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The issue of plastic pollution in the city of Luanda

Olivia Daniela dos Santos Andre

Masters in Environmental Studies and Sustainability

Supervisor: PhD, Cátia Sofia Duarte Lobo de Sousa,

Assistant Professor, ISCTE-IUL

November 2022



CIÊNCIAS SOCIAIS  
E HUMANAS

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*I dedicate this dissertation to my parents, Antonio Manuel Andre and Maria Ivone Rodrigues Dos Santos. Mom, you have always encouraged me and you have never measured your efforts when it came to supporting me and I will forever be grateful for you*



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## Resumo

O principal objetivo desta dissertação é avaliar a gestão de resíduos em Angola, mais especificamente analisar o estado atual da poluição plástica na cidade de Luanda. Descreve os principais desafios associados à gestão de resíduos em Luanda e apresenta um plano de melhoria de Resíduos Sólidos Municipais. Analisa as características socioeconômicas de Ruanda e Quênia, pois possuem origens semelhantes às de Angola e são exemplos de países que implementaram com sucesso a proibição de sacos de plástico. Além disso, analisa o processo de implementação da proibição para ambos os países e analisa os desafios que enfrentaram. Avalia as melhores práticas implementadas no Ruanda e no Quênia que podem ser aplicadas em Angola. A metodologia escolhida para esta pesquisa é uma abordagem exploratória, pois permite uma investigação mais precisa. A combinação de métodos qualitativos e quantitativos foi escolhida para alcançar a completude. A metodologia adoptada para esta investigação baseou-se em informação recolhida a partir de pesquisas bibliográficas, inquéritos preenchidos por médicos e pela população de Luanda, entrevistas a entidades que têm actuado nos setores público e privado em áreas relacionadas com a gestão de resíduos e ambientalismo em Angola. A análise estatística foi realizada no programa SPSS (Statistical Package for the Social Sciences) versão 28 para Windows. Os resultados identificam as questões subjacentes aos atuais sistemas em Luanda e propõem uma proposta de melhoria dos Resíduos Sólidos Municipais.

**Palavra Chaves:** Resíduos Sólidos Urbanos, poluição plástica, gestão de RSU, proibição de sacos de plástico



## **Abstract**

The main aim of this dissertation is to assess waste management in Angola, more specifically to analyze the current status of plastic pollution in the city of Luanda. It outlines the main challenges associated with waste management in Luanda and provides a Municipal Solid Waste improvement plan. It analyzes the socioeconomic characteristics of Rwanda and Kenya as they have similar backgrounds to Angola and are examples of countries that have successfully implemented a ban on plastic bags. Furthermore it analyzes the process of implementation of the ban for both countries and analyzes the challenges they faced. It assesses the best practices that were implemented in Rwanda and Kenya that could be applied to Angola. The methodology chosen for this research is an exploratory approach, as this approach allows for a more precise investigation. The combination of qualitative and quantitative methods was chosen in order to achieve completeness.

The methodology adopted for this research was based on information collected from bibliographic research, surveys that were filled out by doctors and by the population of Luanda, interviews with the entities that have worked in the public and private sectors in areas related to waste management and environmentalism in Angola. The statistical analysis was performed using SPSS (Statistical Package for the Social Sciences) version 28 for Windows. The results identify the underlying issues in the current systems in Luanda and propose a Municipal Solid Waste improvement proposal.

**Key Words:** Municipal Solid Waste, plastic pollution, MSW management, plastic bag ban



## **Abbreviations List**

ADRA- Association for Rural Development and the Environment

ANR- National Waste Agency

BRD- National Development Bank

CAFIL- Friends Club from Luanda's Island Forest Clube dos Amigos da Floresta da Ilha de Luanda

COVID-19 - CoronaVirus Disease

EU- European Union

GDP- Growth Domestic Product

GHG- Green House Gasses

GPL- Provincial Government of Luanda

HDI- Human Development Index

KAM- Kenya Manufacturers Association

LBA- Basic Environmental Law

MINUA- Ministry of the Environment

MCTA- Ministry of Culture, Environment and Tourism

MDG- Millennium Development Goals

MEP- Ministry of Economy and Planning

MSW- Municipal Solid Waste

NEMA- National Environmental Management Agency

NGO- Non Governmental Organization

PBB- Plastic Bag Ban

PESGRU- Strategic Plan for the Management of Urban Waste

SADC - Southern Africa Development Community

SDG - Sustainable Development Goals

SME- Migration and Foreigners Services

SNS- National Health System

SUP- Single Use Plastic

SUPB- Single Use Plastic Bags

REMA- Rwanda Environmental Management Authority

RSCAP- Regional Seas Conventions and Action Plans

UNCLOS- United Nations Convention on the Laws Of the Sea

UN- United Nations

UNEP- United Nations Environment Programme USD - United States Dollars

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## CHAPTER 1

### **Introduction**

It is quite evident that the world is experiencing a tremendous environmental crisis. Even though there has been progress and innovation in various sectors, setbacks such as pollution have been prominent. Many factors are contributing to the rise of environmental pollution, and plastic happens to be one of them. Plastic certainly has a prevalent effect on the environment (Ryan et al. 2020). There is no doubt that several industries are dependent on the use of plastic to do business, however they are not paying attention to the consequences of their actions. The fossil fuels used in the manufacturing of plastics have caused adverse effects on the environment, hence both plastic and the manufacturing process of plastic harm the environment.

Despite the growing awareness of the negative effects that plastic waste has on the environment, it is still produced and consumed in large quantities worldwide. Large-scale plastic production began in 1950 and by 2017 its annual production had risen to 335 million tons, with a projection of a 4% increase in production for the following years (Geyer et al., 2017 & Boucher and Billard, 2019). In many ways, synthetic plastic was revolutionary as it was incorporated into the everyday life of various societies and has a strong presence in the global economy. The advantages of plastic include utility in various sectors as plastic objects tend to be resistant, low cost and of diverse use, however its durability has its downsides. Plastic is not biodegradable and can remain in the environment for a long time. Typical plastic bags take 10 to 20 years to decompose, while plastic bottles take up to 450 years to decompose (US National Park Service, 2004). Approximately 80% of global plastic waste is released into the environment or piled up in landfills, while a large part ends up in the oceans (Boucher and Billard, 2019 and GCRF, 2019). The physical and chemical characteristics of plastic bags can create disproportionate environmental challenges. Most of the monomers used in plastic production like ethylene and propylene, are derived from fossil hydrocarbons, which aid in the demand for fossil fuels and has negative implications for climate change (Clapp and Swanston, 2009).

The rise of globalization allowed organizations to carry out their business transactions beyond borders, which gave rise to the supply and demand of goods and services in the market. This pushed the industries to produce more plastic, therefore it can be stated that globalization is certainly one of the key reasons behind the significant production and use of plastic in industries all around the world. At this rate it is quite evident that if a certain measure is not taken by governing authorities,

then the world will soon witness a significant rise in environmental pollution in the years to come (Wang et al. 2020 and Menicagli et al. 2021).

Developed countries consume more plastic, however, waste management systems and regulations in place help reduce the amount of plastic that is released into the environment while developing countries consume less plastic in comparison, however, the lack of adequate infrastructure, waste management systems, and rising consumption patterns put developing countries in a vulnerable situation (GCRF, 2019).

It is important to analyze the impact of plastic waste on the environment. The research carried out by Royer et al. (2018) analyzed the gasses that are emerging due to the production and use of plastics in the environment. As per the study, the mass production of plastic started around seventy years ago and it is expected that the production rate of plastic in the world will soon be doubled in the years to come. The regression analysis of the study revealed that the most commonly used plastic in the world releases greenhouse gasses, ethylene, and methane. The intensity of the emergence of such gasses is quite greater especially when the plastic is subjected to ambient solar radiation. The results revealed that the rising use of plastic all over the world is causing the emergence of certain gasses that are harmful to the environment in the long run. The study further assumed that the production and use of plastic will be doubled if the world does not come up with alternatives to plastic. Hence, the study suggested that there is a dire need of coming up with certain alternatives to reduce the use of plastic for safer environmental conditions.

It is quite common for some countries to use incineration as a form of waste disposal. The study of (Ágnes & Rajmund 2021) attempted to analyze the impact of plastic waste incineration on the environment. The study was intended to draw the attention of the people to the environmental effects of plastics. According to the study's findings, the lack of global support for product recycling is the primary cause of growing levels of plastic pollution. Research shows that just a small amount of total garbage gets recycled, a large portion is destroyed, and the vast bulk of the waste that has accumulated pollutes our natural environment. More than a billion tons of plastic have been created throughout the globe in the previous year, which is more than one ton for every person on Earth. To show that plastic consumption is more than the world's whole population, it aggressively displays this fact. This is indeed an alarming situation. The study suggested that the world needs to reduce the volume of all those activities that are playing a part in the environmental damage in all aspects of life and governments should prioritize better living conditions.

Cities and developing countries like Luanda and Angola overall, are often severely affected by plastic pollution. There are currently no adequate policies, effective recycling, or waste collection programs at the national level. As a rule, solid waste is incinerated or taken to a landfill. Plastic occupies the third place in the composition of solid waste in Luanda (15%), preceded by organic material (25%) and sand and earth (21%) (Alves, P. 2014). The accumulation of plastic waste harms the environment and their disposal in landscapes and seas interfere with ecosystems and the services they provide in Angola (Tavares, E 2020). The negative externalities associated with plastic pollution in Angola include the expenses necessary for the extraction of residues on land and at sea, the negative impact on marine life and expenses related to public health; it has a negative aesthetic impact on the overall city landscape (Flores, M. 2008). More than 8 million people live in the city of Luanda and, as the population grows exponentially, the level of pollution increases (Tavares, E 2020). The lack of responsiveness at a multi-sectoral level represents serious threats to the environment, and for this reason, it is essential to research viable solutions for the management of plastic waste in the capital of Angola.

To sum up, the use of plastic is on an increasing trend due to many reasons, and there is a dire need to come up with certain measures and alternatives to plastics as soon as possible, otherwise, it will have extremely adverse effects on the environment in the coming years

## **1.1 Objectives**

Plastic waste has been a major focus for academics and scholars in recent years, but despite their efforts, the global government has not taken the necessary steps to deal with the growing environmental pollution produced by plastics. Literature on the subject, however, does not include much evidence of studies focusing specifically on the effect of plastic garbage in Luanda and Angola cities. This research aims to fill a gap in the existing literature by characterizing the current situation regarding plastic pollution and waste collection, analyzing the reasons for the pollution and the challenges the stakeholders face in regard to Municipal Solid Waste management (MSW).

For this research the adopted methodologies are a combination of qualitative and quantitative research as it allows for the collection of primary data via semi-structured interviews, surveys and secondary sources in the form of articles, journals, books and many others cited along. This study

takes an exploratory and comparative approach since it uses Kenya and Rwanda as examples for possible solutions of plastic policy that could potentially be implemented in Angola.

The main objective of this research is to analyze the impact of plastic waste in the city of Luanda and Angola as a whole, to evaluate the measures that have been taken over the years, and to look for solutions to the current problems caused by the poor waste management of plastic and to explore possible solutions to the problems at hand. In several African countries, lawmakers have enacted legislation to protect the environment from contamination due to increased plastic pollution. For this reason, this research aims to evaluate the solutions that have been implemented in African developing countries. For realistic analysis and solutions, the author chose to explore the sustainable development of Rwanda and Kenya, two African countries that have successfully implemented a plastic bag ban and are in the final stages of implementing a single-use plastic ban. Despite the many adversities they faced, these two countries share similarities with Angola in terms of colonization, political conflicts, and economic constraints, but they managed to successfully implement bans that changed the landscape of the countries and reduced a good part of the problems caused by plastic, making them pioneers in this field. The author opted for these two countries instead of *developed* countries due to the large disparities between developed and developing countries.

Studies and research concerning recycling and the implementation of environmental legislation in developing countries are exceptionally unexplored and limited. Low-income countries find themselves in a unique reality, as they have witnessed rapid economic growth, which ends up putting negative pressure on the environment. This research aims to explore the impact of plastic in the city of Luanda, explore policies and legislation implemented in other African countries, assess their effectiveness, and explore solutions that can be implemented in Luanda and at a national level.

## CHAPTER 2

# Literature Review

## 2. Socioeconomic Aspects of Angola

Angola is a country located on the west coast of Africa, whose main territory is bordered on the north by the Republic of Congo, on the northeast by the Democratic Republic of Congo, on the east by Zambia, on the south by Namibia, and on the west by the Atlantic Ocean (Knoema, 2021). Its geographical area is 1,246,700km<sup>2</sup> and according to the most updated statistical data, the population of Angola is 32,866,000 inhabitants (ibid). The city of Luanda is the capital and commercial center of Angola, as well as being a major port city located on the north coast.



Figure 2.1- The map of Angola from Encyclopaedia Britannica (2012).

Angola's total population has been growing on average at a rate of almost 3% per year; this is lower than the rate at which GDP has been growing, on average 10.5% from 2003 to 2012. The low population growth rate, in addition to having contributed to the increase in GDP per capita from USD 808 (2003) to USD 5318 (2011), contributed to the increase in the Human Development Index (HDI)

with an average annual growth of 2.6% (from 0.37 in 2000 to 0.50 in 2012) (Paulo, F. 2013). According to the UN, the most recent GDP per capita figure is USD 2791 and the most updated HDI figure is 0.58 (WPP-UN 2021). Life expectancy at birth increased by 14.94 years between 2000 and 2021, in the year 2000 it was 46.61 years and in 2021 it is 61.55 years (ibid). The average year of schooling has not increased so much, as in 2000 it was 4.4 and in 2012 it was still 4.7.

In the 1970s, some goods such as diamonds, coffee, sisal, and oil exports contributed to the rapid growth of the Angolan economy. Other industries developed, but growth was unbalanced as the concentration of profits was among the colonial class while most of the population was in forced labor or depended on agricultural sales. After becoming independent from Portugal in 1975, the economy was further damaged by the civil war. Workers who held specific positions returned to Portugal and with the lack of access to educational systems, there were few qualified people to replace them in the workforce (Britannica, 2021). The loss of capital and skills had an immediate negative impact on economic development. The consequences of the civil war include the displacement of a large part of the population, the destruction of facilities, the shutdown of transport systems, and the destabilization of most of the economic infrastructure which led to the complete immobilization of most economic activities (agriculture and industry), except for oil and diamond production, which contributed to the financing of the war (Paulo, F. 2013). Food production reached such low levels that food was imported or supplied by foreign aid and humanitarian sources, as near-famine conditions prevailed in much of the country from the mid-1980s until the end of the civil war in 2002 (Britannica, 2021). After the declaration of peace, Angola increased the production of oil and diamonds and started to invest in agriculture and industry, and other sectors of the economy. (Paulo, F. 2013). With the end of the war, Angola increased the production of oil and diamonds and started to invest in agriculture, industry, and other sectors of the economy. According to the analysis by Paulo, F. (2013), one year after the end of the war, Angola recorded a growth rate of 5.31%, and thereafter the average growth rate was around 17.01 % from 2004 to 2008. One of the greatest rewards of achieving peace was the considerable growth at an economic level, mainly due to the increase in oil production that was stimulated by the increase in the demand and price of oil in the international market (ibid).

Currently, oil corresponds to 47% of Angola's total GDP and about 90% of Angola's exports, with the main trading partners being the USA, China, India, France, Canada, Taiwan, and South Africa (Conservation International, 2021). The exports decreased drastically in 2020 by 42.2%, mostly as a consequence of the decline of oil prices, export volumes, and the overall response to covid-19, however, the overall structure did not change in the same proportion, given the fact that although non-oil and non-diamond exports decreased (at 29%) their share only changed by 1.6% (European Commission, 2021).

Despite several attempts to diversify, the Angolan economy is highly dependent on the oil sector and as a result, the local currency Kwanza, is extremely vulnerable to oil price shocks and the country is in external debt (Conservation international, 2021 and European Commission, 2021). Angola continues to export coffee, sisal, cotton, and fish and is the fourth largest diamond producer in the world, despite diamonds only accounting for 1% of the GDP (Conservation International, 2021). The wholesale and retail market, one of the largest plastic producers in the country, accounts for about 21% of the GDP while the other sectors such as agriculture, fisheries, manufacturing, and construction account for an estimate of 16-18% of the GDP (ibid).

## **2.1 Plastic pollution in Angola**

Plastic waste and its effects have only started gaining notoriety recently in Angola and in Africa overall, therefore the data is fairly recent and there are regions where data is lacking. Jambeck et al. (2018) note that despite the lack of data, predictions regarding the amount of waste in unmonitored regions can be made using combining specific indicators such as population, biogeographical factors, socio-economic factors, and accessibility to the location.

In Africa, the high visibility of plastic waste and single-use plastic bags, in particular, have raised deep concerns about their effect on the environment that prompted national and regional policy intervention. According to Bezerra J.C et al. (2021), all 16 members of the Southern African Development Community (SADC), Angola included, have announced policies directed at reducing the use of single-use plastic bags, all varying in terms of implementation. In Angola, the plastic ban policy was announced in 2015, choosing a top-down approach, on a national level through a decree, which currently still seems to be under review and has not yet been implemented (Bezerra, J.C et al., 2021). There aren't many sources with exact numbers regarding the pollution in Angola as a whole, but there are some studies available that provide an estimated value of the Municipal Solid Waste (MSW) generated. Typically, most populous cities produce more waste, as is the case of the capital of Angola, Luanda.

