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Plastic waste: Debate about Law banning plastic bags in Angola: The advisory policy to a Member of Parliament (MP) of RMLA (Revolutionary Movement for Liberation of Angola) in Angola

Charles Karangwa[1]

[1] PPE Master of Arts at University of Witten/Herdecke, Germany.

Address for Correspondence:

Charles Karangwa, PPE Master of Arts at University of Witten/Herdecke, Germany.

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Abstract Plastic pollution has always been a challenge to human life and environment worldwide. It is undoubtable that the plastic waste continues to increase in aquatic and terrestrial areas due to high consumption of goods packed in plastics. The Covid-19 pandemic has contributed to its increase due to the quick development of the digital business whereby the restaurants and other catering companies are delivering their products in plastics at home. In that context, it has been recently declared by UN that more than 11 tones millions are dumped in oceans every year causing a huge burden on earth's ecosystem health.

Therefore, I established and suggested an advisory policy to the MPs of one of Angolan political Parties RMLA based on analysis of impact of plastic waste in the city of Luanda after evaluation of some measures that have been taken over the years. This research paper is meant to provide some of the solutions to the current human and environmental problems caused by the poor waste management of plastic waste in Angola. It has also been an opportunity to explore all possible solutions to the current challenges at hand. In several African countries, lawmakers have enacted the legislation to protect the environment from contamination due to increased plastic pollution. For that reason, this research aims at evaluating the strategic measures that have been implemented in some African developing countries. For the realistic analysis and solutions, I chose to explore the law about the sustainable development in Rwanda and Kenya, as two African countries that have successfully implemented a plastic bag ban and are in the final stages of implementing a single-use plastic ban.

Keywords Plastic waste, environment protection, Plastic bag ban, plastic pollution

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Introduction

Plastic waste has been a major focus for academics and scholars in recent years, but despite their efforts, the governments in several countries have not taken the necessary measures to deal with the growing environmental pollution produced by plastics (Jambeck et al., 2018). Literature on the subject, however, does not include much evidence of studies focusing specifically on the effect of plastic garbage in Luanda city and other Angolan cities, where our research study took place. This Paper research points out a gap in the existing political policy about plastic waste in Angola by characterizing the current situation regarding plastic pollution and waste collection through analysis of the reasons for the pollution and the challenges that the population is facing.

After identifying a huge gap in environment policy related to plastic waste management in many African countries, I decide to write and publish this research paper to provide some African policymakers with a couple of measures and strategies helpful in tackling and handling the environmental challenge in their respective countries. According to the UN, more than 800 marine and coastal species are affected by plastic pollution through ingestion and entanglement, while about 11 million tons of plastic waste are dumped into the ocean every year. The UN warns that this figure could triple by 2040 (Eriksen et al. 2023).

Therefore, the Angolan Government, after hearing the ultimatum of the UN, has established a task force to draft an anti-plastic law that might be firstly voted by the parliament and implemented in the country.

Furthermore, as an adviser to a Member of Parliament for RMLA political party in Angola, I analyzed all impact of the plastic waste as well as potential effects of new law to Angolan society and neighboring countries.

Finally, I came out with a drafted law clarifying potential solutions that will help the RMLA political party to provide a good contribution in parliament as well as to take appropriate political decisions to fight against the negative effect of plastic waste, because there are worrying levels of pollution resulting from the use of plastic in general.

Finally, as the African Union's 2015 Agenda 2063focuses on inclusive and sustainable development actioned through 10-yearimplementation plans. These plans call on African cities to commit to recycling at least 50% of urban waste by 2023. The agenda also recognizes that sustainable consumption and production measures are important for the blue economy (AU, 2015).

1. Background of the study

Plastic waste in Angola is a pressing environmental and socio-economic issue that involves the improper disposal, accumulation, and mismanagement of plastic materials within the country. Angola, like many other African nations, faces challenges related to the proliferation of plastic waste due to its convenience, durability, and low cost. However, the lack of efficient waste management systems and inadequate awareness about the consequences of plastic pollution exacerbate the problem.

After identifying the consequences caused by the problem of plastic pollution in Angola and assessing all the reasons why the plastic waste issue prevails, I consolidated the strategies for improvement regarding plastic pollution which are hereby highlighted. In this paper, I will therefore tackle the strategic measures for solving the issue of the plastic waste issue in Angola. Based on the best practices of some African countries namely Rwanda and Kenya, it is important to propose a drafted plan combining different strategies that could help to mitigate plastic pollution in the city of Luanda and Angola in general. Those measures might lead to a ban of plastic bags in Angola as it has been done in Rwanda or Kenya so far.

2. A statement of the research problem

Plastic waste has emerged as a global environmental concern due to its persistence in ecosystems, negative impacts on biodiversity, and contribution to various environmental and human health issues. In the context of Angola, a rapidly developing country with a growing industrial sector and urban population, the problem of plastic waste management poses significant challenges. The research problem revolves around understanding the complex socioeconomic and environmental implications of plastic waste in Angola and identifying as well as analysing effective strategies for mitigation and its sustainable management. Therefore, the following research questions are hereby highlighted:

- ✓ Analyze the impact of plastic waste in Angola and A fricagenerally as well as looking for possible solutions to the current problems caused by the poor management of plastic waste.
- ✓ Evaluate the strategic measures to be taken by the Angolan government while dealing with the growing environmental pollution produced by plastic waste

3. A statement of the position

Plastic pollution has become a significant environmental concern globally, and Angola is no exception. The hypothesis to be defended is that the plastic pollution crisis in Angola is a result of a complex interplay of economic, social, and environmental factors, and the lack of infrastructure and policy implementation as well as the global influence and international partnerships which requires collaborative efforts between nations.

