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Analyzing the Strengths, Weaknesses, Opportunities, and Threats (SWOT) of Plastic Waste Management in Cameroon

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***Abstract* - Over the years, there has been an increase in the production and consumption of plastic materials, basically due to population growth and urbanization. This has resulted in a plastic pollution crisis worldwide, especially in developing countries. In addressing this plastic pollution problem, a number of studies have so far been carried out in line with plastic waste management. However, very few studies, especially in Cameroon, have been published on the strengths, weaknesses, opportunities, and threats (SWOT) of plastic waste management systems. This study conducted a comprehensive SWOT analysis with the purpose of providing understanding into the current plastic waste management (PWM) situation in Cameroon, and to propose enhancement strategies. The data used for the analysis were obtained from a number of sources including government reports, relevant regulations, and policies, peered-reviewed literature, and questionnaires. The study revealed key strengths and opportunities which included available policies, the presence of recycling companies, circular economy potential, and research institutions as well as weaknesses and threats such as ineffective enforcement and implementation policies, absence of a separate collection system, inadequate waste management infrastructure, inadequate financial and technical capacity, the countries geographical position, lack of public interest and participation and population growth and urbanization. Based on the SWOT analysis, a number of strategies were proposed, that is, promulgate policies and ensure strict implementation, set up separate plastic waste collection systems and adopt a national circular economy action plan for plastics. These would be useful in enhancing the current PWM system in Cameroon.**

Keywords: Plastic waste management, SWOT analysis, Strategy, Extended producer responsibility, Policy, Cameroon.

I. INTRODUCTION

Plastics are synthetic materials manufactured through polymerization process. They are extensively used worldwide due to their durability, density, lightness, low cost, and flexibility [1, 2]. Statistics indicate a global rise in plastic production, increasing from 2 million metric tons in 1950 to 380 million metric tons in 2015 [3]. Additionally, according to OECD [4] projections, global plastic consumption will more or less triple between 2019 and 2060. This increase, in plastic production and use, is due to the growing global population, economic growth, and changing consumption patterns [4].The majority of these plastics are designed for single use, resulting in large quantities of plastic waste being generated. The majority of these generated wastes are inappropriately managed. This has led to serious plastic pollution problems [2, 3, 5]. Due to the non-biodegradability of these plastics and coupled with their unsuitable use and handling, plastics, once in the environment present serious threats to ecosystems [6] as well as human well-being and the economy [7-9].

Although plastics consumption is predicted to rise in all regions of the world, it is, however, projected to have the fastest growth in Sub-Saharan Africa and Asia by over six times higher than 2019 level, basically due to growing populations and economy[4]. In 2009, Cameroon launched an economic emergence program known as "Vision 2035"[10]. With this expected economic growth in Cameroon, coupled with the projected increase in plastic use in sub-Saharan Africa, there is expected to be a surge in plastic use and hence, plastic waste in the country. Up till date, waste management in general and plastic waste management in particular has attracted important attention from scholars, resulting in the publication of a number of research findings in several academic journals. With a particular focus on Cameroon, these publications include issues such as waste management policies[11, 12], circular economy[13], micro plastic contamination[14], plastic debris [15], and municipal solid waste management[16], just to mention a few. Although,

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existing literature, has dealt with topics as highlighted above, there is however, a limited number of literature that provides a comprehensive understanding of the internal and external dynamics that can help guide strategic planning of plastic waste management systems in Cameroon.

In this light therefore, this paper aims to analyze the current state of affairs in plastic waste management practices in Cameroon, with the help of the SWOT analysis method. SWOT analysis is defined as a "comprehensive method used to study the environment of a system (organization, territory, etc.) and analysis of its interior" [17, 18]. This involves a two-dimensional examination that looks into external and internal operative forces in a system. In the SWOT analysis the strength and weakness identification has to do with the condition within the system, whereas opportunities and threats are external factors with respect to the system [17, 19].

