sea that is proximate to the County, as well, some plastic waste blocks drainage systems causing overflow of rain water into residential areas.

²¹ <http://www.greenbeltmovement.org>

²² <https://www.nationalgeographic.com/environment/habitats/plastic-pollution/>

²³ <http://www.lrrd.org/lrrd30/11/clang30182.html>

²⁴ <http://www.greenbeltmovement.org>

²⁵ <http://www.globalcitizen.org/en/media/>

²⁶ [http://ir-library.ku.ac.ke/bitstream/123456789/12914/1/Environmental%20and%](http://ir-library.ku.ac.ke/bitstream/123456789/12914/1/Environmental%20and%20)

²⁷ <http://www.erepository.uonbi.ac.ke>

7.0 The Basel Ban and plastic waste amendments

China National Sword policy has crushed the US recycling policy with tons of waste remaining unrecycled. This has sparked US industries to negotiate trade deals with Kenya in order for them to import their waste in Kenya for recycling which is against the strict Kenyan laws on the ban of single –use plastic bags of 2017.

In addition, developing countries in Africa like Kenya in particular are facing the threats of becoming a ‘dumping site’ for global waste as on-going US trade negotiation deals are aimed at making Kenya a regional hub for supplying US made chemicals and plastics to other markets in Africa.

The China National Sword Policy has also altered in Kenya the flow of plastic waste initially exported to China for recycling when the regulations were a bit favorable thereby causing a decrease in the market of the waste sold²⁸. This however, has presented an opportunity for the Kenyan recyclers to invest more on the plastic waste management in a bid to promote circular economy with the government tasked to create an enabling environment through improvement on an already overwhelmed infrastructure.

Besides, the data we reviewed for Mombasa Port showed that PET is the dominant plastic product import to Kenya and we found no evidence of plastic imports contravening the Basel plastic waste amendments.

8.0 Toxic plastic recycling

During our baseline survey we found out that the workers involved in recycling of plastic waste didn’t have the requisite personal protective equipment and hence were exposed to dangers such as cuts, injuries and respiratory infection that threatened their personal health. This is evident even from the photos we took.

²⁸ <https://africa.cgtn.com/2018/09/21/east-africa-plastic-manufacturing-plants-step-up-recycling-efforts/>

Furthermore, there was evidence of artisanal recyclers burning plastics to extract embedded metals in poor ventilated stores. This exposes the recyclers to dangerous fumes such as dioxins and furans classified as POPs, highly toxic chemicals.

As plastic waste recycling happens at artisanal level, Kenya lacks industrial infrastructure to guarantee safety in handling and recycling of plastic waste. Most of the artisans we visited handled waste with bare hands and operated from back-street stalls that are poorly ventilated.

Thus, toxic plastic waste recycling in Kenya is highly informal and a serious health risk to those involved. Plastic products made from recycled plastics are likely to carry on and transfer the contaminants contained in them like POPs, to the users and consumers of the products.

9.0 Plastic waste and COVID- 19

Protective and disinfecting waste such as masks and other personal protective equipment comprise less than one percent of waste collected in Kenya in 2020. Unfortunately, the widespread use of these products due to covid-19 is posing a major threat in their disposal.

For example in Mombasa, COVID-19 has resulted to increase of waste both from the protective and preventive measures like face masks, gloves and empty containers of sanitizers mostly plastics. These waste were left around homes which end up in the environment or open-burned, in turn becoming more risk to the populations.

Formal retail businesses have to make private arrangements to have their covid-19 related waste incinerated. The National Environment Management Authority (NEMA) has also developed guidelines on how protective waste should be handled by small and informal retails.

Initially, the traders were asked to store the waste for 72 hours before bringing it to the local market where it was collected for incineration. However, to prevent contamination, all protective and disinfecting waste should be separated from general consumer waste (food waste, plastic items, paper and cardboard) by using separate bins and liners. After that, it should be incinerated.