In fact, the plastic pollution crisis in Angola is a multifaceted issue resulting from the intricate interplay of economic, social, and environmental factors. Addressing this crisis necessitates comprehensive strategies that involve awareness campaigns, education, policy reform, waste management infrastructure development, and international cooperation. By understanding and addressing these complex factors, Angola can work toward a more sustainable and plastic-conscious future.

4. A characterization of the method

Research methods concerning plastic waste in Angola has typically involved a combination of qualitative and quantitative approaches to comprehensively understand the issue. The adopted methodology took into account the combination of those academic researches approaches about Kenya and Rwanda. During the gathering of information, I used the collection of secondary sources in the form of articles, journals, books and many others cited along. The research takes an exploratory and comparative approach since it uses some established policies in some selected African countries as examples for possible solutions of plastic waste policy that could potentially be implemented in Angola.

Despite many adversities they faced, the two selected countries share similarities with Angola in terms of historical colonization, political conflicts, and economic constraints, but they managed to successfully implement some strategic measures including plastic bags 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. I opted for these two countries instead of developed countries due to the large disparities between developed and developing countries.

Finally, it is difficult to find holistic studies and research concerning recycling and the implementation of environmental legislation in developing countries because this field is 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. In that regard, this research aims exploring the impact of plastic in Angola, policies and legislation implemented in other African countries by assessing their effectiveness, and providing solutions that can be implemented countrywide.

5. An overview of the structure of the main part

The structure of the main part for this research paper is made of different topics namely definitions, background information of Angola, reconstruction of research examples and argument for category as well as conclusion about the policy decision at hand.

Chapter I. Main Part: Empirical Research

1. Definition

By definition, plastics are known as polymers or a “long chains of monomers,” which are bonded to other identical subunits to form a polymer. Polymers can be of natural origins, such as cellulose as the basic subunits that make up plant cell walls and helps cells to adapt their functions. Cellulose is known as one of the most abundant biopolymers on earth. The first synthetic polymer was discovered around 1869 by John Wesley Hyatt. It was highly expensive as compared to polymeric materials. By properly treating cellulose polymer derived from cotton fiber with camphor, John Wesley invented a plastic that could be changed into various shapes and made to reproduce natural substances including linen, horn, and tortoiseshell that could be useful in plastics production.

In this project paper, as an adviser to MP of a fictious political party called RMLA in Angola, I would like to present a good policy including the possible strategic measures about plastic waste management in Angola referring to the good successful examples in Africa namely Rwanda and Kenya. Finally, I will point out the holistic academic research about the situation of plastic waste in Angola, that will be helpful in consolidating and agreeing upon the good policy for my political party.

2. The interpretivism approach

Interpretivism, also known as interpretivist involves researchers to interpret elements of the study, thus interpretivism integrates human interest into a study. Accordingly, "interpretive researchers assume that access to reality (given or socially constructed) is only through social constructions such as language, consciousness, shared meanings, and instruments" (Myers, M.D., 2008). Development of interpretivist philosophy is based on the critique of positivism in social sciences. Accordingly, this philosophy emphasizes qualitative analysis over quantitative analysis.

Interpretivism is "associated with the philosophical position of idealism, and is used to group together diverse approaches, including social constructivism, phenomenology and hermeneutics; approaches that reject the objectivist view that meaning resides within the world independently of consciousness" Collins, H. (2010). According to interpretivist approach, it is important for the researcher as a social actor to appreciate differences between people (Saunders, M., Lewis, P. & Thornhill, A., 2012) Moreover, interpretivism studies usually focus on meaning and may employ multiple methods in order to reflect different aspects of the issue.

3. The naturalism approach

Naturalism is a deep trend in philosophy, rather than a precise doctrine, with multiple connections in many areas of science and culture. Its starting point is the belief that nothing exists outside nature. It has been developed throughout history along two main directions. Ordinary naturalism relies on commonsense and everyday human practices to uncover reality, while scientific naturalism, dominant today, takes nature to be what physics tells us exists, and natural science to be the sole provider of genuine knowledge, (Papineau, 1993). Cognitive science and evolutionary biology attempt to account for mental and social phenomena in naturalistic terms.