Luanda, as the country's largest city and capital, also makes it the center of employment opportunities and may represent a chance for a better quality of life for populations living in other areas. This factor drives the great demographic movement, which is why there has been a rapid level of population growth (Alves, P. 2014). The increase in urbanization, population growth, and consumption is a reason for concern when there is inadequate infrastructure to help manage the increase in plastic waste. This issue creates both environmental concern and a challenge in terms of socio-economic development, which in turn affects other areas such as tourism, biodiversity, and overall infrastructure (Jambeck et al, 2018).

Local studies carried out by local authorities in 2019 revealed that around 210 commercial establishments are responsible for the distribution of 12 million plastic bags a day in Angola ( Agencia Lusa, 2019).

## MSW Composition in Luanda

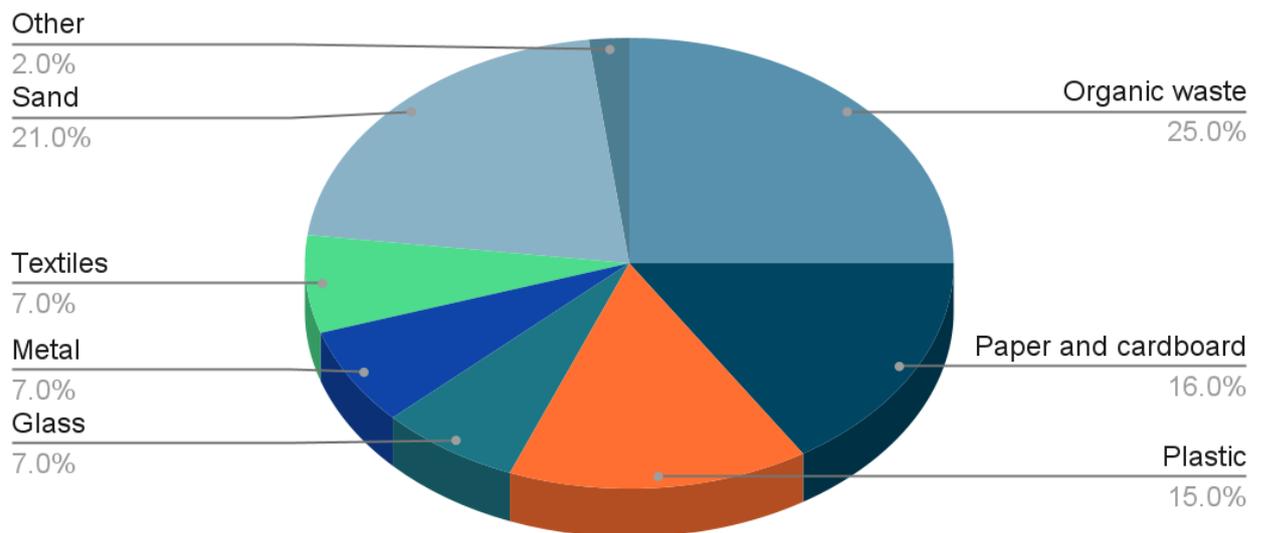


Figure 2.2- MSW Composition in Luanda (MEP for Angop, 2021)

The expected trend is for the production of MSW to increase with population growth, which makes waste management more difficult. According to a study carried out by the Ministry of Economy and Planning (MEP), the composition of MSW in Luanda is 25% organic waste, 21% sand and earth, 16% paper and card, 15% plastic, 7% textiles, metals 7%, 7% glass, another 2% (Angop, 2021). Luanda produces an average of 2.5 million tons of garbage per year, 375,000 tons of which is plastic.



Figure 2.3 Calemba 2, Viana (2022).

### **2.1.1 The current situation in Luanda**

Currently, there are two waste separation methods in Luanda, the formal market carried out by companies that provide services to the state, which collect waste and take it directly to the landfill, and the informal market, carried out by garbage collectors who collect by the 'invasion method', in which the collectors invade the landfill or garbage focal points around the city to search for recyclable items (Angop, 2021 and Pascoal, 2019).

Angola's first landfill, namely Mulenvos, was built and officially inaugurated in Luanda in 2007 and before its existence; waste was deposited in dumps around the city (Almeida, A. 2017). Initially, the projected capacity for the landfill was 2500 tons per day and in 2015 it was found that the daily waste intake was 7200 tons (Barros, H. 2018a). Several factors result in the accumulation of waste in Luanda. According to the Ministry of Urbanism and Environment (MINUA, 2006), these factors include Street markets- In Luanda and other provinces there are several formal and informal markets, poorly organized, resulting in the accumulation of huge amounts of waste; Lack of urban drainage - The lack of proper drainage systems, especially during rainy seasons cause floods and obstruct roads and pathways, which make the collection process difficult; Environmental awareness- Due to lack of knowledge, there is a percentage of the population that creates small dumps, which makes the collection process difficult.

Despite this data being from 2006, these issues are still part of Luanda's reality. Industrialization and capitalism encourage consumption habits that generate large amounts of solid waste. Large concentrations of MSW are found in informal markets, wholesale areas, and retail distribution warehouses (Alves, P. 2014). The street sales along the main avenues and blocks, the preparation of ready-to-eat meals and products, among others, are quickly consumed and disposed of on the spot. The lack of a collection system in these areas results in the accumulation of waste (ibid). Other MSW disposal zones include railway lines, watercourses, and drainage ditches. There are limited access areas in *musseques* (less favored locations) and neighborhoods due to a lack of paved roads, mountainous areas, and degraded pathways. These factors make it difficult for collection vehicles to enter, which increases garbage focal points (Alves, P. 2014). Commercial activity tends to increase, especially in urbanized areas, which pose an enormous challenge for the population and governing bodies. Angola, being a developing country, is currently in a period of economic crisis, faces challenges in basic sanitation, health sectors and other difficulties that consequently create expenses for the state, which in turn end up allocating financial resources in solving these challenges rather than investing in environmental policies and practices that could aid in relieving the problems caused by MSW (Pascal, L. 2019).

In November 2020, the Government of Luanda suspended the services of 6 companies that provided cleaning and MSW collection services, due to an overwhelming debt with them that amounted to 246 billion Kwanzas (approximately 208 million Euros) (Agência Lusa MS, 2021). As a result, there was an increase in the garbage on the main roads, on public transport stops such as buses and local *candongueiros* (shared taxis), pedestrian crossings, and inside neighborhoods (ibid). After the deliberate removal of garbage containers by the collection companies, the governing bodies authorized a 27.96 billion kwanza credit (35.5 million euros) to settle debts with the

companies and approved an expenditure of 34.89 billion kwanzas (44 million euros) for obtaining waste collection and public cleansing services (Lusa MS, 2021).

Following the termination of contracts with companies, the Provincial Government of Luanda announced the resumption of waste collection by 7 companies to ensure the city's cleanliness (Lusa, 2021). Despite having resumed garbage collection, the capital still faces several constraints related to MSW.

The termination of contracts with collection companies raised several questions and concerns. The accumulation of waste and the lack of basic sanitation pose a serious risk to human health and the environment. In June 2021, there were several cases of malaria, typhoid fever, and diarrhea that have put pressure on the hospital sector, due to the lack of conditions and technical capacity to accommodate patients (Ndomba, B. 2021). It can be speculated that the epidemic outbreak of the aforementioned diseases is directly linked to the interruption of waste collection that lasted 4 months.

Following the termination of contracts with companies, the Provincial Government of Luanda announced that waste collection would be resumed by 7 companies to ensure the city's cleanliness (Lusa, 2021). Despite having resumed garbage collection, the capital still faces several constraints related to MSW.

### **2.1.2 Plastic Pollution and Health in Angola**

It is important to understand the overall issues that can be caused by plastic. This subchapter intends to illustrate the difficulties faced in the health sector and how plastic pollution can exacerbate the issues present in the health sector. Macroplastic pollution has a role in the propagation of infectious diseases that affect human health. These diseases include dengue, yellow fever, malaria and others (Marquat, P.O et al 2022). These diseases affect the overall health in Angola. Alves, F.S (2021) affirms that malaria remains a health threat in Angola that causes several deaths. The lack of attention the disease gets is said to be due to socioeconomic factors (ibid).

A study carried out in 2016 by Vicente, M et al estimated that only about 30 to 40% of the Angolan population has access to health services. The provision of health care is carried out by two sectors: the public and private sectors. The Public Sector includes the National Health System (SNS), the Health Services of the Angolan Armed Forces and the Health Services of the Ministry of the Interior. This sector is the main provider of health services at a national level and it shares the same difficulties with other service providers, in ensuring health care without the desired quality and outcomes.

The private sector is mostly located in urban areas and their prices make them less accessible to the population, especially considering the fact that there are no actual regulations in regards to prices (Queza, 2020).

It was concluded that although private medical institutions are far more efficient than public medical institutions and despite it being better, the overall quality of health services offered in Angola is in need of improvement (Vincent et al, 2016).

Given the state of both sectors, it is quite common for people of middle and high income to seek medical help abroad. In 2016, doctor Osvaldo Lourenço (cardiologist) reported the following: “We need to recognize that Angolan medicine needs to advance a lot. There is still a huge limitation in the availability of specialists and means of diagnosis and treatment. Many highly complex cases cannot be resolved in Angola, or the centers that can are not enough to meet the demand. In these cases, the need to seek medical help abroad is indisputable” (Lourenço, O, 2016).



Figure 2.4- Lateral side of Luanda's General Hospital in Camama, August 2022.

The first five months of 2021, approximately 3.8 million cases of malaria were reported in Angola by the ministry of health. It is the leading cause of death in the country, and tends to be more fatal among pregnant women and infants under the age of 5 (Lusa, 2021B). Despite there being an increase of malaria and other vector diseases within the last 3 years, the lethal cases have had a slight decrease, falling to 0.1% (ibid).

There have been several reports, especially in 2021 of patients not being able to seek for medical help at their local medical centers and municipal hospitals and end up seeking help in larger institutions, further away from their municipalities (Ndomba, 2021 ). These same reports indicate that there are large queues in front of the larger hospitals, mostly composed by more vulnerable families. This influx of people creates an overcapacity of the infrastructures present in the hospitals, and nurses have stated that on several occasions the hospitals lack the technical capacity to differentiate malaria from covid-19 (ibid).

It can be seen that the malaria cases increased around the time the waste companies suspended their contracts, however it can be argued that it has to do with the rainy season that occurs in the warmer months, between October and April.

## **2.2 Environmental Laws and Policies in Angola**

Despite the growing global concern for the environment in the 1970s, especially after the Stockholm Declaration in 1972, the Angolan constitution in 1975 did not include any norm relating to environmental protection. After Angola's independence, the constituent legislator only highlighted the economic and utilitarian value of natural goods, in which the government has to manage natural resources responsibly but effectively, to generate wealth to meet the needs of the population (Amado Gomes, C. 2013). The updating of the Constitutional Law marked 1992. According to Amado Gomes, C (2013), the Angolan government demonstrated a new position regarding the environment in article 24, which states the following:

- "1. All citizens have the right to live in a healthy and unpolluted environment.
2. The State adopts the necessary measures to protect the environment and species of flora and fauna throughout the national territory and to maintain the ecological balance.
3. The Law punishes acts that directly or indirectly harm or endanger the preservation of the environment" (Constitutional Law of 1992 and Amado Gomes, C, 2013).

In 1998, the Basic Environmental Law (LBA) was approved and started to define the right to the environment. Its implementation boosted a series of laws and decrees such as the Environmental Impact Assessment Regime, the Aquatic Biological Resource Law, and the Environmental Protection

Regime in the context of petroleum activities, among others. The LBA establishes the State's duty to protect the environment and to uphold a National Environmental Management Plan (Chapter 1, Article 3).

The influence of the LBA was notorious in the revision of the Constitutional Law in 2010, which enshrined the State's duty to protect the environment and use natural resources, mentioning sustainable development and future generations in the second point of Article 39:

“The State adopts necessary measures to protect the environment and species of flora and fauna throughout the national territory, to maintain the ecological balance, the correct location of economic activities, and the rational exploitation and use of all-natural resources, in the framework of sustainable development and respect for the rights of future generations and the preservation of different species”.

In August 2012, the Waste Management Regulation was approved (Presidential Decree No. 190/12 of August 24th), after the government realized that environmental pollution is a constant, resulting from activities designed by mankind to promote economic development (Amado Gomes, C 2012). The state recognized the need for a legal framework to implement waste management and by incorporating the LBA, the government felt the need to fulfill the duties mentioned in the legislation about the environment (ibid).

This regulation (Presidential Decree No. 190/12 of August 24th) defines the -"Use or recovery" of waste as any type of procedure that results in recycling, reuse, recovery, regeneration, or any type of action identified in orders from the Ministry of Environment to create secondary materials.

"Adequate disposal" mentions how the disposal of waste should be carried out, in sanitized containers with lids, preferably coated, and in paper or plastic bags to prevent its spread on public roads.

The regulation for the Transfer of Waste for Reuse, Recycling and its Recovery (Presidential Decree No. 265/18 of November 15th) relates to the procedures regarding administrative and operational control that overlooks “the transfer of waste for reuse, recycling and its recovery abroad”. This is only in regard to non-hazardous waste intended to be transferred abroad from recovery, reuse, and recycling.

The influence of the LBA, the Waste Management Regulation, the inadequate management of solid waste, among other growing problems relating to the environment, led to the promulgation of the Presidential Decree No. 196/12 of 30 August which contains the Strategic Plan for the Management of Urban Waste (PESGRU). PESGRU aims to meet the Millennium Development Goals, establish and implement appropriate infrastructure and models for the collection, transportation, treatment, and disposal of urban solid waste in Angola and manage sorting sites (Presidential Decree

No. 196/12 of August 30). This plan aims to significantly contribute to the well-being of the population, following the constitutional rights of Article 39, which consists of enjoying a healthy and unpolluted environment, promoting job creation in the recycling sector in subsidiary activities that, according to PESGRU “goes against the guiding principles of the Green Economy” (ibid).

In 2014 the National Waste Agency (ANR) was created and its purpose is to implement policies related to waste management and comply with environmental protection criteria in the preparation of programs for reduction, recycling, reuse, and waste disposal (Almeida, A. 2017). The PESGRU consists of a plan with targets for 2015, 2020, 2022, and 2025. The targets of the strategic plan included the opening of landfills in all 18 provinces in Angola by 2015, the implementation of 100% selective collection in Luanda by 2022, and a system of integrated waste management at the national level. The incorporation of several changes such as the phased introduction of landfills/sorting centers in the capital of each province of Angola (until 2022), guarantees the closure and use of dumps throughout the country (Presidential Decree No. 196/12 of 30 August).

PESGRU has Western influences, as during the process the authors chose to analyze the progress and experience that Portugal has had in the last 20 years in terms of waste management and at the time they also analyzed the socioeconomic characteristics of Brazil and South Africa for research and inspiration. 7 strategic axes comprise the base process of the management plan: Training and Awareness, Undifferentiated Collection, Treatment, Disposal and Valorization, Selective Collection and Recycling, Specific Flows, Institutional model and organization of the sector, and Financing Model. According to the decree, these axes were drawn up to be realistic and easy to monitor to ensure the effectiveness of waste management (ibid). It was argued that the creation of the ANR can make a positive contribution to PESGRU, helping to implement selective collection in all municipalities of Luanda until 2022, but in the following points it can be seen that its contribution, in collaboration with regulation on the Management of Waste, PESGRU was not as fruitful as projected. In the current year (2022), it can be seen that in the whole country there is only one sanitary landfill, the Mulenvos, which was inaugurated in 2007. Since it does not present the technical and appropriate conditions, it is no longer possible to designate a landfill but instead a " controlled dump" (Leite,O 2021). As it can be seen, the targets mentioned above were not completed and the MSW situation was exacerbated by the suspension of the contracts of the companies that collected them.

There is a lack of communication and collaboration between regulatory bodies and this fact became quite evident when the Provincial Government of Luanda (GPL) did not comply with the law and with the deadlines stipulated by the ANR for the delivery of documents related to waste and environmental protection (Leite, O 2021). The entities responsible for PESGRU recognized its failures

and decided to draw up a public tender that aims to restructure the Mulenvos and reuse almost half of the waste and distribute it to industries, composting, and energy production (ibid).

### **2.2.1 Governance instruments and Multilateral Environmental Agreements**

Angola is part of the 52 countries that are part of the United Nations Convention on the Laws Of the Sea (UNCLOS). This is a legally binding international instrument that seeks to regulate any activity taking place in the ocean and hold states accountable, by requiring them to prevent, control, and reduce pollution within the marine environment (Jambeck et al. 2018).