10.0 Recommendations on reducing and eliminating sources of plastic waste and pollution in Kenya

1. The government of Kenya in pursuant to the recent Basel Ban Convention amendment should enforce existing measures to restrict any plastic waste imports into Kenya that contravenes the guidelines of the amendments.
2. The government should collaborate with the recycling industries and civil society groups to ensure a holistic approach is adopted that will address the challenges brought by plastic production, consumption, waste management and recycling as a single system rather than relying on existing fragmented stakeholder efforts.
3. The government should prioritize investments in infrastructure that will be necessary for private investors and other interested stakeholders to find out environmentally sound and economically viable means to invest in recycling plastic waste.
4. The National government should enforce occupational health and safety protocols in solid waste management industry.
5. The environmental stakeholders and research institutions should come up with innovative and sustainable models that contribute to environmentally sound management of plastic waste.
6. The county government should invest in capacity building programs for private waste pickers, garbage collectors and recycling factories that will comply with relevant international conventions and agreements.

Project Outcome

11.0 Project activity conducted

We conducted a baseline survey where within one week of field visits to dumpsites, administering questionnaires to waste collectors and visiting recycling plants in addition to desktop researches and key informant interviews- we collected valuable information that can help paint a picture of existing gaps in plastic waste management in Mombasa and extrapolated to reflect a national perspective. In addition, we organized a one day sensitization forum on 10th October 2020 at Tudor ground next to county government rental house with the artisanal recyclers who comprised of ten

men and two women. We trained them on some of the Best Available Technologies (BAT) and Best Environmental Practices (BEP) that complies with environmentally sound management of hazardous waste.

12.0 Communication with National or Local Authorities

We shared the project findings with the Mombasa County government Department of Environment regarding updating their solid waste management policy to accommodate private waste pickers and artisanal recyclers. Lack of partnership between the county government and private waste handling entities is part of the primary challenges of waste management in Mombasa.

We also engaged the National Environment Management Authority (NEMA) officials through the Mombasa County Director of Environment, Mr Lopokoityit, on the findings we made concerning non-compliance of the safety and healthy protocols in waste recycling. We noted that NEMA should facilitate private waste recyclers to register an association and obtain necessary licenses to ensure easier compliance alongside plastic waste recycling value chain.

13.0 Changes from the original plan- Challenges

Owing to limitations of COVID-19 guidelines, about 12 key resourceful people were reached as opposed to the initial number target of 45 people which proved difficult in gathering a large group. However, information about plastic waste trade and its effects to the environment and human health was collected and shared among those who were reached. These people were representatives of their recycling companies and some represented their waste collection premises who shared the knowledge they had learnt in the awareness meeting to their colleagues.

Consequently, our efforts to access the Kenya Ports Authority (KPA) premises proved difficult due to strict COVID-19 guidelines that were placed by the authorities who regulated entry of people during the time of our survey. However, we managed to contact some key resourceful persons at KPA who shared insightful information with us that helped in compiling the report in regard to the volumes of plastic imports that got into the country. In addition we used the UN

ComTrade Data that helped us achieve our objectives of monitoring amount of plastic imports into Kenya.

14.0 Resources on plastic waste and pollution

Key References used for this study include the following:

- 1) <https://www.weforum.org/whitepapers/harnessing-the-fourth-industrial-revolution-for-the-circular-economy-consumer-electronics-and-plastics-packaging>
- 2) <https://advances.sciencemag.org/content/3/7/e1700782>
- 3) <https://www.sciencedirect.com/science/article/pii/S0165237016306015?via%3Dihub>
- 4) <https://www.weforum.org/agenda/2018/03/8-steps-to-solve-the-oceans-plastic-problem/>
- 5) <https://www.statista.com/statistics/270312/consumption-of-plastic-materials-per-capita-since-1980/>
- 6) <https://www.pagder.org/images/files/euromapreview.pdf>
- 7) https://eng.mst.dk/media/189822/kenya-plastic-packaging-report_final.pdf
- 8) <https://www.ipsos.com/en/throwaway-world-challenge-plastic-packaging-and-waste>
- 9) <https://global-recycling.info/archives/2309>
- 10) <https://enveurope.springeropen.com/articles/10.1186/s12302-019-0254-5#Tab2>
- 11) <https://advances.sciencemag.org/content/3/7/e1700782>
- 12) <https://science.sciencemag.org/content/347/6223/76>
- 13) <https://journals.sagepub.com/doi/10.1177/0734242X07088433>
- 14) <https://openjicareport.jica.go.jp/pdf/12005443.pdf>
- 15) https://beyondtheframe.shorthandstories.com/toxic_flow_two/index.html
- 16) <https://www.nationalgeographic.com/environment/habitats/plastic-pollution/>
- 17) <http://www.theguardian.com>
- 18) <http://www.globalcitizen.org/en/media/>
- 19) [European Topic Centre Waste and Materials in a Green Economy report \(2019\), \(http://europa.eu\).](http://www.europecentre.europa.eu)
- 20) <http://www.greenbeltmovement.org>
- 21) <https://www.nationalgeographic.com/environment/habitats/plastic-pollution/>

- 22) <http://www.lrrd.org/lrrd30/11/clang30182.html>
- 23) <http://www.greenbeltmovement.org>
- 24) <http://www.globalcitizen.org/en/media/>
- 25) [http://ir-library.ku.ac.ke/bitstream/123456789/12914/1/Environmental%20and%](http://ir-library.ku.ac.ke/bitstream/123456789/12914/1/Environmental%20and%20)
- 26) <http://www.erepository.uonbi.ac.ke>
- 27) <https://ipen.org/documents/basel-ban-amendment-guide>
- 28) <http://www.basel.int/Default.aspx?tabid=8120>
- 29) <https://recycling.tomra.com/blog/chinese-national-sword-inspire-global-recycl>
- 30) <https://www.chicagotribune.com/business/ct-biz-single-stream-recycling-china-20190122-story.html>
- 31) <https://africa.cgtn.com/2018/09/21/east-africa-plastic-manufacturing-plants-step-up-recycling-efforts/>
- 32) Foldi L, Halasz L (2009) Környezetbiztonság. Complex KiadóKft, Budapest, Hungary.
- 33) <https://africa.cgtn.com/2019/03/08/kenya-finding-it-hard-to-succeed-with-plastic-recycling-efforts/>
- 34) <https://www.linkedin.com/pulse/plastic-waste-everywhere-what-pollution-kenya-reveals-joshua-kolondo/>
- 35) <https://www.mombasa.go.ke/wp-content/uploads/2019/11/Mombasa-County-Solid-Waste-Management-Policy.pdf>
- 36) ¹<https://www.pagder.org/images/files/euromappreview.pdf>
- 37) ¹https://eng.mst.dk/media/189822/kenya-plastic-packaging-report_final.pdf
- 38) ¹<https://www.ipsos.com/en/throwaway-world-challenge-plastic-packaging-and-waste>
- 39) ¹<https://global-recycling.info/archives/2309>

15.0 Communication efforts

We managed to write and publish a newspaper commentary with the leading local media house where we created POPs and plastic pollution awareness in Mombasa and Kenya at large. Below is a link to the newspaper publication.

<https://www.mtkenyatimes.co.ke/imported-plastic-waste-choking-an-already-poor-waste-management-system-in-kenya/>

16.0 Outreach to government authorities and industry

During our baseline survey, it emerged that the artisanal recyclers and waste pickers represent an important link in solving the waste management menace currently experienced in Mombasa city but most of them due to lack of necessary support are just involved in sorting waste. And a nuanced coordination to recognize and support their noble work can go a long way in reducing the amount of waste left uncollected in the city. For this reason, Eco-Ethics initiated talks with the artisanal recyclers and waste pickers to form a formal group, get registered and thereafter workout a partnership initiative with them to engage the county government on how to effectively manage plastic waste in Mombasa County. This initiative which is in progress, though still at the level of registration and paper work, will also go a long way to enhance compliance in solid waste management in Mombasa County.

Annexes

Some photos taken by Eco-Ethics during the field survey