4. More details on the policy decision to be discussed: Background of Angola

I would like to start with information background of Angola as formerly a Portuguese colony. Historically, Angola gained independence in 1975 and it is a country rich in natural resources, the second largest producer of oil and third-largest producer of diamonds in Africa. The country has about 35 million inhabitants, 60% of whom are young. However, it continues to face the challenge of reversing this wealth to benefit the people, two-thirds of whom live on less than two American dollars a day. In 2017 the Human Development Index placed Angola in the group of countries with a low development index of 0.533, and the country is known for the vast social discrepancies between its haves and have not's. Following the end of the civil war in 2002, Angola became one of the fastest growing economies in the world. Its economy was stimulated by a substantial increase in oil production and the exponential increase of prices from 20 to 147 American dollars per barrel between 2002 and 2008, making it the third largest economy in sub-Saharan Africa (Pearce et al., 2018). Although it was formally known as a developing country, it is facing a great challenge of plastic waste management due to the fact it is located on the western Atlantic Coast of Southern Africa between Namibia and the Republic of the Congo.

Therefore, the current president of Angola has declared that there are "worrying levels of pollution resulting from the use of plastic in general". He said that in Angola, 12.4 million plastic bags are distributed for free every day in trade. Angola has a 1,600-kilometre coastline and plastic pollution is a real threat to aquatic ecosystems.

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

In that context, as an adviser to the member of parliament of RMLA, this year I am drafting a policy meant to hasten the fight against the plastic waste with a national diagnosis to "measure the state of pollution" in the country.

In this advisory policy, I will show and analyze the impact of the plastic waste and prepare potential solutions that will help my political party to give good contributions in plenary parliament that will take place at the end of this month in Luanda as well as to take appropriate political decisions; because there are worrying levels of pollution resulting from the use of plastic in general.

5. Legal background: 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. However, recently in 2012, 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).

As long as the government realized that environmental pollution is a constant, resulting from activities designed by mankind to promote economic development (Amado Gomes, C., 2012) without taking any decisive measures for mitigating the plastic waste; my political parth as recognized the need for a legal framework and policy to implement waste management and by incorporating the position of our political party that will be suggested to the government in order to fulfil the duties mentioned in the legislation about the environment.

In this new policy, the aim is to present potential solutions by defining 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 policy about the regulation for the Transfer of Waste for Reuse, Recycling and its

Recovery relates to the procedures regarding administrative and operational control that overlooks "the transfer of waste for reuse, recycling and its recovery abroad" has to be developed. This is only in regard to non-hazardous waste intended to be transferred abroad from recovery, reuse, and recycling.

Chapter II: Categorizing the Research: Reconstruction of Research Examples

Due to the occurrence of academic research about plastic waste in Africa, I analyzed the so far established interpretivist researches summarizing the comparison of findings for quantitative research about plastic waste that led to the law banning the plastic bags in Rwanda and Kenya. The analysis of the exploratory quantitative and qualitative research about plastic waste management in the above-mentioned countries might serve as a blueprint for Angola and other African countries.

1. Examples of Rwanda and Kenya

For analytical purposes, Rwanda and Kenya are the countries chosen to assess socioeconomic aspects and waste management practices, namely single use plastic bans as best examples in Africa. In this part, I will illustrate the backgrounds of the countries in question and their stance on single use plastic bags, how it was achieved and considered.

2. Interpretivism: Summary of the findings of Quantitative research about Rwanda's plastic bag ban

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^2, with an estimated population density of 445 people per km^2. 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

After a holistic 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 100microns thick, and in 2008 the ban on the use of plastic bags came into effect (Behuria, 2021)

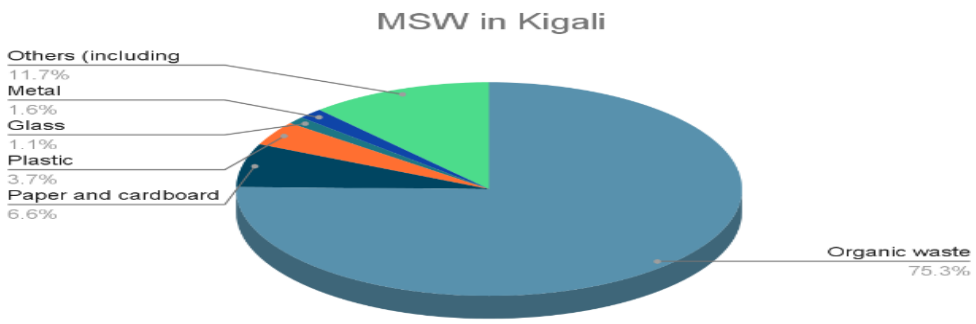


Figure 2.6- The composition of MSW in Kigali (Fidele Iraguha et al 2022).

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

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; (CH2 = CH2)." (REMA, 2009). To enforce the ban, the Rwandan government used some strict policy instruments such as fines and imprisonment (up to 1 year) as adeterrent, in addition to other instruments such as information campaigns suggested in the study carried out by Kabenga and Musabe in 2003.

3. Interpretivism: Summary of the findings of Quantitative research about Kenya's plastic bag ban

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 km2 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).

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

The country of Kenya is notorious in Africa 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.