Angola adopted the UN 2030 Agenda for Sustainable Development Goal and presented its Voluntary National Report for the first time in 2021 (VNR Angola, 2021). While the SDGs do not have a specific goal focused on plastic pollution, it does have goals that indirectly address the issue such as SDGs 3,6,11, and 13 which focus on good health and well-being, clean water and sanitation, and climate action and management (Westerbos, M. 2019). The SDGs 12, 14, and 15 focus on waste reduction, land-based activities regulation, marine pollution, among others (Jambeck et al. 2018 Westerbos, M. 2019). The four African Regional Seas Conventions and Action Plans (RSCAPs), which include the Abidjan Convention, of which Angola is part of act as an instrument in which countries sharing the same coastal lines can cooperate to achieve common goals (Jambeck et al, 2018). The Abidjan Convention has taken measures to assess the risk posed by waste and has evaluated the effectiveness of potential programs and strategies to implement soon, as marine waste has been the main topic of the most recent conventions (ibid).

Although there are governance instruments at a national and international level it can be argued that they are at a superficial level and given the current outcome the effectiveness can be improved. Several countries in Africa have taken measures against plastic pollution by implementing bans on plastic bags among other measures. Rwanda and Kenya will be used as case studies for comparative purposes since both countries are similar to Angola in terms of history and socioeconomic backgrounds.

## **2.3 Environmentalism in Angola**

The angolan society has debated and dealt with issues regarding the environment after the independence and in 1982 the Angolan Environment Association was created. The debates and the publicizing of environmental problems led to the emergence of more organizations in the early 1990s, such as the Association for Rural Development and the Environment (ADRA), the Ecological Youth of Angola (Juventude Ecológica de Angola) , Friends Club from Luanda's Island Forest ( CAFIL) (MINUA, 2006). In 2001, an NGO forum, namely the Maiombe Environmental Network, was created

with the aim of safeguarding the environment and had the objectives of incentivizing collaboration with international organizations and, in general, creating dynamism of the environmental movement (Angop, 2005). Currently, there are numerous associations linked to the Maiombe Network that aim to address the various environmental issues. As concerns about the environment and interest in sustainable development increase, there is an increase in environmental organizations with a significant presence in the press and on social networks. Currently, there are already several NGOs and companies focused on the Environment and Sustainability sectors. As can be seen, the environmental movement in Angola is growing, although limited, it has the potential to promote even more significant changes in the socio-economic and legislative sectors.

## **2.4. Rwanda and Kenya**

For analytical purposes, Rwanda and Kenya were the countries chosen to assess socioeconomic aspects and waste management practices, namely single use plastic bans. This chapter will illustrate the backgrounds of the countries in question and their stance on single use plastic bans, how it was achieved and considerations. Refer to table 3.1 in appendix D for a comparison of socioeconomic aspects between Angola, Rwanda and Kenya.

### **2.4.1 Socioeconomic Aspects of Rwanda**

Rwanda is a landlocked country located in Central Africa, bordered to the north by Uganda, to the east by Tanzania, to the south by Burundi, and the west by the Democratic Republic of Congo ( Republic of Rwanda, 2021). The total area of Rwanda is 26,338 km<sup>2</sup>, with an estimated population density of 445 people per km<sup>2</sup>. The estimated population is 12.3 million inhabitants, of which approximately 50% of the population is under 20 years of age and the median age is 22.7 years (ibid).



Figure 2.5- The map of Rwanda from Encyclopaedia Britannica (2012).

Rwanda is a rural and agrarian country and its agriculture accounts for approximately 63% of export earnings and with some mineral and agro-processing. Rwanda's main sources of foreign exchange are tourism, coffee, tea, and minerals. Demand for food in the country is high, so despite Rwanda's fertile ecosystem, there is still a need to import food (Index Mundi, 2020). The country's socio-economic and political context is heavily influenced by the civil war of the early 1990s and the 1994 genocide, a tragedy that still affects the country to this day. The genocide devastated Rwanda's economic base, temporarily paralyzed the country's ability to attract private and foreign investment, and severely impoverished the population, especially women (Index Mundi, 2020). The country's socio-economic and political context is heavily influenced by the civil war of the early 1990s and the 1994 genocide, a tragedy that still affects the country to this day. The genocide devastated Rwanda's economic base, temporarily paralyzed the country's ability to attract private and foreign investment, and severely impoverished the population, especially women (Index Mundi, 2020). Problems with access to energy, instability in neighboring states, and the lack of adequate transport connecting to other countries continue to hamper private sector growth (ibid).

However, Rwanda has made substantial progress in stabilizing and rehabilitating its economy, far beyond pre-1994 levels. GDP has rebounded with average annual growth of 6% to 8% since 2003 and

inflation has been reduced to single digits (Index Mundi 2020). In 2003 the GDP per capita was 250 USD and the most updated GDP was 820 USD (World Bank, 2021). In 2015, 39% of the population lived below the poverty line, according to government statistics, compared to 57% in 2006 (UNESCO, 2017). The poverty rate dropped from 44% in 2011 to 39% in 2014, while inequality, as measured by the Gini coefficient, reduced from 0.49 in 2011 to 0.45 in 2014. Rwanda's HDI in 2014 of 0.483 is below the average of 0.505 for countries in the low human development group and below the average of 0.518 for countries in Sub-Saharan Africa. Despite the low numbers, Rwanda continues to see great progress, especially in life expectancy which is currently 64.2 years (2014) above the sub-Saharan average of 58.5 and low HDI countries of 60.6.

The government adopted an expansionary fiscal policy to reduce poverty by improving education, infrastructure, and foreign and domestic investment. Rwanda achieved most of the Millennium Development Goals (MDGs) by the end of 2015. Strong economic growth was accompanied by substantial improvements in living standards, evidenced by a two-thirds drop in child mortality and school enrollment in almost universal primary care (UNESCO 2017 and Index Mundi 2020). The focus on local policies and initiatives contributed to a significant improvement in access to services and human development indicators. Rwanda ranks consistently in terms of ease of doing business and transparency.

#### **2.4.2 Rwanda's plastic bag ban**

Part of Rwanda's strategy to recover from the effects of the genocide includes a focus on environmental protection. Similar to Angola's constitution, Rwanda's constitution states, "Everyone has the right to live in a clean and healthy environment" (Constitution of the Republic of Rwanda, 2015, Article 22). While the complete ban on the use of plastic bags seems extreme, it can be seen that its implementation has been successful in Rwanda.

Polyethylene bags were mostly single-use and their use resulted in clogging of sewer systems, garbage, excessive amounts in landfills, and flooding caused by blocked waterways (Kardish, 2014 Danielsson, M. 2017). Cattle and marine life were also severely affected, cattle ingesting the sacks, which resulted in their death (ibid). A study funded by REMA (Rwanda Environmental Management Authority) conducted in 2003 generated discussions about banning plastic bags. The study reports that at the time, plastic was thrown on the streets irresponsibly. Garbage could be seen in public gardens, sidewalks, and markets (Kabenga and Musabe, 2003). This same study highlighted the need for quick solutions to plastic waste through the creation of a legal framework with sanctions, and educational and interactive campaigns in which citizens would receive lessons about its harmful

effects and get involved through the collection of plastic bags. It was also recommended that the government seek and promote alternatives to plastic bags and invest in means of control and recycling (ibid). After the study, the government decided to raise awareness by initiating campaigns across the country. In 2005, the government banned the use and import of plastics less than 100 microns thick, and in 2008 the ban on the use of plastic bags came into effect (Behuria, 2021).

The law banning plastic bags is considered strict by many but effective as well. Its purpose is to ban the use, manufacture, import, and sale of polyethylene plastic bags. The law defines polyethylene bags as “a low-density synthetic industrial product composed of numerous chemical molecules of ethylene with a chemical formula;  $(CH_2 = CH_2)$ .” (REMA, 2009). To enforce the ban, the government used some strict policy instruments such as fines and imprisonment (up to 1 year) as a deterrent, in addition to other instruments such as information campaigns suggested in the study carried out by Kabenga and Musabe in 2003.

One of the policy instruments that were applied in Rwanda is a concept called Umuganda. It is a government initiative rooted in the idea of building national identity through action that helps reconstruct the country (Danielsson, 2017). This concept is referred to in Rwanda as a home-grown solution, linked to Rwandan tradition and culture that consists of community members working together towards goals. Umuganda occurs on the last Saturday of each month from 8am to 11am, in which public transportation is restricted and businesses are closed. By law, individuals between the ages of 18 to 64 that have physical ability should participate in performing tasks as a community. These tasks include activities such as planting trees, cutting grass, fixing public facilities within neighborhoods and more. It is an opportunity for citizens to share their concerns among the community and to the local authorities (ibid).

Overall, the effects of the ban were positive. REMA officials mention the main changes, which are cleaner streets, cleaner waterways, and healthier livestock. The ban has resulted in the emergence of recycling technologies, which further helps to maintain the positive effects of the law (Danielsson, 2017).

Government officials mentioned the existence of some resistance to the law banning plastic bags, and say they took this possibility into account in its implementation. Resistance came from plastics manufacturers and bakeries who relied on bags to keep their products “fresh” (Danielsson, 2017). It could be argued that resistance was limited due to the little entrepreneurial power that the

plastics industry had. Despite limited resistance, the plastics industry suffered from the ban and a lack of coordination between different government sectors. An example of this factor is a company called SOIMEX, a plastic bag manufacturer closed down during the genocide (Behuria, 2021). The company owner had moved back to Rwanda in the 2000s to resume life in his homeland. The latter managed to receive a loan from the National Development Bank (BRD) to restart SOIMEX. A week after receiving the loan, the intention to ban plastic was announced in 2004. SOIMEX and other companies were forced to close and lay off their employees (Behuria, 2021; Danielsson, 2017). The lack of efficient communication between REMA, BRD, and other sectors could have avoided such a situation and is a lesson to be considered in policy implementation. Currently, SOIMEX is still a plastic manufacturer authorized by REMA to produce garbage bags, plastic tarpaulins, and plastic tubes and has also been actively engaged in recycling since 2008 (ESAJA, 2016).

After the ban, to use and import plastic, companies had to obtain permission from the government and the consequences of illegal plastic use could lead to up to a year in prison (Behuria, 2021). Despite the fines and imprisonment, a black market in plastic bags emerged, which resulted in arrests for possession and/or sale of plastic bags and, therefore, police inspection became routine (Danielsson, 2017). The ban has been in place for over a decade and people are better informed about the effects of plastic as well as the laws around it, making the black market in plastic bags a minor issue (ibid). Several international environmental agencies praised Rwanda and the capital Kigali, due to the positive impact the ban had on the city's landscape (Kardish, 2014). In 2008, Kigali received the Scroll of Honor Award for being a beautiful, clean and more modern city and the ban on the use of plastic bags played an important role in receiving the award (Danielsson, M. 2017). Furthermore, Rwanda's position as a regional environmental leader was solidified in 2016, when the Kigali Amendment was incorporated into the Montreal Agreement, which asks countries to gradually reduce the production and consumption of hydrofluorocarbons (Behuria, 2021). The European Union (EU) and 93 countries signed the Kigali Amendment, which solidified Rwanda's role as a leader on a global environmental stage (ibid).

## MSW in Kigali

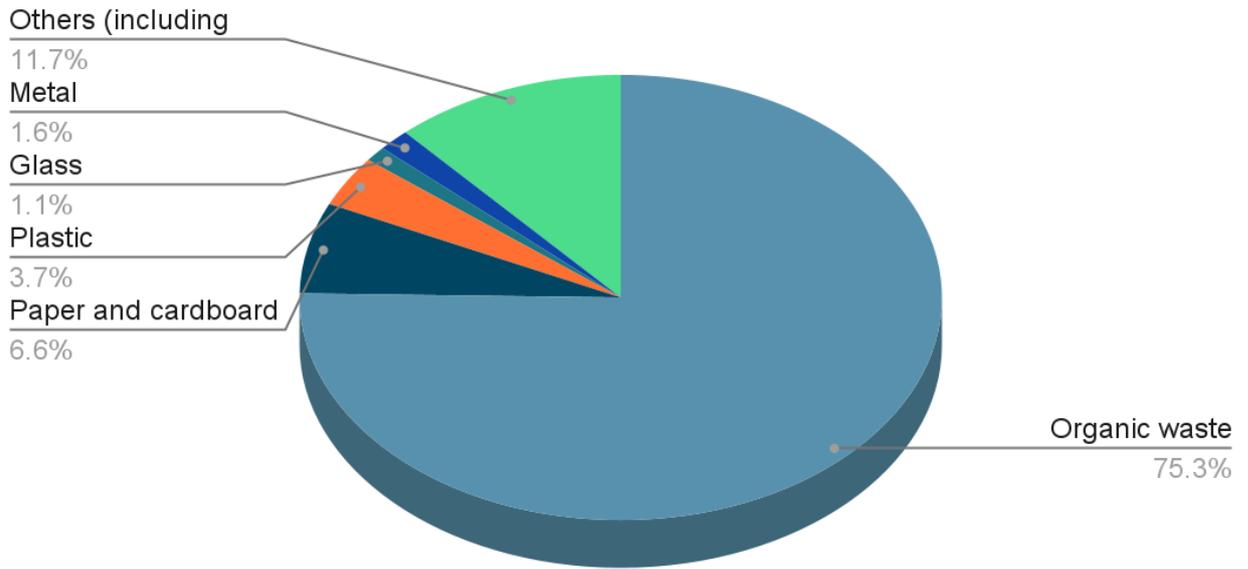


Figure 2.6- The composition of MSW in Kigali (Fidele Iraguha et al 2022).

Rwanda can be seen as an example of what could happen if proper legislation is implemented at a national level to reduce plastic consumption.

### 2.5 General and Socioeconomic Characterization of Kenya

Kenya is a country located in East Africa and is bordered by Sudan, Ethiopia, and Somalia to the northwest, north, and east respectively. To the west is Uganda, to the south is Tanzania and to the southeast is the Indian Ocean. The total area is 582,600 km<sup>2</sup> and the population rate is approximately 54 million inhabitants. The largest urban areas are the country's capital, Nairobi with approximately 4.7 million inhabitants, and the city of Mombasa with approximately 1.3 million inhabitants (Heritage, 2021 and IDS-Institute of Development Studies, 2014).



Figure 2.7- The map of Kenya from Encyclopaedia Britannica (2012).

Kenya experienced abrupt population growth in the mid-20th century as a result of a declining death rate and rising birth rate. More than 40% of Kenyans are under the age of 15 due to high fertility, premature procreation and marriage, and an unmet need for family planning (Heritage, 2021).

Agriculture is considered the backbone of Kenya's economy, contributing a third of GDP. About 75% of Kenya's population work part-time or full-time in the agricultural sector, including livestock and pastoral activities. More than 75% of agricultural production comes from rainfed agriculture or small-scale livestock production.

Kenya is considered the economic, financial, and transport hub of East Africa. Kenya's real GDP growth has averaged over 5% over the past eight years. Since 2014, Kenya has been classified as a lower-middle-income country because its GDP per capita has exceeded the World Bank threshold (Moody analytics, 2021).

Kenya was colonized by Great Britain and gained its independence in 1963, but political liberation was not achieved until the early 1990s. Kenya has gone through unstable political times. As per the new 2010 constitution, a presidential election was held in 2013 and was won by Uhuru

Kenyatta, the son of Kenya's incumbent president. The Supreme Court overturned his victory in the initial vote; however, he won the re-election that took place in 2017 (Heritage, 2021).

Although Kenya has a growing business middle class and steady growth, weak governance and corruption can hamper its economic and development trajectory. While reliable figures are difficult to find, unemployment and underemployment are extremely high and can reach 40% of the population (Moody analytics, 2021). Kenya was once considered East Africa's largest and most diverse economy, with an average annual growth rate of over 5% for nearly a decade. In terms of the HDI, Kenya ranked first in the region in 2014 (IDS, 2014). Kenya's most up-to-date HDI value (2020) is 0.601, which places the country in the medium human development category, placing it at 143 out of 189 countries and territories. Between the 1990s and 2019, Kenya's HDI value increased from 0.482 to 0.601, an increase of 24.7%. Between the same years, life expectancy in Kenya at birth increased by 9.3 years, average years of schooling increased by 2.8 years, and expected years of schooling increased by 2.3 years. Kenya's Growth National Income by capitalization increased by about 37.1 percent between 1990 and 2019 (UNDP, 2020).

Its entrepreneurship and human capital provide enormous potential for further growth, job creation, and poverty reduction. However, despite the decline in the country's absolute poverty rate, wealth was not evenly distributed (IDS, 2014). The country's society remains highly unequal in terms of income, gender, and geographic location. Poverty is greatest in arid and semi-arid areas, which cover about 80% of the land area and are inhabited by about 20% of the population. Poverty also affects the coastal area, which receives fewer resources (ibid).

### **2.5.1 Kenya's plastic ban**

In terms of environmental leadership, Kenya has always been number one in Africa. The country is notorious for some achievements, such as the creation of the 'Wildlife Club Movement of Kenya', one of the first clubs in the world dedicated to wildlife, the Green Belt Movement, a movement responsible for planting more than 51 million trees in Kenya, created by Kenyan Nobel Peace Prize winner Wangari Maathai. The country even successfully lobbied for UNEP to establish its headquarters in the city of Nairobi (Behuria, 2021). Nevertheless, implementing the ban on the use of plastic bags in Kenya was laborious.