Generally, conducting a SWOT analysis of PWM system could contribute in three main dimensions. Firstly, it permits the government and stakeholders to gain a broad understanding of current PWM situation in the country. Secondly, it would enable the identification of main concerns in the PWM practice, from which concrete measures could be put forward in addressing lapses. And lastly, the results could be a source of valuable information to direct an appropriate PWM practices in the country.

The remainder of the paper is arranged as follows: Section 2 will cover the research method, section 3 will look at the current PWM situation in Cameroon; section 4 will cover SWOT analysis of PWM system, Section 5 will look at the proposed strategies while section 6 will provide the conclusion.

II. METHODOLOGY

SWOT analysis as a planning tool has been in use since the 1960s in analyzing business effectives [17]. Since then is has successfully been applied in other fields such as medicine[18, 19], education[20], industry[21, 22], water resources [23, 24], fisheries[25], and waste management[17, 26-28]. In the case of waste management, for instance, Longsheng, et al. [28], used SWOT analysis to "explore SWOT factors of Waste-to-Energy (WtE) implementation" and which then helped in developing strategies that provided a foundation for formulating the WtE policy hierarchy, to help decision-makers take right policy steps in Pakistan. Similarly, Aich and Ghosh [27], used SWOT analysis to develop a systematic approach for the "selection of right technology for the sustainable processing and disposal of municipal solid waste". In the case of TEMEL, *et al.* [26], they used SWOT analysis to identify strategic management of municipal solid waste (MSW) in Turkey. This helped them to propose options, based on the SWOT analysis that could help improve on the countries municipal solid waste management (MSWM) practices. Based on above studies, it is clear that the SWOT analysis is an appropriate method in exploring issues strategically. As a consequence, this study adopts a SWOT approach to analysis the plastic waste management system in Cameroon.

The study was carried out in four major steps (Figure 1). Firstly, relevant literature (government reports/legislations and articles) were reviewed. This was accompanied by questionnaire administration to key government staff working with the ministry in charge of the environment as well as key stakeholders in the plastic value chain. This helped in identifying strength, weaknesses, opportunities and threats in the PWM system. Secondly, through the review of relevant literature, the current PWM status was analyzed and presented. Thirdly, a comprehensive SWOT analysis waste carried out based on the questionnaires. Finally, proposed strategies for enhancing the current PWM system were put forward.

Figure 1: Research Flow Chart

III. CURRENT PWM SITUATION IN CAMEROON

3.1 Plastic Consumption in Cameroon

Plastic consumption in Cameroon has been in a steady increase over the years. According to the National strategy to combat plastic pollution (NSCPP), plastic import increased from 97.841 tons in 2015 to 107,743 in 2018. In terms of plastic waste generation, about 600,000 tons of plastic waste is generated yearly, that is, 10% of total MSW generation. Amongst the plastic waste generated, LDPE constituted a larger proportion (35%) followed by PET (31%) and HDPE (10%) (Figure 2). In 2017 only 1,089.15 tons were recycled. That is, less than 1% of the total generated plastic waste [29].

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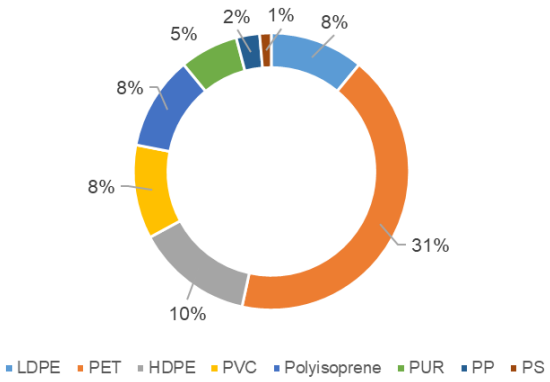

Figure 2: Proportion of plastic waste generation in 2017
Source: NSCPP (2022)

3.2 Plastic Waste Collection and Treatment/Disposal

Currently, there are no plastic waste collection systems in the country**.** Plastics are generally mixed with other household waste during disposal in open dumps and/or littered in the environment, from where they are collected by individuals ("waste pickers"), who then sell to scrap dealers for recycling. Additionally, there are some recycling companies and non-governmental organizations (NGOs) that are engaged in collecting plastic waste, especially PET bottles, for recycling. Some of the plastic wastes, especially the hard to recycle are used to produce paving stones [13]At the dump sides, the remaining plastic wastes are usually burnt along with the other household waste.