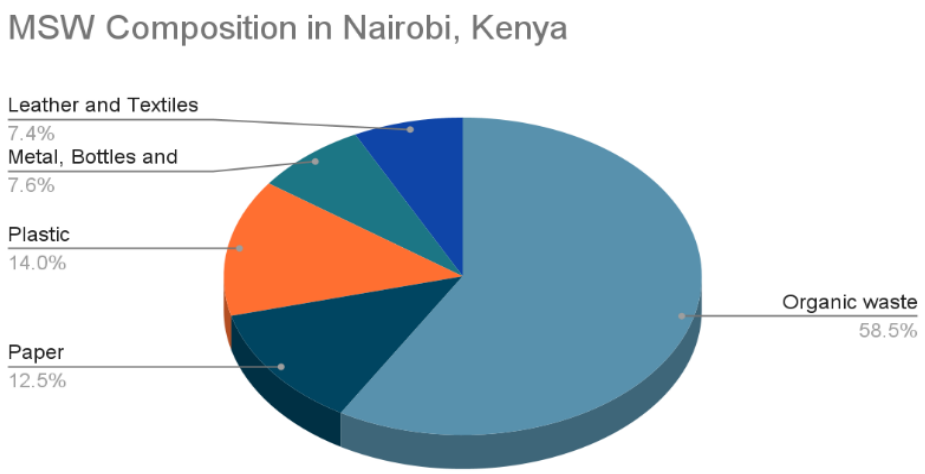


Figure 2-8- MSW composition in Nairobi, Kenya (Kabeyi, Moses & Olanrewaju, Oludolapo 2021).

Chapter III: Argument for category

1. Which category and research should be used and preferred for the policy decision at hand?

After analyzing the policy of plastic waste in Rwanda and Kenya, I would like to recommend the MPs of RMLA in Angola to step in the Rwandan environment policy. As long as Angola is a country in southern African region touching the ocean, the coastlines, where plastic wastes are rapidly produced and exposed at a high rate due to the world's industrial development and population growth, the government should establish a clear and strict environmental policy and law to be implemented throughout the country. As known, plastics are constituted of both biodegradable and non-degradable wastes which are highly generated from man-made activities (operational sectors and climatic conditions, industrial growth, socio-economic development) and the natural processes of living creatures. Therefore, I propose and recommend the Government municipalities, social communities, and local authorities to follow the example of Rwanda by establishing and implementing the different strict measures and environmental safety legislation rules that will guide the population to dispose of plastic waste after utilization.

Moreover; in this part, I also recommend to raise the awareness level among the population. The drafted policy including potential solutions will be submitted to the MPs of RMLA with hope to help the Angolan government to effectively manage the plastic waste. Further, I advise the MPs of RMLA to take into account the waste management strategies such as recycling, incineration, bioremediation, and landfills. These strategic methods are established to have a clean environment and good plastic waste disposal.

Chapter IV: Conclusion about the policy decision at hand

In this part, it is important to emphasize that I will first of all point out all qualitative and quantitative researches that I will present to all MPs of RMLA describing why we should ban plastic bags in Angola.

I will summarize the impacts of plastic waste clarifying that plastic bags pollute land and water. They are made from non-renewable sources, they require a lot of energy to produce, plastic bags are toxic, they don't degrade, plastic bags are dangerous to wild and marine life, plastic bags are harmful to human health, plastic bags are not easy to recycle, plastic bags are produced in massive quantities, Consumers are reluctant about recycling plastic bags, Plastic bags are disposable, plastic bags clog storm drains, plastic bags are a major contributor to landfills, Bans can reduce plastic bag waste, a ban can help keep the environment clean, it can save money, it is a proven approach in some countries, a ban will raise awareness, the ban would be easy to apply, it would be a big relief to the governments. Angolan government is currently trying to solve environmental challenges. Banning plastic bags would mean Angola has one less pollutant to deal with.

1. Effects of plastic waste

Many countries lack the infrastructure to prevent plastic pollution such as: sanitary landfills; incineration facilities; recycling capacity and circular economy infrastructure; proper management and disposal of waste systems. This leads to 'plastic leakage' into rivers and the ocean. The legal and illegal global trade of plastic waste may also damage ecosystems, where waste management systems are not sufficient to contain plastic waste.

✓ Impacts on marine ecosystems

The most visible impacts of plastic debris are the ingestion, suffocation, and entanglement of hundreds of marine species. Marine wildlife such as seabirds, whales, fish and turtles' mistakes plastic waste for prey; most then die of starvation as their stomachs become filled with plastic. They also suffer from lacerations, infections, reduced ability to swim, and internal injuries. Floating plastics also help transport invasive marine species, thereby threatening marine biodiversity and the food web.

✓ Impacts on human nutrition

Microplastics have been found in tap water, beer, salt and are present in all samples collected in the world's oceans, including the Arctic. Several chemicals used in the production of plastic materials are known to be carcinogenic and to interfere with the body's endocrine system, causing developmental, reproductive, neurological, and immune disorders in both humans and wildlife. Recently, microplastics were found in human placentas but more research is needed to determine if this is a widespread problem.

Toxic contaminants also accumulate on the surface of plastic as a result of prolonged exposure to seawater. When marine organisms ingest plastic debris, these contaminants enter their digestive systems, and over time accumulate in the food web. The transfer of contaminants between marine species and humans through consumption of seafood has been identified as a health hazard, and research is ongoing.