Existing literature on plastic bag pollution in African countries mentions problems such as clogging of drainage systems, which at various times causes flooding and severely affected livestock. It was no different in Kenya, as a study by the National Environmental Management Agency (NEMA) confirmed that more than 50% of cattle near urban areas ingested plastic bags (BBC, 2019). Before

the ban, more than tens of millions of bags were distributed across the country through supermarkets (ibid).

Since 2005, the Kenyan government has announced a ban on plastic bags on four separate occasions. In 2005 and 2007 the government announced a ban on the use of 30-micron thick plastic bags, and in 2011 it also bans 60-micron plastic bags to include all bags considered light enough to be dispersed by the wind (Obiria, M 2017). The influence of the business sector became evident in the narratives that defied prohibition. Producers and traders of plastic bags objected to the ban, arguing that it would cause job losses for factory workers and workers at supply points. NEMA also sided with manufacturers, noting that implementation would result in job losses for over 4,000 Kenyans (Behuria, 2021 Obiria, 2019). Traders protested and threatened to pass on the extra cost of making thicker polyethylene to the consumer in the 2007 ban attempt. When NEMA announced a new 2011 ban, similar protests followed. Between 2010 and 2014, Kenya's annual plastic production expanded by a third to 400,000 tonnes (The Economist, 2017).

Kenyan plastics manufacturers have frequently expressed concerns about the bans, both independently and through the Kenya Manufacturers Association (KAM) (Behuria, 2021). Through KAM, the power of business proved to be effective in blocking implementation until 2017.

In 2017 there was increasing pressure from local activist groups, foreign environmental agencies (UNEP), the press, and social media, via the popular hashtag #banplasticsKE, which was supported through a 'retweet' (Twitter repost) by the Cabinet Secretary. for Kenya's Environment and Natural Resources (Obiria,M 2017).

On February 28, 2017, the Ministry of the Environment issued Official Gazette No. 2,356, banning the use, manufacture, and import of all plastic bags used for commercial packaging and domestic use. Effective from the 6th month from the date of the notice, naturally, the ban on plastic bags came into effect on August 28, 2017 (Ministry of Environment and Forestry, 2020).

The ban that took effect in 2017 threatened up to four years in prison or \$40,000 fines for anyone who produced, sold, or even carried a plastic bag. Government officials stated that, in the initial phase, manufacturers and retailers would be the targets, not ordinary citizens (BBC, 2019). After the issuance of the Official Gazette, the Minister of the Environment at the time, Judi Wakhungu, was taken to court due to objections to the decision, but the court ruled in his favor, due to the correct procedures that were followed (Ngei and Karamali, 2020).

Three years after the ban, the benefits can be seen. Landscapes in Kenya are less polluted and there are fewer reports of unintentional ingestion of bags of cattle. The behavior patterns, while slow, were noticeable as people started buying reusable bags. According to government officials, about 80% of Kenyans have stopped using plastic bags. Some studies indicate that there has been a drastic reduction in plastic bags along the coast of the country. There are reports that the country's

landscape has improved significantly as there are now fewer bags hanging from trees and areas that used to be filled with garbage from plastic bags are cleaner (BBC, 2019, Ministry of Environment and Forestry, 2020 Ngei and Karamali, 2020).

According to the Kenya Ministry of Environment, after the implementation of the ban, some challenges emerged internationally. Some neighboring countries continue to use polythene bags, which consequently end up being illegally imported into Kenya (Ministry of Environment and Forestry, 2020).

After the ban, polypropylene bags became a popular option, as they are easier to recycle compared to bags made from polyethylene. However, NEMA noticed the change in the quality of polypropylene bags, as manufacturers began to increase the level of polypropylene, making the bags non-recyclable materials (BBC, 2019). The government decided to ban this type of material, but the manufacturers objected and as a result, its use is still allowed (ibid).

## MSW Composition in Nairobi, Kenya

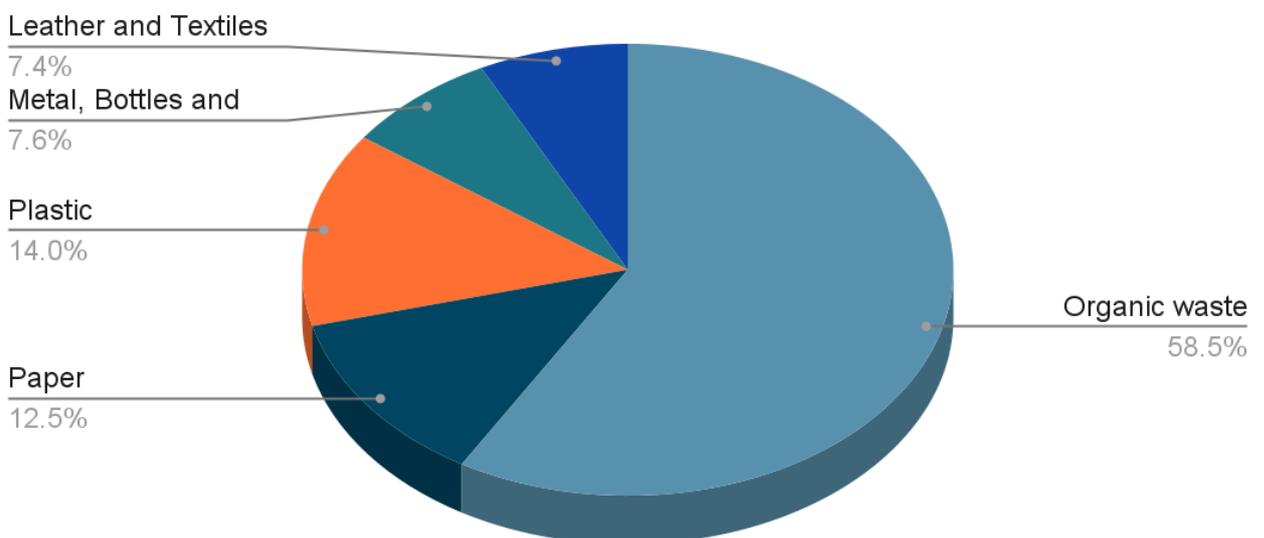


Figure 2-8- MSW composition in Nairobi, Kenya (Kabeyi, Moses & Olanrewaju, Oludolapo 2021).

### 2.6 Plastic Ban Considerations

The consideration for the Plastic Bag Ban (PBB) of Single Use Plastic Bags (SUPS) can be due to the negative externalities associated with the usage of plastic. SUPBs are not limited to being an

environmental issue. Muposhi, A et al (2022) identified economic and social issues as being equally important when it comes to ban considerations. Economic factors include remediating the clogged waterways caused by SUPB and the costs to manage plastic bag litter, the loss of cattle and other issues that tend to be costly. The funds associated with those expenses could instead be allocated towards different concerns (Danielsson, M. 2017, BBC 2019 and Muposhi, A et al, 2022).

The benefits of PBB are not limited to combat the negative effects of plastic referenced throughout this chapter, as there are also economic and social benefits that can be associated with banning plastic bags. Repurposing and recycling plastic bags can promote a circular economy and green practices and the environmental benefits can be seen in the reports stating that Kenya's landscape and overall coastal line is less polluted, as well as there being fewer reports of plastic bags hanging in trees (Behuria, 2019 and BBC, 2019 ). In Rwanda the environmental benefits can be attested through the prestigious Scroll of Honor Award that can be attributed to the enforcement of the plastic ban (Danielsson, M 2017).

The effectiveness of PBB varies from country to country and other factors. There is limited data accounting for the pre and post-ban effects. The effectiveness of the implementation of SUPB in certain regions like Kenya, Uganda and Mali were not as successful or caused delays due to the structural power of the plastic sector, non-compliance and the lack of awareness among certain communities ( Behuria, 2019 and Muposhi,A et al 2022).

Both Kenya and Rwanda dealt with a few consequences caused by implementing the PBB. One of the unintended effects of PBB was the emergence of the black market. The lack of bans in bordering countries allowed for plastic bags to be smuggled and distributed (Nehu 2006 and Behuria 2019). The PBB had a negative impact on the economy in Kenya as 60 to 90% of jobs in the plastic industry were lost (Muposhi,A et al 2022). Other impacts include the government losing tax revenue due to the emergence of the plastic bag black market, reports of Rwandan and Kenyan companies profiteering from the alternatives to plastic bag and reports of industry and civil disobedience ( Njeru 2006, Behuria, 2019 and Muposhi,A et al 2022).

The strict policies that were introduced in Rwanda yielded positive results in terms of plastic imports. According to Babayemi, J. et al (2019), plastic labeled as "Other articles of plastic", which include finished plastic articles, has a significant decline of 4825 tonnes between the years 2004 to 2016. Despite this decrease, there was an increase in plastic imports up until 2014, followed by a decrease. The increase was in part, due to the imports of polymers of styrene in primary form, in efforts to reduce the need for air conditioning through the use of foam insulation, in order to reduce GHG emissions (Babayemi, J. et al 2019). Overall, there was a general decrease in polymers and other plastics within the last 10 years.

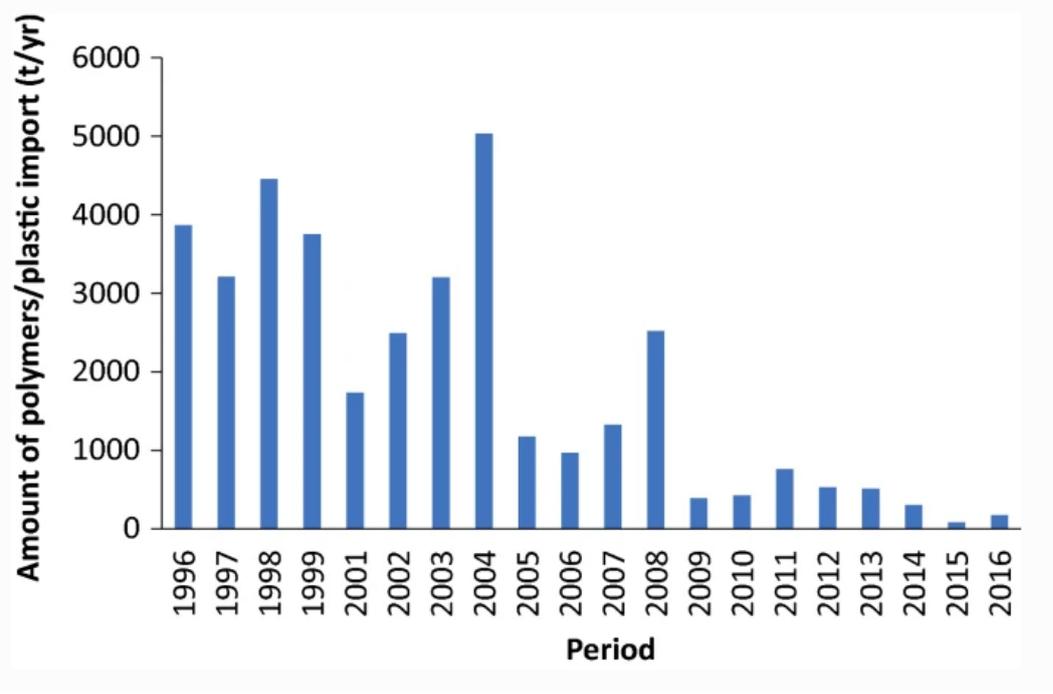


Figure 2.9- Time trend Time trend of “Articles of plastics” imports to Rwanda (1996–2016) (Babayemi, J. et al 2019)

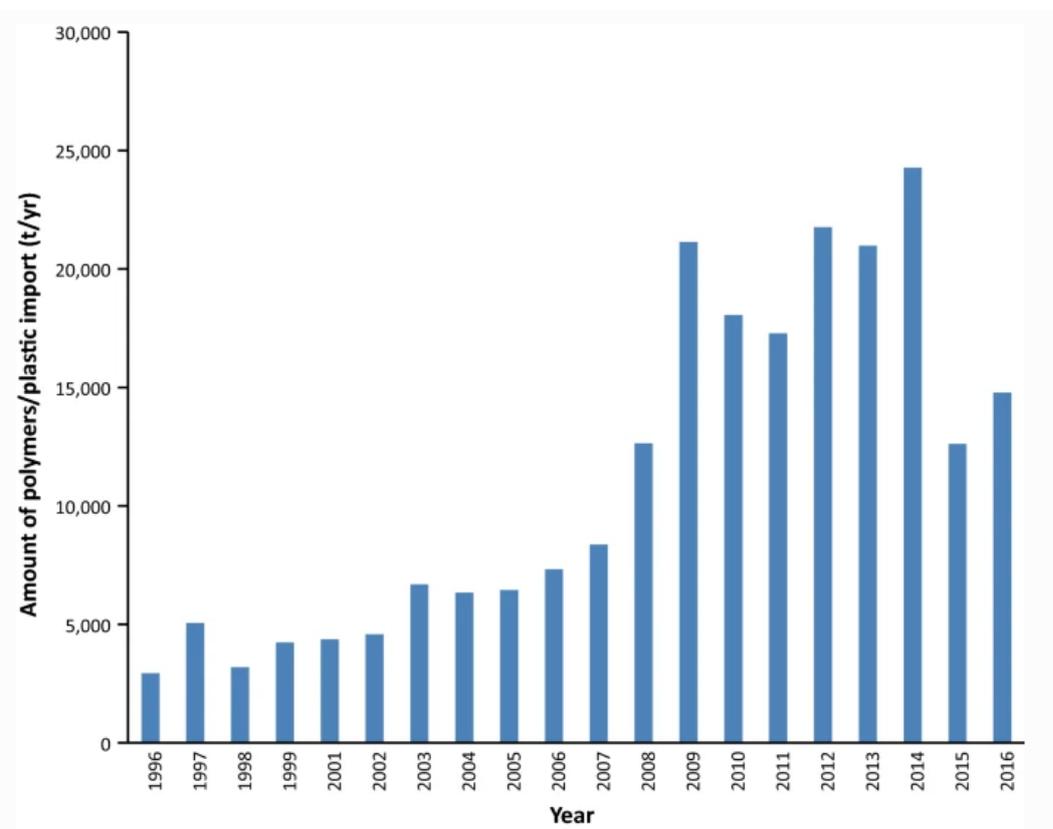


Figure 2.10 Time trend of total primary polymer/plastic imports to Rwanda (1996–2016) ( Babayemi, J. et al 2019).

## CHAPTER 3

# Methodology

The focus of this research is to analyze the plastic problem in the city of Luanda and explore possible solutions. To achieve the objectives of this study, there was a thorough review of the literature around waste management in Angola, Rwanda and Kenya. This chapter presents the methodological choices and reflects the difficulties presented in the study. More specifically, this chapter will illustrate the approach to answer the research questions; it will outline research philosophy (design), the data and methods used, the choice of case study, the procedural method, ethical considerations, and limitations and boundaries.

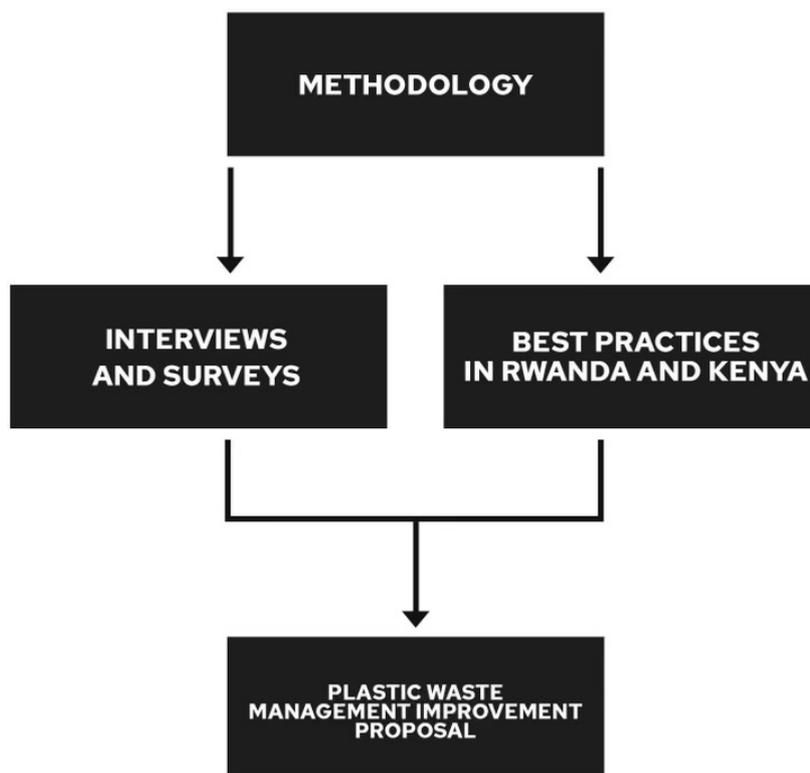


Figure 3.1- Methodology Framework

### **3.1 Research Philosophy**

As part of the investigation of the current situation of plastic in Luanda, this study aims to extensively explore which methods have been used in waste management in Angola until the present time, which policies have been implemented over the years, what are the consequences of the problem in question and analyze how the countries chosen for the case study deal with the same issues. For these reasons, the exploratory approach was chosen, as this approach allows for a more precise investigation. The combinations of qualitative and quantitative methods were chosen in order to achieve completeness. According to Byman et al (2012), combining both methods can lead to completeness, as the possible gaps in one method can be addressed in the other. In order to acquire the knowledge necessary to answer the research questions, the method chosen was a series of semi-structured qualitative interviews with open-ended questions. This format was chosen to give respondents the opportunity to develop responses based on the experiences and perspectives they gained in their areas of occupation. The semi-structured interview method was considered the best option, compared to structured interviews, as the latter ran the risk of being influenced by the author's potentially biased ideas. The survey method was chosen in order to collect and quantify the perspective of citizens that inhabit Luanda. The surveys include a multiple item measure, namely the Likert scale to measure the intensity of feelings in the area of study. Due to time constraints, distance, covid-19 restrictions, costs, tools used and the fact that the population is very large, surveying the population as a whole was not taken into consideration. For this reason, it was necessary to work with a small part of the population that was willing to participate in the surveys. The sample selection was done in a way that it is representative of the population that is the object of this research.