✓ Impacts on humans

Plastics contain many different types of chemicals, depending on the type of plastic. The addition of chemicals is the main reason why these plastics have become so multipurpose; however, this has problems associated with it. Some of the chemicals used in plastic production have the potential to be absorbed by human beings through skin absorption. A lot is unknown on how severely humans are physically affected by these chemicals. Some of the chemicals used in plastic production can cause dermatitis upon contact with human skin. In many plastics, these toxic chemicals are only used in trace amounts, but significant testing is often required to ensure that the toxic elements are contained within the plastic by inert material or polymer. Plastic pollution can also affect humans in which it may create an eyesore that interferes with enjoyment of the natural environment.

✓ Impacts on tourism

Plastic waste damages the aesthetic value of tourist destinations, leading to decreased income from tourism. It also generates major economic costs related to the cleaning and maintenance of the sites. The build-up of plastic litter on

beaches can have a negative impact on a country's economy, wildlife, and the physical and psychological wellbeing of people.

✓ **Impacts on climate change**

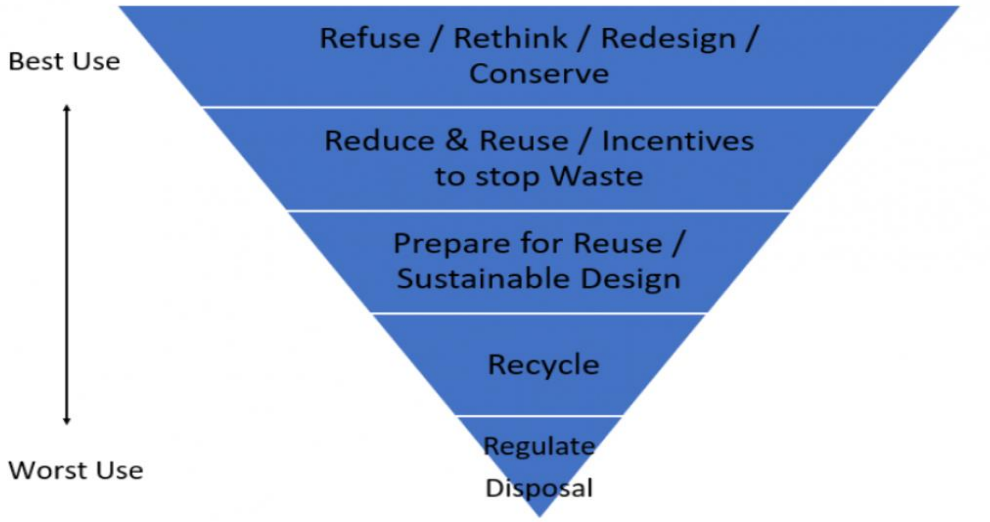
Plastic production contributes to climate change. If plastic waste is incinerated, it releases carbon dioxide and methane (from landfills) into the atmosphere, thereby increasing emissions.

2. What should the Member of Parliament, minister or head of state now do according to the research?

After summarising the above blueprint in Africa, I would like to advise and recommend the MPs of RMLA to agree upon the following strategic measures that can be implemented in Angola to handle the plastic waste issue.

❖ **Implementation of recycling as solution to the plastic waste**

To find a long-term solution to the plastic waste, it is important to recommend the policymakers to adapt the best use of suggested strategies by rethinking and redesigning the current policy as well as implementing new strategies. Recycling refers to the waste management method which collects waste materials and converts them into raw materials that can be reused to form other valuable products. It is also be known as "renewing or reusing" to prevent the harmful effect on society and environmental protection. The plastics are non-biodegradable as carbon-based products and other polymers. It contains bottles and other materials that can be melted and transformed into other products like plastic tables and chairs. This process is performed in the following six steps: collecting waste plastics, sorting, or arranging plastics into categories, washing to remove impurities, shredding and resizing, identifying and separating plastics, and compounding. There are several benefits of plastic waste recycling that the world can gain when plastic is reused rather than disposing of them in non-desirable places, one of the advantages is the protection of human life by decreasing carbon dioxide and other harmful gases in the atmosphere, which can occur during incineration or combustion of the wastes. Recycling reduces pollution across in ecosystem, requires less energy, and helps in natural conservation. It saves fast-depleting landfill space and eases the demand for fossil fuel consumption.



The **UN 2030 Agenda for Sustainable Development** calls for action to 'Conserve and sustainably use the oceans, seas and marine resources' (Goal 14) and 'By 2025, prevent and significantly reduce marine pollution of all kinds, particularly from land-based activities, including marine debris and nutrient pollution' (Target 14.1).

Moreover, it promotes a sustainable lifestyle and contributes to the national economy. Although recycling has different benefits to the community, it also has some disadvantages that can be managed and controlled. During the recycling process, some chemicals are released into the environment. Among these chemicals, some are volatile gases that come from plastic waste compositions and organic chain of monomers that build up a plastic chain of organic fumes and ashes, which kill plant structure and affect wildlife when inhaled by different animals that live near the recycling zone. As the process requires heat to melt plastics, it also generates sulfur, carbon, and other gases emitted to the environment. These gases can cause global warming, greenhouse effect, and acidic rain that harm the environment in different ways. This can also lead to health issues for the population who are crossing the plastics recycling zone. After the plastics down cycling process, wastes are separated for continuous recycling, which explains

how it ends up with plastic is generally unfit for another round of recycling. This means that it ends up in a landfill rather than regarding them as a secondary use of unconsumed plastic waste.

❖ Implementation of incineration as solution to the plastic waste

The waste incineration method refers to the burning of wastes in oxygen, which is chemically known as complete combustion that releases water molecules and carbon dioxide into the atmosphere. The waste produced after incineration is composed of different volatile chemicals, ash, and a small amount of hydrochloric acid. Generally, all plastic waste is not a good candidate for combustion; some are resistant to oxygen heating and explosives.

It is not an obligation that incineration can be used to treat all household waste plastic types properly. To select plastics to be incinerated, we must be careful on non-combustible waste to avoid these unprepared explosive accidents. The combustion of organic molecules can also produce energy which is known as fuel. The fuels can be presented in different physical states like liquid, solid, and gas used by vehicles and airplane propulsion.

This method of incineration has several different positive impacts on society rather than energy production. It also has huge contributions in minimizing waste and producing electricity from the waste, which is highly needed in modern industrialization. Waste incineration has played a critical part in producing renewable energy from biomass resources. Incineration, including heat recovery, was used in a different part of the world and more than four hundred fifty times in Europe. Despite the decreasing waste generated from different factories and other production houses, each person in the European Union generally generates 481 kg of municipal waste. Overall, 26% of wastes were recycled, 15% compost, 31% was land filled, and 26% incinerated. This data shows how the European government has advanced in using recycling and incineration methods in waste treatment compared to the period between 1995 and 2013, where incinerated and recycled waste counted 18% and 43%, respectively. There are several benefits of plastic waste management through incineration. These include decreased quantity of waste in the ecosystem, produces heat and power needed in different activities, reduces pollution of the atmosphere, saves economy on transport fee of the waste, and emilites harmful germs and chemicals. Moreover, it can be applied in any season or weather and prevents the production of methane gas. Incineration as a chemical process has benefits and drawbacks like all other biochemical processes or scientific processes. Some of the disadvantages of the incineration process include expensive setup compared to other waste management methods. It pollutes the environment and can damage public health. It releases ash waste that can harm people and the environment.

❖ Implementation of landfills as solution to the plastic waste

Plastics disposal post-utilization in different dustbins ends-up in landfill. Landfills refer to all places and areas where we reject all disposable plastic waste after utilization before being buried under the earth's face. Through this manual disposal process, many precautionary measures should be applied to avoid secondary side effects like groundwater contaminants and soil degradation that can result from poor processing. The objectives of landfill arrangement are to provide a safer area of plastic waste disposal to protect all dimensions of the environment, i.e., aquatics and airspace, to achieve the objectives mentioned above. It demands a lot of work be done in the community, like digging a long hole or dumping in high depths and putting waste into it and letting them decompose. This process is completed very slowly, as it can take more than a year. During this landfills processing, each organic molecule passes through biodegradation and decomposition. Plastic bags and other long polymer wastes can take around ten to a hundred years to degrade in landfills processing. Different plastic wastes can take a long time of degradation due to their specific biochemical properties and environmental or climate conditions like sunlight, wind, and climate change without these main driving factors. Therefore, the first selection or choice for disposing of all plastic products must be reused or recycled. Landfills are an excellent energy source due to the carbon dioxide and methane gas produced during the biodegradation process. It keeps cities clean, hygiene maintenance and segregates hazardous waste from other types of wastes. Moreover, this is a cost-effective method of plastic waste management. Although this method can be used to treat plastics wastes, it has some disadvantages, including being partially responsible for climate change and lighting up methane as combustible gas. It contaminates soil and water and affects wildlife.

❖ Implementation of Pyrolysis as solution to the plastic waste

Pyrolysis refers to the process of converting gases and fatty oils to recover crude petrochemicals and obtain hydrocarbons. It is even used to recover crude petrochemicals and generate renewable energy from plastic wastes.

Pyrolysis process is classified into three main categories according to the amount of heat energy needed to destruct plastic connections. There is high temperature, medium temperature, and low temperature-based media. Medium and high temperatures are based on the range of temperatures used to destroy the plastic structure. The corresponding temperatures defining the pyrolysis states are in the following ranges ≤600 °C, 600–800 °C, and higher than 800 °C, respectively. Thermo sets and thermoplastics are the main categories of the most used plastics in humans' daily necessities, where about 80% of used plastics are all thermoplastics. This is based on their easy ability for molecular reformation under heat treatment and their suspensibility to change. The products resulting from the pyrolysis of plastics, depending on different factors like reactor type, residence time, plastics, condensation arrangement, feeding arrangement, and the temperature applied. The crude oil derivative plastics are modified to its monomers and other useful components, e.g., additives and plasters classified into the first derivative of petroleum refining cuts and petrochemicals through catalytic means of chemical treatment or thermal effects. These chemical treatment principles were initiated for good management and proper accumulation of plastic wastes in the waste management industry. This scientific method is an efficient manner of waste management even though it may require high capital cost.