### **3.2 Methods used**

As it can be seen, the methods used for this research are qualitative and quantitative. These methods were deemed the best methods for this study, following an analysis of the study carried out by Danielsson, M (2017) that was based on semi-structured interviews and Almeida, A (2017), which consisted of surveys to collect data regarding MSW practices. The combination of both allowed for semi-structured and open interviews, which enabled an in-depth analysis of the research question and allowed a broader perspective on behavioral patterns and general public opinions in regards to the current state of Luanda. Interviews, surveys and observations were the methods used as primary sources. The observations were made in the city of Luanda, where plastic pollution can be seen in large quantities in public spaces. The observations that are illustrated in figures 2.3 and 2.4 reinforce the data that was collected from interviews, surveys and literature review, as they reflect the reality of plastic pollution near hospitals and other areas.

The interview questions and surveys can be found in appendixes A,B,C and D. For the semi-structured interview there were a total of 6 participants, of which, 4 were Angolan that occupied positions in the public sector as former MINUA employee and private sectors as NGO director and private companies Aquasystem director and Vista director, 1 Rwandan interviewee that works at REMA and 1 Kenyan interviewee that is a former UN employee and is currently a PhD student at Science Po in Paris.

As for the surveys, there were 2 surveys carried out, one for the general public and another one directed to doctors. The survey on appendix C had 225 participants in total while survey on D had a total of 22 participants. Given the strict covid-19 measures of Luanda, the interviews were carried out through platforms such as Zoom, Teams and Whatsapp while the surveys were carried out via Google forms. For the literature review and secondary sources, the materials used include presidential decrees, documents issued by the governments of the countries in question, scientific articles, journalistic articles and books. These materials were essential in the conduction of this investigation. Official documents issued by the government such as decrees, constitution and legislation allowed an analysis of the importance and relevance of the meaning of environment and sustainability. They also allowed the analysis of the definition of Municipal Solid Waste (MSW) and its relevance in the constitution of each country in question. The main problem with some of the secondary data in the countries under study is reliability due to high rates of corruption. Despite reliability issues, the articles helped to obtain the information needed to structure the study. Scientific, journalistic articles and books are more reliable and helped to better understand the real effects of plastic pollution, the role of plastic in the economy and also helped with the history of the countries covered in this research.

With the problems that the city of Luanda has been facing, it was deemed appropriate to choose the journey of Rwanda and Kenya in banning plastic, as they are world pioneers in this field. Rwanda was one of the first countries in the world to implement a plastic bag ban and today has 13 years of experience in the field, which makes it an ideal case study for this research. Like Rwanda, Kenya is also a pioneer in the environmental sector and has successfully implemented its ban on plastic bags. Although not implemented as early as in Rwanda, the benefits of Kenya's plastic bag ban are visible and regional single-use plastic bans also came into effect a few years after the plastic bag ban. Both cases serve as an example, as they are low-income countries and are recovering from the effects of serious events such as colonization, genocide, corruption, political instability and much more. These countries are unique because, despite the adversities they face, they were able to tackle environmental issues successfully and possibly even better than countries that are deemed more developed. Since both countries were able to come up with a plan to address the plastic waste problems, they can be used as examples for countries that have experienced similar difficulties.

### **3.3 Ethical Considerations, Challenges and Justification**

To carry out this research, the primary data used, namely the interviews and surveys were voluntary and the participants had the right to withdraw if they felt the need to do so. Their privacy was respected and they had the option to be anonymous if necessary. The data collected from the participants in this research is as precise as it can be. As for secondary data, all the material and authors used were duly cited and referenced and despite the pandemic, the research was considered safe enough to be carried out. The qualitative and quantitative methods were chosen because with both methods the perspective of the people involved in the study is considered significant and can provide guidance and possibly change the course of the study. According to Bryman (pp. 408, 2012), this type of data and method are considered “rich and profound”, and in this particular case they allow the interconnections between the social scenario in question, in this case the city of Luanda and the actions carried out by the participants (actors involved in the MSW management plan), as well as setting the tone for the relevant events that have unfolded over time. It is important to note that given the circumstances, online methods were the chosen method and as a result, the surveys were only available to those with smart devices and internet connection, which does not reflect the reality of a lot of Luanda’s inhabitants. There was some reluctance in terms of participation, as some people seemed to be scared about the survey and declined participation. There also seemed to have been skepticism among the surveyed, especially for the surveys that were directed towards doctors.

## CHAPTER 4

# Interview and Survey Results

Based on the qualitative data collected the following was found through interviewing 4 individuals that currently work or have worked in public and private sectors that address MSW and plastic in Angola, Rwanda and Kenya. The interviewee from the public sector in Angola is a former Ministry of the Environment employee, while the interviewees from the private sectors are directors of NGOs and companies that work in waste management. Interviewees from both sectors were chosen because they work directly in policy making and waste collection and were able to provide information in regard to the difficulties faced in MSW collection, regulation and policy enforcement. As for the surveys, Luanda inhabitants were chosen for the surveys because they are affected by plastic pollution on a daily basis and doctors were chosen because they could provide insight on the health sector and diseases that can be caused by macroplastics. The interview questions and the surveys can be found on appendix A, B, C and D. Since the interviews were semi-structured and open ended, on several occasions the interviewees would repeat themselves or answer the previous questions, which is why the results are displayed according to the theme of the questions, rather than the order of each question.

The interviews were carried out according to the availability of each interviewee and were carried out via Zoom and Whatsapp, according to the preference of each interviewee and had the approximate duration of 30 minutes, while the surveys were carried out through Google forms and were open for 3 weeks.

### 4.1 Angola

Respondents 3 represents the public sector and 1, 2 and 4 represent private sectors that work with MSW.

#### 4.1.1 Difficulties in job/positions

In terms of difficulties in the area of work, when asked what are the main challenges each respondent faces, the common factor was internal communication. Respondent 1, 3 and 4 highlighted the difficulties in communication in a top-down hierarchy structure, while respondent 2 emphasized the difficulties in communication with customers and overall communication challenges in regard to internal organization. Respondent 1 added that motivating volunteers is also a challenge.

#### **4.1.2 Pollution**

When asked about feeling affected by pollution and which kind, respondent 1 affirmed that they feel affected by several kinds of pollution such as atmospheric, which they mentioned has a negative affect on their chronic sinusitis and allergies, noise pollution and pollution from solid and organic waste. The respondent also mentioned the strong smell that comes from the organic waste and states how common it is in several places in Luanda. Marine and river pollution were also mentioned and the respondent pondered the possibility of there being polluted aquifers, given the pollution they see and experience. Respondent 1 and 3 highlighted outbreaks of diseases such as cholera, malaria and typhoid fever, which result from solid waste. Respondent 2, 3 and 4 both feel affected by solid waste pollution, while respondent 2 identified plastic as a villain of the 21st century. Respondent 4 mentioned open sewers and stated that they used to live in the city center and often dealt with the strong smells, which was one of the reasons that led them to move to a different location.

#### **4.1.3 Plastic in Angola**

When asked about the effects of plastic in Angola, all respondents mentioned concluded that the negative effects outweigh the positive effects and listed the positive aspects as: cost effective, practical and easily accessible.

When asked about the negative effects, all respondents stated that out of all of the solid waste, plastic is the most concerning one, especially because of the way it is dealt with. All respondents mentioned there not being good plastic management in terms of social use and structural policies that could mitigate the use and final end of plastic. The respondents also highlighted the cultural and societal norms and how from their perspective, the population seems to be unaware of the negative effects of plastic and therefore they consume and dispose of it as they wish, without any type of penalization. Respondent 1 mentions the fact that the MSW all end up in open dumps, are incinerated, which ends up being inhaled by those around. They explain that they have to travel a lot for work and even in the most remote areas in certain provinces in Angola they still see plastic litter, especially bags and bottles and mentioned it being worse in the capital. The respondent also emphasizes how it could affect tourism in a negative way because people would not like to visit beaches infested with plastic bags. Respondent 2 and 4 mention the lack of the use of 5 R's of sustainability (refuse, reduce, reuse, repurpose and recycle). Respondent 3 emphasizes how plastic has a negative effect on biodiversity, specifically marine biodiversity, which could then affect the local communities that depend on fishing for financial and food sustenance.

#### **4.1.4 MSW Challenges**

When asked about the challenges and current situation of MSW in Angola, there seems to be an agreement in terms of lack of conditions that enable proper waste management.

Respondent 1 states that the current conditions are poor, and despite the fact of there being meetings and conversations addressing selective waste management and recycling, there are no actual conditions on a national level that enable actual policies to be implemented. Respondent 3 also mentioned conversations and meetings that address MSW and believes that much of it seems to be wishful thinking and mostly for political gain, with no actual intent of carrying these ideas out into the real world.

Respondents 2 and 4 state that one of the biggest challenges are the operating conditions for private companies and both mention that typically in several parts of the world, citizens are responsible for paying taxes that go towards waste collection, however in Angola the government is responsible for these costs. They say that in some companies there are little to no conditions in terms of materials and resources, which reflect the current state of the landscape of the city. Respondent 2 added the following challenges: the lack of public lighting for nocturnal collection and lack of adequate drainage ditches for rainwater drainage, which ends up contributing to the accumulation of solid waste, mainly plastic, in various parts of the city. Respondent 2 mentioned that through their work, they estimate that in regard to MSW, plastic waste probably amounts to 20–30 % of the waste, and emphasized the significance of that amount. Respondents 2 and 4 mention physical challenges and limitations such as potholes throughout paths that make it difficult to collect waste and complete inaccessibility in certain neighborhoods and musseques. Respondent 4 mentions the operational costs as a challenge since most of the materials used in waste management is imported and at times restocking faces delays, which can then delay the overall operations.

#### **4.1.5 PBB, taxes and Opinions**

Respondent 1 notes that there are a few proposals that include the possibility of plastic bans and taxes, however they believe that there are no follow-ups for the proposals. They say that some proposals are emulations of proposals from other countries, which tend to not be realistic because they do not address Angola's reality in terms of financing, infrastructure, policies and population. Respondent 1 believes that a plastic ban would be efficient, however they believe that in order to implement such there should be a plan focused on the reasons for it, so people could understand why it is needed, and to avoid situations similar to those in some African countries with existing policies that have not been actually followed accordingly. They suggest focusing on awareness campaigns through televisions and through school and education. The other respondents also believe that raising awareness would be vital in making effective changes. Respondents 2 and 4

stated that they have never heard anything in regards to a plastic ban, however respondent 2 says they have noticed that some companies in the waste industry use other mediums as substitutes for plastic bags and single use plastic. Respondent 3 states that they have heard of a plastic ban as a consideration and thinks that a combination of a plastic ban and biodegradable replacements would be a good way to start and used an example of select places in Luanda, such as bakeries that use paper bags, and some bakeries charge per bags, which lead some people to take cloth bags that are designated for bread. Respondent 4 believes that a plastic ban would be very interesting and would create opportunities for existing companies to transition and believes that overall it would have a positive impact.

#### **4.1.6 Stakeholders**

All of the respondents believed that there are several stakeholders who should be involved in the implementation of a solid urban waste management plan and legislation related to the use of plastic. They all agree that the MCTA and ANR as state organs should be a regulatory agent and that private sectors that produce, import and distribute plastic should be involved and play an active role towards reducing plastic and improving waste management. Respondent 1 believes the stakeholders involved should be the MCTA, the ANR, ministry of territory and planning, the ministry of economy, and ministry of health due to this issue being a transversal issue. In terms of the private sector, respondent 1 believes that the population and all of the companies that produce plastic bags and single use plastic should be involved in the waste management and policy making process since it is a topic that affects everyone. Respondent 2 believes that the municipal authorities should be a main stakeholder since the decentralization of municipal authorities resulted in a shift of fiscalization power, which would improve accountability and follow ups at a local level. Respondent 3 believes that the population should be one of the main stakeholders since these decisions can affect the life quality and daily routines of everyone. They also believe that environmental associations should be fully involved since they have always prioritized environmental practices. Respondent 4 believes the private sector can play a significant role as stakeholders since they can help shape consumer habits and suggests methods such as attributing credits to companies that are able to reduce the amount of waste they generate, or to charge the companies for producing over a specific limit, and using those taxes towards the collection of waste and other sustainable practices.

#### **4.1.7 Public and Private Sectors**

When the respondents were asked who they believed would benefit from a PBB and selective waste management the opinions varied.

Respondents 1, 3 and 4 stated that the manufacturing industry and the sectors that commercialize and profit from the use of plastic would be negatively affected while respondent 2 shared a different perspective. Respondent 1 states that the people that would benefit from the implementation of plastic bans are those small companies that currently sell bio plastic and paper bags, companies that use mostly glass and reusable bottles.

Respondent 2 believes that as a whole, there would be more positives than negatives in terms of plastic levies, taxes and bans. They believe that society as a whole would benefit from a ban or taxes and the manufacturing industries might be impacted in a negative way, however it would be an opportunity to remodel and rethink their business plans, in order to use recycled materials and reshape the relationship people have with single-use plastic. Respondents 3 and 4 both mentioned that a levy and bans can benefit the economy and tourism, since it would open doors for manufacturers that currently work with items that could be used to replace plastic bags. Both believe that a plastic-free landscape can increase tourism. Respondent 4 added that the health sector would also benefit from these levies and taxes since a cleaner environment can result in less health issues associated with poor waste management.

#### **4.1.8 PESGRU**

When asked about PESGRU all of the respondents recognized it as being an ambitious plan that would only work if there were actual working conditions and a reliable budget. The respondents were aware of some of the goals PESGRU was set to achieve in the span of 10 years and all were aware that the goals were not met. Respondents 1 and 4 mentioned that they never fully read it but are aware of its contents while respondents 2 and 3 are familiar with it. Respondent 1 mentioned their dissatisfaction with the parts of the plan they are familiar with, because in their opinion if there was a lack of garbage containers throughout the city that was not being addressed, it did not make sense to promise selective waste containers and recycling. Respondent 1 believes PESGRU does not address waste management as effectively as it could and mentioned the fact that there is no actual sanitary landfill since it has been worked until its capacity, now there is just a controlled open dump and if this has not been addressed, mentions of waste selection and recycling seem farfetched. Respondents 2, 3 and 4 were very familiar as their line of work all of the steps are modeled by PESGRU, and respondent 2 mentioned that they have to follow the presidential decree No. 190/12. Respondent 2 states that almost none of the set goals within PESGRU were met and they believe the plan should be revisited and amended because it was established in 2012 and since it has been a decade, it should be updated in order to meet our current needs.

Respondent 3 believes that PESGRU's structure should take into account the current reality of Angola and should create conditions to allow for private companies to support governmental plans, in order to achieve certain goals.

Respondent 4 brought up the failures of PESGRU and mentioned how it was stated that the plan was to have at least 1 official sanitary landfill per province and since the plan was established not a single landfill has been established. They mentioned that when establishing ambitious goals there should be contingency plans to avoid such massive failures, and also mentions that such long-term plans can be hard to achieve, especially since unpredictable factors that could affect the economy, such as covid-19 and financial crises.

#### **4.1.9 Next steps**

When asked about which steps should be taken into consideration for the future of waste management in Angola, there seems to be an agreement in terms of promoting social awareness and finding ways to include sustainable practices in several societal aspects.

Respondent 1 believes that the next steps should be investing in awareness campaigns on a national level, implementing environmental literacy in schools and to encourage stakeholders to collaborate and to welcome innovative ideas. Respondents 1 and 3 mentioned that corruption would have to be addressed as it could affect the effectiveness of policies.

Respondent 2 believes that the next steps for Angola would be to implement collection waste taxes and believes that if people start paying these taxes they would be more aware of the waste they generate and would demand more from the government. They also believe that if taxes were to be collected, the government would have to create proper conditions that would enable proper waste management. Respondent 3 believes that the private and public sectors should work towards remodeling PESGRU and setting realistic goals that can be achieved. They believe that improving the communication between sectors is crucial in establishing plans and moving forward. Respondent 4 believes that if people and companies had financial incentives or were attributed some sort of credit for collecting recyclable plastic it could change behavioral patterns and could serve as a trial for the proper implementation of selective waste collection.