❖ Implementation of Bioremediation as solution to the plastic waste

It refers to the process where microorganisms decompose wastes. Bioremediation can also be defined as the branch of biotechnology that has main principles towards detoxification and decontamination by using microorganisms to biodegrade all-natural compounds that can be treated under biodegradation of plants, algae, fungi, and bacteria. It needs different conditions for culture medium like nutrients, enzymes, pressure, and temperature, which all need to be settled at an optimum level to facilitate the growth of microorganisms. In the absence of any of the mentioned factors or the presence of growth inhibitors, the bioremediation process will not be well applied. Plastic polymers can be separated and biodegraded when it is subjected to heteroatomic molecules, e.g., nitrogen or oxygen and the presence of a carbon = carbon double bond. This facilitates the beginning of biodegradation of the waste; also, extracellular enzymes are applied for plastic polymer fragmentation. In the bioremediation process, enzymes as a chemical catalyst work by reducing the activation energy and converting substrate into the product. The enzymes are most likely to be used in the process, including microbial oxidoreductase, microbial oxygenase, laccases, peroxidases, microbial lignin peroxidases, hydrolases, and microbial manganese peroxidases, microbial lipases. Plastics like polyvinyl chloride under natural degradation result in monomers of phthalates like vinyl monomers, dioxins, and CFCs. Solid waste management depends on landfills and incineration. These techniques are harmful to the environment therefore; a huge investment is required to employ the degradation of synthetic compounds by enzymes. Basing on our research, we have identified and summarized different reasons, explaining why plastic bags should be banned, that will help to elaborate the good policy to be implemented in the country.

In Angola, people are facing a crisis with plastic bags. They are one of the greatest risks to the environment despite their practicality and versatility. Governments like Rwanda and Kenya have banned plastics, and others have made it illegal to use certain types of bags. Despite the many applications, there's no shortage of reasons why plastic bags should be banned in Angola.

3. Dialectical Assessment: What could an opponent say about the drafted law?

As it happened in Kenya after banning the plastic waste, the influence of the business sector can become evident in the narratives that defied prohibition in Angola. Producers and traders of plastic bags may object to the ban, arguing that it can cause job losses for factory workers and workers at supply points. Traders can protest and be threatened to pass on the extra cost of making thicker polyethylene to the consumer as it happened in Kenya in the 2007 and 2011 through the plastic ban attempt.

Moreover, an opponent can also say that plastic was invented during the industrial revolution some 100 years' ago and dubbed as a miracle alternative to expensive natural materials which were depleting. Since its inception, the fantastically flexible substance has revolutionized the way we live. It brought about convenience and we celebrated throwaway living, as depicted in Life Magazine in 1955.

Plastics help us protect the environment by reducing waste, lowering greenhouse gas emissions, and saving energy at home, at work, and on the road. Plastic packaging helps to dramatically extend the shelf life of fresh foods and beverages while allowing us to ship more product with less packaging material, reducing both food and packaging waste.

Plastic insulation, sealants, and other building products are making our homes significantly more energy efficient, while reducing costs for heating and cooling. And lightweight plastics in cars can dramatically increase miles per gallon, saving drivers money at the pump.

Plastics not only help doctors save lives, but they also protect our loved ones at home, on the road, on the job and at play. And these advanced materials are helping make health care more affordable.

Finally, an opponent can also say that plastics are widely used in our economy namely in packaging, buildings, cars, electronics, agriculture, and other sectors. Several synthetic activities are being carried out with the development and population growth, increasing the need for plastic utilization in packaging and stocking artificial finished products. For instance, during December 2019, due to the rise of the COVID-19 pandemic, the world health organization took different restrictions and preventative measures, including partial/total lockdown, to prevent the spread of pandemic by contact.

But, in order to continue daily human life, many people were using plastic bags, take away to deliver food from restaurants, and the product from the supermarket which were delivering online services. Up till now, the same methods are still useful.

Through digitalization, people are becoming familiar with using online shopping which is increasing plastic packaging.

The use of plastic waste will highly uprise in the coming future, but as an adviser to the MP, it is highly recommended to urgently handle this issue of the plastic waste that is polluting our environment and affecting the human life. The mismanagement and poor plastic waste disposal is the main effects of environmental pollution that causes the problems and different diseases. According to the opposition policy, plastics should be used, and the environment should also be protected by applying some of the methods we have already discussed. For example, recycling, incineration, pyrolysis, bioremediation, and providing education on the world population about the harmfulness of poor plastic waste management. The implementation of these methods will help the population to have a clean and green environment.

Finally, opposition can also say that plastics positively impact our daily lives due to their basic applications in household activities and industrial packaging of various end-products.

Conclusion

Finally, we found out that the plastic pollution is an already massive and quickly growing global environmental challenge which seriously harms wildlife and can be detrimental to human health by causing several other problems in Angola. Plastic waste causes damage from the local to the global level, resulting in considerable costs, especially in vulnerable sectors like fishing and tourism. It is its discharge into the oceans and subsequent distribution across the globe which makes plastic pollution a transnational issue warranting multilateral efforts to solve it.

✓ Once more a statement of the defended position / the hypothesis / the results

Although plastics have several important roles in our lives due to their physicochemical composition, they can cause different problems to human life and the ecosystem if the post-use disposal is not well-managed. Therefore, I recommend to the MPs of the political party RMLA to carefully read this project paper about plastic waste. I also advise them that, the different strategic methods as illustrated above, can be implemented countywide to treat plastic wastes so that the plastic life can be cyclic. The applications of these strategic methods will save the lives of people, animals, and the environment by saving a lot of money by recycling raw-materials and reusing plastics. In addition, it is crucial to keep the environment safe because it will help everyone living in this ecosystem to live well and to spend safe and healthy life. Finally, the recycling of plastic waste will help us to improve the economy by decreasing the production cost. Not only economically viable, but it will also help to eradicate infectious diseases that are transmitted through polluted air and water.

In summary, plastic waste in Angola is a multifaceted challenge that demands collaborative efforts from various stakeholders to address its environmental, economic, and social impacts. By implementing effective waste management strategies, raising awareness, and promoting sustainable practices, Angola can work towards a cleaner and healthier environment for its citizens and ecosystems.

✓ Recommendation and open questions for improvement of plastic waste in Angola

Defining a plastic waste policy for Angola requires a comprehensive and holistic approach due to the diverse challenges and contexts across the continent. Indeed, developing a comprehensive and holistic plastic waste policy for Angola is crucial, given the diverse challenges and contexts across the continent. Such a policy should consider a wide range of factors, including environmental, social, economic, and cultural dimensions.

Improving plastic waste management in Angola, as in many parts of the world and in Africa specifically, requires a comprehensive and multi-faceted approach involving government policies, community engagement, education, and infrastructure development. Here are some suggestions for improving plastic waste management in Angola:

- Policy and regulation:
- Implement and enforce regulations: Introduce or strengthen regulations that govern the production, use, and disposal of plastic products. This includes policies on single-use plastics, plastic packaging, and plastic waste management.
- Extended producer responsibility (EPR): Implement EPR programs that make manufacturers responsible for the entire lifecycle of their products, including their collection, recycling, or safe disposal.
- Plastic bans: consider banning or limiting the production and distribution of single-use plastics and non-recyclable plastics.
- Waste collection and infrastructure:
- Improving collection systems: Establish efficient and regular waste collection systems, especially in urban areas, to prevent plastic waste from being dumped in streets, rivers, and open spaces.
- Recycling Infrastructure: Invest in recycling facilities and promote the development of a local recycling industry to process and recycle plastic waste.
- Waste-to-energy: explore waste-to-energy technologies as a means of converting non-recyclable plastic waste into energy.
- Awareness and Education:
- Public awareness campaigns: Launch campaigns to educate the public about the negative impacts of plastic waste on the environment and human health.
- School Programs: Introduce educational programs in schools to teach students about the importance of reducing, reusing, and recycling plastic waste.
- Community engagement:
- Community clean-up initiatives: Organize regular clean-up events involving local communities to raise awareness and actively clean up plastic waste from public spaces.
- Support for Informal Waste Collectors: Recognize and support the role of informal waste collectors in collecting and recycling plastic waste.
- Innovation and research:
- Innovative Solutions: Encourage research and innovation for alternative packaging materials, biodegradable plastics, and sustainable substitutes for single-use plastics.
- Plastic Collection Apps: Develop mobile apps that allow citizens to report plastic waste hotspots and request waste collection services.
- Partnerships and collaboration:
- Public-private partnerships: Collaborate with private companies to develop sustainable solutions for plastic waste management.
- International Cooperation: Seek partnerships with international organizations and neighboring countries to share best practices and technology.
- Incentives and rewards:
- Deposit-return schemes: Introduce deposit-return systems for plastic bottles and containers to incentivize proper disposal and recycling.
- Plastic Recycling Incentives: Provide incentives for businesses that use recycled plastics in their products.
- Research and data collection:

- Waste Audits: Conduct regular waste audits to understand the types and quantities of plastic waste being generated and discarded.
- Data-Driven Decision Making: use collected data to make informed decisions and track the progress of plastic waste management initiatives.

➢ Infrastructure for waste Separation:

- Segregated collection bins: install separate bins for different types of waste to facilitate the sorting of plastic waste at the source.

➢ Sustainable alternatives:

- Promote reusable items: Encourage the use of reusable bags, containers, and utensils to reduce the consumption of single-use plastics. It is important to emphasize that successful plastic waste management requires a combination of short-term interventions and long-term strategies, along with active involvement from the government, private sector, civil society, and the public.

4. Suggestions for future research

The current research study has provided a balanced understanding of the various approaches used to handle the plastic waste in Angola.

Furthermore, the implementation policy's recycling knowledge and awareness level about other strategic measures to be implemented were researched. The level of access to the environmental policies of the Angolan government must be enhanced to boost environmental protection attitudes and promote recycling habits.

The present research also envisaged different strategies and recommendations for the good handling of plastic waste in Angola. Besides, the same is true in the proposal stage within MPs of the political party of RMLA. The scope of the present study is narrow and focused on "plastic waste management.

Considering the fact that the novel concept of building environmental concerns and attitudes toward safe environmental practices needs further studies in the Angolan environment, future research should be conducted to determine how the recycling of plastic waste will affect the economy. It is possible to investigate how plastic waste recycling affects environmental sustainability. This will also allow for the study of plastic waste recycling in developing and less developed countries in order to determine how different countries are attempting to be more environmentally friendly. The realization of the water bottle recycling drive requires further exploration in each area of plastic waste recycling.

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