## **4.2 Rwanda**

When asked about the impact of the PBB in Rwanda, the respondent used the following example: Before the ban was enforced, imagine you had to take a picture after strong winds came, you would see several items of plastic around, now if you take a picture after strong winds come, you might not see even 1 plastic item both in the countryside and on the roads. Now we don't have the

issue of animals being affected by plastic bags. There are a lot of changes in cleanliness and now we know the impacts of plastic bags towards biodiversity so the difference is big. The expectations of the plastic ban have been met.

#### **4.2.1 Stakeholders and PBB enforcement**

The private sector was given a 1-year grace period to help. They reached out to private investors and companies that produce paper bags and alternatives to SUPB for alternatives and attempted to inform those that lived in rural and urban areas so they were aware of the changes being made. The plastic ban contributed a lot towards biodiversity conservation.

REMA collaborated with the private sector and had meetings to seek alternatives and worked on projects with large investments that have the objective of ensuring that the current plastic circulating and that have been disposed of are being reused and repurposed. They have regular inspections and work with local police to monitor what is coming inside the country, and seek to export the current alternatives that are currently being used. No one is allowed to produce SUPB, unless they are destined for hospitals and a few other exceptions.

#### **4.2.2 Umuganda**

Homegrown solutions where people come together and share, sometimes the purpose is for cleaning, for planting trees, it also builds a sense of community, we share barriers and concerns, etc. In terms of protecting the environment, we take this opportunity to solve issues like soil erosion, we run through issues that we have and seek solutions. People go away with a message of how their homes can contribute towards environmental protection.

#### **4.2.3 Difficulties**

There were difficulties in dealing with the black market since the surrounding countries were still using plastic bags. People will do whatever is necessary to see their business survive so that was an issue, which is why we were working together with the National police, a special unit that helps enforce the ban. There were concerns on how people would survive without plastic bags and the government worked on explaining how and addressed these issues through Umuganda.

When asked if they would suggest Angola to implement a PBB the answer was as follows: "Corruption is an enemy that cannot enable you to win the battle of banning plastic bags". They stated that with a country that deals with corruption, it makes it difficult to carry out and enforce bans. The culture of no corruption helps the ban enforcement in Rwanda. They believe corruption must be addressed or taken into account before seeking a ban.

#### **4.2.4 Considerations**

When asked, “Knowing about the outcomes of your country, what do you think should have been done differently?” the answer was the following:

“For today I may say that the position we have taken is perfect in terms of protecting human health and the environment, if given a chance to correct I would not correct, I would at least have the opportunity to tell the people we can live a plastic free life”. They believe all of the decisions that lead to the ban made it perfect, given the positive outcome and would not wish to change anything. If the respondent had to go back in time it would just be to enforce the fact that a life without plastic bags and SUP is possible. The respondent mentions that centuries ago people survived without plastic and going back to those roots was the best decision.

### **4.3 Kenya Before the PBB**

Before the bans were enforced the respondent says the landscapes were negatively affected by plastic, mentioned that it was very common to travel and see plastic everywhere and mentioned that before there were reports of cows ingesting plastic and they would notice after dismembering the animals and finding high amounts of plastic. They state that there were several floods caused by plastic and plastic management in Kenya was bad, especially since people had no awareness on how to manage their plastic waste and as a result there were several issues.

#### **4.3.1 Expectations**

Based on the respondents' experience, they were excited once they heard that the PBB was going to be enforced, because the waste management was poor. They say that since Kenya and most African countries do not have the proper infrastructure to manage plastic waste, the best solution is to ban it. The expectations were positive and the respondent says that the ban can bring innovation and economic opportunities in regard to plastic bag alternatives. Corporations like the UN and others encourage cooperation with other countries so the respondent believes the ban can strengthen communication and cooperation within East Africa.

#### **4.3.2 Stakeholders**

The respondent believes the main stakeholders that helped enforce the plastic ban were the people. A lot of people started using and selling reusable bags and alternatives. The respondent mentions resistance among some people that were going to Uganda to purchase plastic bags and resell them in Kenya, but overall people have accepted the PBB and it is now the new norm and the respondent reiterates that the people are responsible for enforcing the ban since they are cooperating. Other stakeholders include the government, such as the Ministry of the Environment and National

Resources, the president that has given support and endorsed the cause, the Parliament of Kenya, the National Environment Management Authority (NEMA), which has helped with creating and enforcing, policies, enabled regulations and shared expertise. The Kenyan Bureau of Standards also has a role since they set the standards for the quality of materials and bans. They help ensure that reusable bags and reusable material are up to standards and have longevity. The Courts also played a big role in everything; people from the plastic manufacturing industries that were going to be affected by the PBB went to court in an attempt to stop the bans from happening. The courts were firm in their decision and they helped enforce the ban through judicial mechanisms. The Border Customs Officers are also essential since they ask whether or not travelers are bringing in plastic and can also inspect the luggage in case of suspicions. The Border Customs Officers played a big role in arresting those that tried to smuggle plastic into the country and made arrests. The private sector was also instrumental, the public and private sector worked together and now the private sector is manufacturing and commercializing reusable bags. They were quick to seek alternatives, and started stocking reusable materials they took action instantly. Some were pushing back the government but now they are complying with the regulations.

#### **4.3.3 Transition and challenges**

“The transition was not easy as we were used to using plastic bags”. The respondent says that before the norm was to go to the store and receive free plastic bags to store the items and it went from that to having to pay for them and if you forget to take the one you have previously purchased you have to buy more bags, which made it hard to adjust but now for most people it has become a norm to reach for bags before leaving the house. “It became instinct, you feel that something is missing”. Initially it was difficult due to the court case and push backs from businesses and there were several complaints about paying for plastic bags. There were several concerns from employees in the manufacturing industry. The respondent notes that there was skepticism among the media, especially in international media and noted that the international media mentioned corruption and believed a PBB would not work.

The respondent believes the biggest challenge was to accept and adjust to the new reality, which was the PBB. The other issue was some manufacturers having to shut down their business and loss of employment. Initially there were low stocks of plastic bag alternatives so it was a challenge to adjust to the new demands but it has gotten better.

The respondent added that those negatively affected include market and street vendors and those that sell fruit and vegetables in informal markets, as they did not have immediate access to alternatives.

There were incentives such as tax reliefs for those manufacturing alternatives to SUPB and NEMA did a good job in terms of raising awareness, spreading campaigns and incentivizing people to use alternatives. The government's position played a key role in public engagement.

The respondent believes the PBB was one of the best decisions made for Kenya. The respondent describes it as a monumental step for the country and encourages other countries in similar situations prior to the ban to follow the same steps. The level of compliance has increased, people are now more prone to using alternatives and the respondent says that they have their favorite bag that they have been carrying for over 10 months that is still in good condition and has even taken it abroad due to its practicality and quality. The respondent says that the PBB has instilled a sense of duty towards the environment and believes that even if people travel to other places with no bans, they would still feel a sense of duty towards the environment and would like to have good behavior towards the environment. The respondent states that right now it is rare to see plastic bags hanging from trees and flying around, even outside of urban areas like Nairobi. The cleanliness of the country has improved and new economic opportunities have been created since there is space for green companies to thrive.

#### **4.3.4 Delays in the implementation of PBB**

The respondent explains how the manufacturing industry was very big and had a lot of power. The environment was not a concern for many big companies. The respondent reports cases of hotels that would dump MSW into rivers and states that profit in most cases would outweigh the wellbeing of the environment and believes that the mentality of “environmental protection being the responsibility of the neighbor and not of me” was one of the factors that led to the delays. Industries were using lobbying powers and influence to delay and some political aspects played a role in some of the delays that occurred. The respondent believes the right systems were not in place when the first bans were announced. The respondent believes that human resources and financial resources were not there when the bans were previously announced.

The respondent believes that due to certain constraints that most African countries face, including lack of infrastructures, financial support and human resources, the best way to deal with issues that cannot be managed is to ban, especially if it is affecting human health and the environment. The respondent explains that through their travels in Africa they have visited a couple of countries that were extremely polluted, which was shocking and compares them to Rwanda, which according to the Respondent is the cleanest country they have ever visited, and states that good systems were set in order for them to be this clean and enforcing the plastic ban is one of the reasons for it and believes that a country such as Angola can do the same and follow a PBB system.

The respondent says there are several options Angola could follow, such as levies, banning SUPB less than certain microns thick.

#### **4.3.5 Considerations**

When asked, “Knowing about the outcomes of your country, what do you think should have been done differently?” the answer was the following:

“My only wish is that the ban had been implemented earlier”. The respondent says other than that, they cannot think of anything else that could have been done differently and adds that perhaps stricter policy in regard to SUP such as water bottles and other forms of SUP. Perhaps even financial incentives for recycling such as receiving discounts or small amounts of money or credit per item recycled.

### **4.4 SPSS Data analysis**

The statistical analysis involved measures of descriptive statistics (absolute and relative, means and respective standard deviations) and inferential statistics. In this, we used the Mann-Whitney test and the Kruskal-Wallis test. The significance level for rejecting the null hypothesis was set at  $(\alpha) \leq .05$ . Statistical analysis was performed using SPSS (Statistical Package for the Social Sciences) version 28 for Windows. Appendix C and D contains the respective tables that correspond to these results.

#### **4.4.1 Sample characterization**

The data refers to a total of 225 respondents. Most were female (56.9%), aged 26-40 years (48.4%), with higher education (86.7%) and resided in the Municipality of Luanda (45.3%).

#### **4.4.2 Results**

The percentage of agreement regarding the statement that there is a problem of plastic pollution in the city of Luanda amounts to an expressive 97.4%, as can be seen on table 5.2 in appendix. More than 90% of respondents indicate that they have access to garbage containers in their area or neighborhood and a high percentage (92.4%) indicated that they deposit the waste produced at home in garbage containers.

Almost half of the garbage containers were located, at most, less than 100 meters from citizens and 72.9% were located less than 200 meters. A little more than half of the respondents indicated that garbage collection in their neighborhood was carried out frequently, while 20.4% stated that it was only carried out occasionally. The most produced waste was organic waste (56%), followed by plastic at 28%. If garbage collection sites had recycling bins, 92% agree that they would separate waste according to each bin.

The total percentage of subjects who have heard about recycling and waste separation is 99.1% and the amount of respondents satisfied with the collection services of the local authorities was 17.3% while the dissatisfied totaled 64%.

About 26% state that they very often feel directly affected by plastic pollution and 35.6% indicate that they often feel affected by plastic pollution.

A high percentage indicates that in the last 3 years, either the respondent or someone who lives in the same household was affected by paludism, malaria and dengue.

The percentage of respondents who consider it important to live in a healthy and unpolluted environment was 94.7%.

#### **4.4.3 Satisfaction with Waste Collection Services**

##### **Comparison by Municipality**

Dissatisfaction with local authority collection services is highest in Belas (2.19) and lowest in Luanda (2.38), although the difference is not statistically significant,  $\chi^2$  KW (4) = 1,470,  $p = .832$

##### **4.4.4 Comparison by Gender**

Dissatisfaction with local authority collection services is higher among females, although the difference is not statistically significant,  $MU = 5,634$ ,  $p = .434$ .

##### **4.4.5 Comparison by Education**

Dissatisfaction with local authorities' collection services is higher in subjects with higher education, although the difference is not statistically significant,  $MU = 2,619$ ,  $p = .573$ .

##### **4.4.6 Age comparison**

Dissatisfaction with local authorities' collection services is higher in subjects aged 26.40 years, although the difference is not statistically significant,  $\chi^2$  KW (2) = 1,303,  $p = .521$ .

#### **4.4.7 How often is garbage collected in your neighborhood?**

##### **Comparison by Municipality**

The differences in the perception of the frequency with which garbage collection is carried out in the neighborhood, depending on the Municipality of residence, are statistically significant,  $\chi^2$  KW (4) = 10,890,  $p = .028$ . The paired comparison test indicates that residents in Luanda or Talatona consider it to be more frequent than residents in Belas.

#### **4.4.8 Comparison by gender**

The perception of the frequency with which garbage is collected in the neighborhood is higher among females, although the difference is not statistically significant,  $MU = 5,776$ ,  $p = .620$ .

#### **4.4.9 Comparison by education**

The perception of the frequency with which garbage is collected in the neighborhood is higher in subjects with higher education, although the difference is not statistically significant,  $MU = 2,625$ ,  $p = .410$ .

#### **4.4.10 Age comparison**

The perception of the frequency with which garbage is collected in the neighborhood is higher in subjects over 40 years old, although the difference is not statistically significant,  $\chi^2_{KW}(2) = 4,842$ ,  $p = .089$ .

#### **4.4.11 Plastic and Health in Luanda**

For a high percentage of respondents, and according to their average experience, 86.4% completely agree that plastic pollution and the lack of waste collection in the city of Luanda directly affect the health of the population.

The care of patients with malaria, dengue and typhoid fever is done very frequently (54.5%).

From the perspective of the respondents, the lower class was the most affected with the aforementioned diseases (40.9%) and particularly children (90.9%).

The respondents who agree that there is a problem of plastic pollution in the city of Luanda amount to an expressive 95.5%. Almost 70% of respondents agree that environmental conditions in low-income hospitals contribute to the spread of the aforementioned diseases.

It can be seen in Table 4.28 (in appendix D) that 77.3% of the respondents witnessed an increase of malaria during the period that the waste collection services were suspended. Lastly, the majority of the respondents seem to be in agreement that an effective waste management plan would aid in reducing the number of malaria cases.



## CHAPTER 5

# Discussion

In order to seek a solution for MSW in Luanda and to mitigate the issues of plastic pollution, this chapter's aim is to identify the underlying issues in the current systems in Luanda and overall in Angola based on the primary and secondary data that was collected.

### 5.1 Plastic Pollution

After comparing the results, 97.4 % of the population that was surveyed agrees that there is a plastic pollution problem, while 95.5% of the doctors surveyed also agree. The respondents that have worked in the sector also agree and stated that they have dealt with other forms of pollution that have affected them in several ways, which includes health and overall well-being. Although the perception of this issue is very significant, given the percentage, it is important to note that out of the 247 survey respondents, 22 were doctors and out of the remaining 225, 86.7% have pursued higher education. These numbers do not reflect the reality of Angola; especially considering the fact that the literacy rates in adults is 66% and 77% in the youth. Despite it not reflecting the reality in its totality, the data indicates that there is a problem with plastic pollution.

91% of the surveyed respondents have access to garbage containers and 92.4% stated that the waste they produce at home is disposed of in garbage containers. 2.2% of the respondents stated that they dispose of their waste in abandoned spaces, while 2.2% mentioned that they dispose of waste in open ditches. In terms of distance, approximately 72.9% of the respondents state that the garbage containers are located less than 200m from their houses. The distance between residential areas and garbage containers can play a significant role in proper waste disposal and management. Out of all respondents that dispose of their waste in open ditches, abandoned spaces and others, only one has a container less than 100m from their house, while the remaining respondents do not have access to garbage containers, with the distance from the nearest ones being over 300 meters from their houses. When asked which type of waste the survey respondent's produce the most at home, 56% stated they produce organic waste the most, followed by 28% that have stated that they produce plastic waste the most.

### 5.2 Plastic Pollution and Health

One of the interviewees mentioned that given their experience and what they see on a daily basis, they believe that plastic amounts for 20-30% of MSW in Luanda and the others mention that it has

affected them in some ways and state the negative impacts which include the incineration of waste, polluted landscapes, beaches and oceans that can have a negative effect on human health, biodiversity, tourism and the overall economy. The interviewees reported the cases of disease outbreaks like malaria, typhoid fever, cholera and others. When asked if the surveyed or people in the same household as them were affected by paludism, malaria and dengue, 69.8 % of the respondents said yes. The doctors that were surveyed agree that plastic has a negative impact in health as 86.7 % strongly agreed, while 13.6% agreed. 54.5% of the surveyed doctors oversee cases of paludism and malaria very frequently, while 18.2% oversee the same cases frequently and 9.1% only see these cases on occasion. 40 % of the same respondents believe that the lower class is the most affected by the aforementioned diseases and 90% of the respondents affirm that the most affected are children. 68.2 % of the doctors that were surveyed agree that the environmental conditions in low-income hospitals can contribute to the propagation of the diseases in question and about 77% of the respondents witnessed an increase of paludism and malaria cases when the waste collection services were suspended. Compared to the literature review, these results reinforce that the diseases previously mentioned mostly affect children and confirm that the suspension of solid waste collection lead to an increase of those diseases in 2021, which ended up affecting 3.8 million of Angolans.

### **5.3 MSW Collection and Challenges**

When the survey respondents were asked about their levels of satisfaction with waste collection services, 64% of the respondents were dissatisfied, while 17.3% showed satisfaction. It can be seen that the levels of satisfaction with the collection services are higher in the Luanda municipality, which is the city center of Luanda and in Talatona, while the levels of dissatisfaction are highest in the municipality of Belas. It can be seen that Belas inhabitants have the perception of waste being collected less frequently, in comparison to those that live in Luanda and Talatona.

The common denominator in the challenges of MSW collection is the lack of infrastructure and conditions. The 4 interviewees agreed that there are no adequate conditions for the collection and disposal of MSW. One of the issues that were pointed out is the fact that there are no sanitary landfills. According to the literature Angola's first and only sanitary landfill, namely Mulenvos was inaugurated in 2007 and due to the excess amounts of waste it receives, the conditions were exacerbated and the respondents do not consider it to be a sanitary landfill, and one of the respondents referred to it as a monitored open dump. This statement is similar to the existing literature, in which the landfill Mulenvos is referred to as a "controlled dump" (Leite, 2021).

The respondents that work in the private sector for MSW collection mentioned physical limitations and challenges such as potholes along the roads, difficulties accessing certain neighborhoods, lack of public lighting and lack of proper drainage ditches. Similar issues were reported by the Ministry of the Environment in 2006, in which they mention the lack of proper drainage systems that lead to floods during rainy seasons. The respondents from the private sector also reported difficulties with stock. Since they depend on imported goods to carry out the work, whenever there are delays it can affect the operations and minimize their work capacity.

The interview respondents all agreed that the population seems to be oblivious about proper waste disposal and the negative effects of plastic. Although 99.1% of the survey respondents have heard of recycling and waste selection, they do not have access to recycling systems. About 92% of the survey respondents stated that if they had access to recycling bins they would separate the waste according to each Eco point. This shows that the fact that the respondents acknowledge that there is a problem with plastic pollution and has felt affected by it; they are likely to dispose of MSW accordingly if given the chance.

The literature shows that the main concentrations of MSW take place in informal markets, wholesales and retail distribution areas, and street vendors. The interview respondents suggest that the reason why the MSW generated in these areas is because people are oblivious to their actions and are not aware of the harm they can cause, and also because people do not pay taxes or levies. If people had to pay for collection services and if they had levies on SUP items, it is believed that there would be more consciousness and possibly less waste would be generated.

#### **5.4 PBB, Levies and Taxes**

There was a plastic ban policy announced in Angola through a decree in 2015, it has not been implemented. Despite this announcement that seems to be under revision, out of the 4 interviewed respondents, 2 have not heard much and never heard of a follow up and the other 2 simply never heard of such. One of the respondents mentioned that in certain bakeries people are charged per bag and in some cases people take bags that are designated for bread to avoid paying the extra cost for the bag. The respondents believe that a PBB would be efficient, however one of them believes that in order for it to be efficient, awareness campaigns would have to be the main instruments, while the others believe that a ban would have a positive impact by incentivizing customers to carry their own bags and by creating new opportunities for existing manufacturers to innovate. One of the interview respondents mentioned that in other countries it is the norm for waste collection taxes to be collected, which relieves the government of such costs. Applying a similar method in Angola can be efficient since it would create financial means while simultaneously creating awareness of

collection services to the public, which could lead the public to hold the government accountable for providing improved infrastructures.

## **5.5 Stakeholders**

After analyzing the collected data, one of the main issues identified is difficulty in communication. In order to create and implement sustainable policies, communication within sectors should improve, in order for the information to be passed on intersectionality. In Rwanda, there were reports of miscommunication among sectors, and an example of this was between the financial sector and the government. The financial sector ended up funding a plastic manufacturer, which received a loan a week before the ban was announced, which then led the company to lay off their workers and close. Despite the miscommunication, the Rwandan respondent mentioned several times that there was collaboration among different governmental sectors and with REMA and the private sectors to seek alternatives and to work together towards a common goal. The same was the case with Kenya, as the Kenyan respondent mentioned that the collaboration among stakeholders was one of the main factors in the success of the ban. According to the Kenyan respondent, several governmental sectors such as NEMA, the Ministry of the Environment, the Kenyan Parliament, the Court and others lead to the enforcement of the ban. In Kenya, one of the reasons that the implementation of the ban was delayed was due to KAM and members of the private sector. They were displeased and attempted to delay and reverse the ban on many occasions. The Courts and green lobbying were the elements that helped enforce the ban during the private sector protests.

In the literature review regarding Angola, it was found that communication within the public sector is in need of improvement when the GPL failed to comply with the deadlines that were given by ANR. All of the interviewed respondents believe that the MTCA he ANR should enact as regulating entities to uphold policies. They believe both state entities should enact as the main stakeholders in regard to MSW. Respondent 1 believes that several government bodies should cooperate since MSW is an issue that affects several sectors and believes that the population should engage in the process. Respondent 2 suggests that municipal authorities engage in MSW management to help enforce future bans and levies on a small scale within localities. Respondents 3 and 1 believe that the population should have more of an involvement and believe that the presence of environmental associations can help solidify future policies. Based on the findings in Kenya, environmental associations and green movements have indeed played a key role in applying pressure and enforcing the ban, with aid of social media. The Kenyan respondent also stated that they believe one of the main reasons as to why the ban has been successful is due to the population's contribution through compliance. The results from the survey respondents indicate that when individuals are more aware

of issues they are more willing to comply and to be part of the solution. Respondent 4 believes the private sector can help shape consumer habits, which makes them important stakeholders.

## **5.6 PESGRU**

When asked to share opinions in regard to PESGRU, the respondents all agree that it is a well-elaborated plan, however it seems to be unrealistic given Angola's reality. In the literary review, it can be seen that PESGRU drew inspiration from western society and includes analyses from South Africa, Brazil and Portugal, countries that have significantly different realities and socioeconomic backgrounds in comparison to Angola. The respondents that work in the private sector have to abide by the rules established in PESGRU. They believe that the current decrees are important in maintaining and regulating work, however they believe that the financial crisis, lack of policy enforcement, lack of collaboration among sectors, lack of infrastructure and lack of taxing system all contribute to the failure of PESGRU. After looking at the socioeconomic data and policies that were implemented and enforced in Rwanda and Kenya, this research defends that one of the best options in terms of policy making and MSW management is to draw inspiration from countries that have a similar background to Angola that were able to successfully implement PBB and make sustainable changes that had several positive impacts.

PESGRU could benefit from a revision, in order to establish why none of the set goals were achieved, and to update the management plan with recent literature, in order to establish realistic short-term and long-term goals.



CHAPTER 6

## Best Practices in Rwanda and Kenya

The best practices implemented in Rwanda and Kenya was divided into 3: Informative, Economic and Regulations. These practices are believed to be suitable to be adapted and implemented in Angola.

Table 6.1- Best Environmental Practices in Rwanda and Kenya that could be applied to Angola

	Best Practices		How it could be
	Rwanda	Kenya	Angola
Informative	Sharing information through Umuganda	Green campaigns (i.e Green Belt Movement)	Maiombe Networks & Ngo's
	REMA Press releases	NEMA campaigns	ANR Press releases MCTA campaigns
	Awareness campaigns through TV, radio and other platforms	Awareness campaigns through social media platforms	Awareness campaigns through TV, radio, newspapers and social media
	Promoting environmentally friendly alternatives to plastic bags		Public and Private sector promoting alternatives to plastic bags
Economic	Fines	Levies Fines	Levies Fines

Regulations	Ban	Ban	Ban
	Inspections	Inspections	Inspections
	Umuganda Duties	Penalties (imprisonment)	An adaptation of the Umuganda concept
	Penalties (imprisonment)		Penalties (imprisonment)

## 6.1 Informative Practices

In order to encourage sustainable practices, the government in both Rwanda and Kenya opted towards information campaigns to spread awareness on the effects of SUPB and incentivize people to participate in proper waste management. The joint efforts of press releases, social media engagement, and community work through Umuganda and through green movement were deemed effective and could potentially yield results in Angola. Although green movements in Angola are not as prominent, there is a presence of environmental movements and with combined efforts, awareness campaigns can be carried out in collaboration with organizations such as the Maiombe Environmental Network and others. Since this topic covers various sectors, the campaigns could be a collaboration of several entities such as the Ministry of Culture, Tourism and the Environment, Ministry of Health, Ministry of Public Construction and Spatial Planning. In Rwanda, REMA started by focusing on awareness and after a couple of years the focus shifted to sharing information regarding the sanctions for not following the ban. The Kenyan respondent mentioned that NEMA raised awareness through campaigns and were able to spark public interest.

Public and private sectors in Angola can cooperate and create campaigns illustrating alternatives to plastic bags through TV commercials and reiterating the harms caused by plastic, including the negative effects it can pose to human health.

## 6.2 Economic Practices

Fines and levies are the tools that can aid in financing sustainable environmental practices. In Rwanda, fines and imprisonment were methods chosen to deter people from participating in the consumption and distribution of plastic bags. The fines in Kenya can amount to \$40,000 for anyone

who sold, produces and carried plastic bags and also include imprisonment. Fines and levies could be implemented in Angola as a way to increase the use of plastic bag alternatives, which could have an effect towards a circular economy, and the funds collected from the fines could go towards budgets allocated to MSW management.

### **6.3 Regulation Practices**

The ban is a form of regulation that has been deemed extreme but has proven to be effective in terms of reducing plastic waste. The plastic bag ban in Rwanda and in Kenya is similar, as both focus on prohibiting the use, import, manufacture and sale of plastic bags. The 12 million plastic bags that circulate on a daily basis in Luanda put a strain on proper waste management. The issues Luanda faces with high amounts of plastic bags circulating on a daily basis could potentially be mitigated with an effective ban. With the emergence of the black market, the ban was enforced by routine inspections in Rwanda. REMA counted on the collaboration of a special unit from the police department and border officers for the inspections. The inspections in Kenya were similar to Rwanda in terms of collaboration between the police, customs and NEMA. Routine inspections in Angola could be easily implemented with the collaboration of the MCTA, ANR and SME (migration and foreigners services), to have inspection in the borders. With joint effort, arrangements can be made to avoid plastic bag imports, and to inspect and enforce a possible ban in the manufacturing industry.

The Umuganda concept consists of community service for those between the ages of 18 to 64 that are physically able to perform tasks. When the ban was enforced, some of the activities included collecting plastic bags that were scarred across the community. It was one of the ways for the local authorities to explain the harm of plastic towards human health and the environment. This kind of regulation is a hands on approach that not only spreads awareness, but also creates the opportunity to re-educate communities and could deter improper waste disposal. This concept could be adapted to Angola's reality. There could be a law enforced that requests public and private institutions to meet certain metrics through corporate social responsibility and other concepts in which each institution would have to register their employees and students, so they can come together once a month and perform tasks related to their community such as beach cleaning, collecting litter, planting trees and more. There could also be a less intense version for primary and secondary schools, to cultivate proper waste management habits at an early age. After the tasks are performed, the participants and policy enforcers could exchange ideas and raise concerns.

In regard to imprisonment, Rwanda's ban can include up to 1 year of imprisonment for commercializing or selling plastic bags, while in Kenya it could be up to 4 years. The same could be

applied to Angola with the suggestion of adding community service as a sentence, in which people that were manufacturing or selling plastic bags would have to pay fines and participate in community service that includes working with waste management.

## **6.4 MSW Improvement Proposal**

After analyzing the literature review and the data collected through the surveys and interviews, the challenges highlighted in MSW collections are:

- Lack of waste collection due to access to certain areas such as musseques, which lead to the accumulation of plastic waste throughout the city, causing a negative impact on the landscape
- Lack of working conditions such as faulty roads and lack of lighting
- The absence of waste containers, which ends up overwhelming the limited containers and can make collection more difficult
- Waste disposal in improper areas such as abandoned spaces, along roadsides and others, which can lead to the propagation of diseases such as paludism and malaria
- Financial limitations
- Lack of population compliance, due to lack of awareness
- Lack of collaboration among the stakeholders in the public and private sectors.

Based on the best practices of Rwanda and Kenya, this chapter proposes a plan that could help mitigate plastic pollution in the city of Luanda. After establishing the issue of plastic pollution in Luanda and assessing why the issue exists, the proposed plan for improvement in regards to plastic pollution highlights 2 aspects that have the potential to tackle the issue. The 2 aspects lead to a ban of plastic bags.



Figure 6.2 – MSW Proposal Framework

#### 6.4.1 Information

The countries selected as case studies for this research demonstrated that information is a key element in plastic waste management. This practice is focused on the population, as it is believed that focusing on the population can be the most effective aspect in tackling plastic pollution. In order for a ban to be implemented, there has to be proper communication from the regulatory entities towards the public. As mentioned in the previous chapter, this should include the participation of the public and private sectors and the information should be spread out through awareness campaigns, TV commercials, newspapers and social media announcements. The ban should be announced between 12-18 months before it is enforced, which would allow the public and all parties involved to prepare for the changes ahead.

This time should also be given to the manufacturers and sellers of plastic bags, to give them time to restructure their business models and to dispose of their stock accordingly. There should be easily accessible information for small and medium vendors, and to those that lack legal awareness/literacy. Mandatory community engagement, similar to the Umuganda concert can be implemented 6-8 months after the announcement of the ban, to start building the sense of community and to have in person communication directly from the local authorities to the

participants. The first sessions of the community engagement can be limited to seminars and workshops that address plastic pollution, its effects and the importance of proper waste management.

Populations play a big part in understanding, complying and enforcing policies. The education sector should include environmental education in curriculums, in order to promote environmental literacy. This combination of information, if applied properly can influence the behavior and perspective across generations. Environmental education is a pivotal step towards the minimization of plastic pollution.

#### **6.4.2 Multi Sector Collaboration**

There is no doubt that a reform of the current MSW strategic plan is in need. A proper reform can occur through proper communication. After assessing the challenges the public sector has faced in Rwanda and Kenya, Angola can make efforts to improve communication skills within the private sectors through transversal communication in forums and meetings to ensure collaboration between different government bodies. These meetings should address the challenges and concerns each entity faces and should serve as a foundation point for policy announcement, revision and enforcement.

There should also be collaboration between the public sector and private sector, in which they can join forces to discuss policy enforcement, challenges and to promote sustainable environmental practices. The collaboration between all stakeholders involved can lead to policy implementation; financing, technological innovation and can promote a circular economy. Circular economy encompasses the lifespan of a product. It maximizes the use of a product by taking into account the design, conception and ability to be reused and repurposed.

The government can incentivize the public sector by providing tax exemptions for those able to comply with the policies and incorporate alternatives to plastic bags within their business models.

A reform of a waste management plan requires multi-sectoral collaboration of stakeholders and financing. Since financial limitations exacerbate the difficulties in waste management, waste collection taxes or fees should be added to utility bills. The fees should be charged on a residential and commercial basis. This would lessen the pressure from the government, while creating awareness on proper waste collection, and could serve as means to hold the government accountable for improving waste management. With these fees, the government could reattempt to open landfills with proper structures that would disable access from people that invade the landfills, ensuring their safety. These landfills should have proper conditions such as proper sorting areas, to ensure the material can be reused, by qualifying as sources of raw materials.

### **6.4.3 Ban**

Once the information, awareness and the collaboration between sectors improve, implementing and enforcing the PBB should yield similar results to the countries analyzed as case studies. The bans in both countries prohibit the manufacture, use, purchase, and sales of plastic bags. Since the studies show that despite that the ban was successful, it is suggested that governmental entities create a ban that also prohibits the manufacture, use, import and sale of plastic bags in order to reduce the pollution caused by plastic. Once announced, manufacturers should be given a grace period, in which they can adapt and remodel their businesses according to the new policies. The stakeholders should collaborate on a national level to enforce the ban, by elaborating a policy framework designated to enforce the ban and by creating designated inspection forces in the borders and within the manufacturing industries. During the grace period, the public sector should collaborate with the private sector, to ensure that there are minimal job losses. The multi sector collaboration should mitigate problems that could arise such as the emergence of a black market and potential setbacks from the business workforce.



## CHAPTER 7

# Conclusion and Future Considerations

This research aimed to characterize the situation of plastic pollution and the environment in Angola; more specifically it detailed the case of plastic pollution in Luanda; assessed the challenges in relation to waste management; identified solutions that could help solve or mitigate the problems that were identified.

Waste management is a complex task, as it encompasses a combination of environmental, ecological, political, technical and socio-economic aspects, to promote sustainability and proper solid waste management. It was concluded that plastic pollution poses a severe health threat to the population of Luanda and Angola as a whole, pollutes the landscape, lessens the quality of life and does not meet the requirements of article 24 of the Angolan constitution that states that citizens have the right to inhabit a healthy and unpolluted environment. This research establishes that although there are current measures to mitigate plastic pollution, they have not been sufficient and require a multi-sectoral approach to reform PESGRU and implement a ban on plastic bags and create policies to enforce it. Countries with similar socio-economic backgrounds have been able to implement PBB successfully despite facing challenges, proving that it can be possible. In sum, a reformed waste management plan that consists of effective communication through awareness campaigns, combined with stakeholder collaboration and a plastic bag ban may help solve the plastic problem in Luanda.

Throughout the research, there were a few limitations that took place. The literature regarding plastic and waste management in Angola was limited and some of the existing options were written over a decade ago. Furthermore, during the time the interviews and surveys were carried out, some of the participants that were originally contacted had conflicting schedules, while others preferred to opt out due to a belief that replying to the questions would criticize the governance of local authorities. The pandemic also posed limitations, as the interviews and surveys were carried out online due to the covid-19 restrictions.

While this research focused specifically on plastic bags, it is recommended that further studies analyze the effects of single use plastic items. Future studies should seek to understand the reasons that lead to failure of PESGRU and should analyze the effects of the ban of single use plastic in developing countries to assess if it is feasible in countries that depend on imports and lack the means for proper waste management.



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## Appendix A



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Com esta entrevista pretende-se obter informações sobre a **Problemática do Plástico na cidade de Luanda**. O objetivo desta entrevista é de auxiliar uma investigação no âmbito do Mestrado em Estudos do Ambiente e da Sustentabilidade do Instituto Universitário de Lisboa (ISCTE) para a elaboração da respetiva dissertação. Todo tipo de informação recolhida é estritamente confidencial. Por favor responda com sinceridade. A sua opinião é muito importante. Obrigada pela colaboração.

**Portuguese:**

**Angola**

**Introdução:**

1. Qual é a sua ocupação atual?
2. Há quanto tempo ocupa esta posição?
3. Quais são os principais desafios do seu trabalho?
4. Já considerou a poluição um problema para si / membros da sua comunidade? Se sim, Que tipo de poluição?

**Situação atual:**

1. Quais são os principais efeitos do plástico em Angola no seu ponto de vista?
2. Qual é a situação atual de Angola em relação ao plástico e à recolha de resíduos urbanos?
3. Quais são os desafios existentes?
4. Já existem propostas relativas à proibição do uso de sacos de plástico?
5. Acha que a inclusão de taxas ou uma proibição completa seria um passo efetivo?
6. Quais seriam os setores envolvidos e responsáveis pela implementação de um plano de gestão de resíduos sólidos urbanos/legislações relativas ao uso do plástico?

7. Que setores em Angola se beneficiaram com a proibição de sacos de plástico/sistema de reciclagem?
8. Que setores em Angola se prejudicariam com a proibição de sacos de plástico/sistema de reciclagem?
9. Está familiarizado com o PESGRU? Se sim, o que acha do plano?
10. Porquê que o PESGRU não atingiu as suas metas?
11. Na sua opinião, dada a situação atual, quais são os próximos passos a serem seguidos?
12. Gostaria de adicionar algum ponto ?

**English:**

This interview aims to obtain information about the **Plastic Problem in the city of Luanda**. The purpose of this interview is to support an investigation within the scope of the Master in Environmental and Sustainability Studies at the Instituto Universitário de Lisboa (ISCTE) for the preparation of the respective dissertation. All information collected is strictly confidential. Please answer sincerely. Your opinion is very important. Thank you for your collaboration.

**Angola**

Introduction:

1. What is your current occupation?
2. How long have you held this position?
3. What are the main challenges of your work?
4. Have you considered pollution a problem for you / your community members? If yes, what kind of pollution?

**Current situation**

1. What are the main effects of plastic in Angola from your point of view?
2. What is the current situation in Angola in relation to plastic and municipal waste collection?
3. What are the existing challenges?
4. Are there already proposals on banning the use of plastic bags?
5. Do you think adding fees or a complete ban would be an effective step?
6. Which sectors would be involved and responsible for implementing an urban solid waste management plan/legislation related to the use of plastic?
7. Which sectors in Angola benefited from the plastic bag ban/recycling system?
8. Which sectors in Angola would be harmed by the ban on plastic bags/recycling systems?
9. Are you familiar with PESGRU? If yes, what do you think of the plan?

10. Why did PESGRU not reach its goals?
11. In your opinion, given the current situation, what are the next steps to be taken?
12. Would you like to add some points?



## Appendix B



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This interview aims to obtain information about the **Plastic Problem in the city of Luanda**. The purpose of this interview is to support an investigation within the scope of the Master in Environmental and Sustainability Studies at the Instituto Universitário de Lisboa (ISCTE) for the preparation of the respective dissertation. All information collected is strictly confidential. Please answer sincerely. Your opinion is very important. Thank you for your collaboration.

### **Rwanda and Kenya:**

1. What is your current occupation?
2. For how long have you had this position?
3. Before the ban, what were the impacts of plastic in Rwanda/Kenya?
4. Which were the expectations of the plastic ban?
5. Who were the main actors to carry out and enforce the ban?
6. How was the transition from plastic bags to no plastic bags?
7. How did the public react ?
8. Were there any difficulties introducing alternatives to the public?
9. Which sectors were negatively impacted?
10. Were there any forms of governmental aid for the sectors negatively impacted?
11. What are the positive effects of the ban?
12. (For Kenya) In your opinion what delayed the implementation of the ban on plastic bags?
13. (For Rwanda) Can you explain the concept of Umuganda?
14. Given the positive outcomes, would you urge a country like Angola to opt for a plastic ban?
15. Knowing about the outcomes of your country, what do you think should have been done differently?



## Appendix C



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Com este questionário pretende-se obter informações sobre a **Problemática do Plástico na cidade de Luanda**. O objetivo deste inquérito é de auxiliar uma investigação no âmbito do Mestrado em Estudos do Ambiente e da Sustentabilidade do Instituto Universitário de Lisboa (ISCTE) para a elaboração da respetiva dissertação. Todo tipo de informação recolhida é estritamente confidencial. Por favor responda com sinceridade. A sua opinião é muito importante. Obrigada pela colaboração.

1- Idade:

- a. Menos de 18 anos
- b) De 18 a 25 anos
- c) De 26 a 40 anos
- d) Mais de 40 anos

1.1- Sexo:

- a. Masculino
- b) Feminino

1.2- Habita em que Município:

Belas Cacuaco Cazenga Icolo e Bengo Luanda Quiçama Kilamba Kiayi Talato

2- Qual é o seu nível de escolaridade?

- a. Ensino Primário
- b) Ensino Secundário
- c) Ensino Superior

3- Tem acesso a contentores de lixo na sua zona ou bairro?

4- Na sua opinião existe um problema de poluição de plástico na cidade de Luanda?

Discordo totalmente, discordo, não concordo nem discordo, concordo, concordo muito

5- Já ouviu falar de reciclagem e separação de resíduos ?

6- Os contentores mais próximos da sua casa ficam a que distância?

- a. Menos de 100 m      b) 200-300m      c) 300-500 m      d) Mais de 500 m      e) Não sei

7- Com que frequência é feita a recolha de lixo no seu bairro?

Nunca, Raramente, ocasionalmente, frequentemente, muito frequente

8- Está satisfeito/a com os serviços de recolha das autoridades locais?

Muito insatisfeito/a    insatisfeito/a    neutro    satisfeito/a    muito satisfeito/a

9- Qual o tipo de resíduo que mais produz em casa?

Plástico    Papel    Metal    Resíduo orgânico    vidro    outros

10- Na sua casa praticam a separação de resíduos?

Sim              não              so quando algumas coisas conseguem ser reaproveitadas

11- Se não, por que não o fazem?

- a. Nunca pensamos em tal coisa    b) Não gosto              c) Dá muito trabalho

12- Já se sentiu afetado/a por poluição plástica?

Nunca, Raramente, ocasionalmente, frequentemente, muito frequente

13- Se nos pontos de recolha de lixo tivessem ecopontos (vários contentores para a recolha seletiva de plástico, papel, vidro, etc) depositaria o lixo de acordo a cada ecoponto?

Discordo totalmente, discordo, não concordo nem discordo, concordo, concordo muito

14- Se a recolha de lixo for implementada, estaria disposto/a colaborar?

Discordo totalmente, discordo, não concordo nem discordo, concordo, concordo muito

15- Existem doenças associadas à poluição plástica, tais como paludismo, malária e dengue. Nos últimos 3 anos você ou alguém da sua casa foi afetado com uma dessas doenças?

Sim Nao

16- Se sim, qual delas?

Paludismo Malaria Dengue

17- Para si, é importante viver num meio ambiente sadio e não poluído?

Sem importância, pouco importante, razoavelmente importante, importante, muito importante

#### Tables:

Table 4.1 - Sociodemographic Characterization (N = 225)

	N	%
<b>Gender</b>		
Female	128	56,9
Male	97	43,1
<b>Age</b>		
< 18	17	7,6
18 -25	35	15,6
26-40	109	48,4
41-60	57	25,3
> 60	7	3,1
<b>Education</b>		
Primary School	1	,4
Secondary School	29	12,9
Higher Education	195	86,7
<b>Municipality</b>		
Belas	37	16,4
Cazenga	4	1,8
Kilamba Kiayi	25	11,1
Luanda	102	45,3
Talatona	43	19,1
Viana	14	6,2

Table 4.2 - There is a problem of plastic pollution in the city of Luanda

	N	%
Completely disagree	2	,9
Disagree	2	,9
Do not agree nor disagree	1	,4
Agree	40	17,8
Completely agree	180	79,6
Total	225	100,0

Table 4.3 - Do you have access to garbage containers in your area or neighborhood?

	N	%
No	20	8,9
Yes	205	91,1
Total	225	100,0

Table 4.4- Where do you deposit the waste produced in your home?

	N	%
Garbage containers	208	92,4
Abandoned spaces	5	2,2
Other	7	3,1
Open ditches	5	2,2
Total	225	100,0

Table 4.5 - How far are the closest containers to your home?

	N	%
100-200 m	61	27,1
200-300 m	25	11,1
300-500 m	18	8,0
Less than 100 m	103	45,8
Over 500 m	18	8,0
Total	225	100,0

Table 4.6- How often is garbage collected in your neighborhood?

	N	%
Frequently	131	58,2
Very frequent	31	13,8
Never	2	,9
Occasionally	46	20,4
Rarely	15	6,7
Total	225	100,0

Table 4.7- Which type of waste do you produce the most at home?

	N	%
Metal	1	,4
Other	18	8,0
Paper	16	7,1
Plastic	63	28,0
Organic waste	126	56,0
Glass	1	,4
Total	225	100,0

Table 4.8 - Would you deposit the waste according to each Eco point?

	N	%
Disagree	2	,9
Do not agree nor disagree	14	6,2
Agree	59	26,2
Completely agree	148	65,8
Total	223	100,0

Table 4.9 - Have you ever heard of recycling and waste separation?

	N	%
No	2	,9
Yes	223	99,1
Total	225	100,0

Table 4.10- Are you satisfied with the collection services provided by the local authorities?

	N	%
Very unsatisfied	54	24,0
Unsatisfied	90	40,0
Neutral	42	18,7
Satisfied	36	16,0
Very Satisfied	3	1,3
Total	225	100,0

Table 4.11 - Have you ever felt directly affected by plastic pollution?

	N	%
Never	7	3,1
Rarely	17	7,6
Occasionally	62	27,6
Frequently	80	35,6
Very frequent	59	26,2
Total	225	100,0

Table 4.12 - Have you or someone in your household been affected by one of these diseases?

	N	%
No	68	30,2
Yes	157	69,8
Total	225	100,0

Table 4.13 - Is it important to live in a healthy and unpolluted environment?

	N	%
Important	10	4,0
Very important	213	94,7
Not so important	1	,4
Moderately important	1	,4
Total	225	100,0

Table 4.14 – Comparison by municipality

	Mean	Standard Deviation	Sig.
Belas	2,19	1,07	,832
Kilamba Kiaxi	2,24	1,12	
Luanda	2,38	1,06	
Talatona	2,23	,97	
Viana	2,36	1,00	
Total	2,30	1,04	

Table 4.15 – Comparison by gender

	Mean	Standard Deviation	Sig.
Female	2,27	1,091	,434
Male	2,35	,987	

Table 4.16– Comparison by education

	Mean	Standard Deviation	Sig.
Secondary school	2,37	,99	,573
Higher education	2,29	1,05	

Table 4.17- Comparison by age

	Mean	Standard Deviation	Sig.
Up to 25	2,42	1,07	,521
26-40	2,23	1,00	
> 40	2,33	1,09	

Table 4.18 Comparison by Municipality

	Mean	Standard Deviation	Sig.
Belas	3,38	,861	.028*
Kilamba Kiaxi	3,84	,688	
Luanda	3,83	,705	
Talatona	3,88	,905	
Viana	3,86	1,027	
Total	3,77	,807	

\*  $p \leq .05$

Table 4.19 – Comparison by gender

	Mean	Standard Deviation	Sig.
Female	3,78	,866	,620
Male	3,76	,725	

Table 4. 20 – Comparison by education

	Mean	Standard Deviation	Sig.
Secondary school	3,67	,80	,410
Higher education	3,79	,80	

Table 4.21 – Comparison by age

	Mean	Standard Deviation	Sig.
Up to 25	3,56	,93	,089
26-40	3,80	,77	
<b>&gt; 40</b>	<b>3,89</b>	<b>,72</b>	

## Appendix D



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Com este questionário pretende-se obter informações sobre a **Problemática do Plástico na cidade de Luanda**. O objetivo deste inquérito é de auxiliar uma investigação no âmbito do Mestrado em Estudos do Ambiente e da Sustentabilidade do Instituto Universitário de Lisboa (ISCTE) para a elaboração da respetiva dissertação. Todo tipo de informação recolhida é estritamente confidencial. Por favor responda com sinceridade. A sua opinião é muito importante. Obrigada pela colaboração.

1-De acordo a sua experiência médica, a poluição plástica e falta de recolha de resíduos na cidade de Luanda afeta diretamente a saúde da população?

Discordo totalmente, discordo, não concordo nem discordo, concordo, concordo completamente

2-Atende pacientes com paludismo, malária e dengue com que frequência?

Nunca, Raramente, ocasionalmente, frequentemente, muito frequente

3-Quais são os pacientes mais afetados por essas doenças?

Homens Mulheres Crianças com menos de 12 anos Crianças de 12 para cima outros

4-Dos pacientes afetados, com que frequência atende pacientes de classe média/alta?

Nunca, Raramente, ocasionalmente, frequentemente, muito frequente

5-Com que frequência atende pacientes de renda média/baixa?

Nunca, Raramente, ocasionalmente, frequentemente, muito frequente

6-Na sua opinião médica, as condições ambientais nos hospitais de baixa renda contribuem na propagação das doenças acima mencionadas?

Discordo totalmente, discordo, não concordo nem discordo, concordo, concordo muito

7-No período em que suspenderam a recolha de lixo (Novembro 2020 até Abril 2021) houve um aumento de casos de paludismo, malária, dengue e febre tifóide?

Discordo totalmente, discordo, não concordo nem discordo, concordo, concordo muito

8-Na sua opinião, um plano de recolha de resíduos efetivo resultaria em menos casos de paludismo, malária, dengue e outras doenças associadas à poluição plástica?

## Tables

Table 4.22 -Plastic Pollution directly affects the health of the population?

	N	%
Agree	3	13,6
Strongly Agree	19	86,4
Total	22	100,0

Table 4.23- Patients care: Malaria, dengue and typhoid fever

	N	%
Never	4	18,2
Occasionally	2	9,1
Frequently	4	18,2
Very frequent	12	54,5
Total	22	100,0

Table 4.24 - Which groups are most affected by these diseases?

	N	%
Lower class	9	40,9
Lower-middle class	7	31,8
Everyone is equally affected	6	27,3
Total	22	100,0

Table 4.25 -Within these classes, which sub-group is most affected?

	N	%
Children	20	90,9
Men	1	4,5
Women	1	4,5
Total	22	100,0

Table 4.26 -Is there a plastic pollution issue in Luanda?

	N	%
Agree	8	36,4
Strongly agree	13	59,1
Disagree	1	4,5
Total	22	100,0

Table 4.27- Do environmental conditions in low-income hospitals contribute to the spread of the aforementioned diseases?

	N	%
Disagree	1	4,5
Do not agree nor disagree	6	27,3
Agree	10	45,5
Strongly agree	5	22,7
Total	22	100,0

Table 4.28 - Was there an increase in malaria cases during the period that the waste companies suspended their services from November 2020 to December 2021?

	N	%
Do not know	5	22,7
Yes	17	77,3
Total	22	100,0

Table 4.29 - Would an effective waste collection plan result in fewer cases of the aforementioned diseases?

	N	%
Agree	9	40,9
Completely agree	11	50,0
Disagree	1	4,5
Do not agree nor disagree	1	4,5
Total	22	100,0

**Other tables and supporting items**

Table 3.1- Comparison of Socioeconomic data of Angola, Rwanda and Kenya (combined data from Index mundi, 2021 and Heritage 2021)

Socioeconomic Factors	Angola	Kenya	Rwanda
GDP per Capita (USD)	2791	2,039	819
HDI	0.58	0.60	0.48
Population in 2021	33933611	54985,702	13,276,517
Size	1246700km2	582,600 km2	26,338 km2
Gained independence	1975	1963	1962
Years of conflict	27 years	Approximately 30+ years (Political liberation achieved in the 1990s) Heritage, 2021	35
Adult literacy rates in 2014	66.03	81.53	73.22
Youth literacy rates in 2014	77.43	87.83	86.49
CO2 Emissions (million tonnes) in 2021	24.5%	22.4%	1.2%
Life Expectancy in 2020	61.5	67	69.3
Infant mortality rate in 2020	48.3%	31.2%	30.3%
Corruption perceptions index 2021	29	30	53