3.3 PWM Policies

The Government of Cameroon over the years has enacted a number of policies on waste management and plastic waste in particular. These includes, the framework law No. 96/12 0f 5th August 1996 relating to environmental management in Cameroon. This is the main legal instrument regulating environmental issues in Cameroon. In terms of waste management, the law, in its article 42 stipulates that "Waste shall be treated in an ecologically rational manner to eliminate or curb their harmful effects on human health, natural resources, the fauna and flora, and on the quality of the environment in general". However, the law does not, in particular, address plastic waste management per se. It rather makes provision for the establishment of an implementing degree for specific environmental issues such as plastic waste management and waste management in general [30].

Additionally, "decree No. 2012/2809/PM of 26 September 2012" was passed in 2012, outlining guidelines and conditions for "sorting, collecting, transporting, retrieving, recycling, treating and final disposing of waste". Article 4(1) of this decree gives responsibility to regional and local authorities for the collection and storage of household waste in collaboration with competent State services. They are also responsible for drawing up "municipal or inter-municipal plan for the management of household and similar waste, as well as define sorting, pre-collection, collection, transport, landfill, treatment, retrieval and final disposal of wastes"[30].

In 2022, the government, through the ministry in charge of the environment developed a National Strategy to Combat Plastic Pollution (NSCPP), with the objective that by 2029, a favorable regulatory framework to ensure a 40% reduction of prohibited plastics and boost the recovery of 50% of all non-biodegradable plastics, while promoting a circular economy and the thermal treatment of at least 10% of plastic waste, was established.

In addition to the above regulations Table 1 presents further policies with a particular focus on plastics and plastic waste management in Cameroon.

Table 1: Policies regulating the use of plastics in Cameroon

Policies	Description
The Joint Ministerial Order No. 004/MINEPDED/MINCOMMERCE of 24th October 2012, relating to the manufacture, importation, and commercialization of non-biodegradable plastic packages.	The order prohibits the manufacture, importation, handling and sale or distribution of non-biodegradable plastic packaging with thickness less than or equal to 60 microns as well as the granules used for their manufacture.
Circular No.096/c/CAB/MINEPDED of 10th April 2014, to check compliance and punish offenders with regard to Joint Order No.004/MINEPDED/MINCOMMERCE of 24 October 2012, on, inter alia, the ban of plastic packaging less than 61 microns in thick.	This circular sets up an Operational Team at the different administrative level (Divisional and Regional levels) for the implementation of the plastic ban within the country.
Circular No.00036/NC/CAB/MINEPDED of 28 August 2014, relating to small scale violators to Joint Order No.004/MINEPDED/MINCOMMERCE of 24 October 2012 relating amongst others to the prohibition of plastic packages inferior to 61 microns	The circular defines a fine of 4000 to 25000 FCFA ($6.62 to $41.40) and imprisonment of five to six days or any of the two sanctions.

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Law No. 2022/020 of 27th December 2022 relating to finance law of the republic of Cameroon for the 2023 financial year	The law in it article 142 levies a tax of CFAF 5 ($0.0083) "per unit of nonreturnable packaging" (beverages and mineral water), at a 10% maximum value of the product. This money is intended to be used for the management of these wastes

IV. SWOT ANALYSIS OF PWM IN CAMEROON

As already noted in section 2 above, the SWOT analysis of the PWM system would highlight the current external (strengths and weaknesses) and internal (opportunities and threats) circumstances associated with the PWM system in Cameroon. The following presents an in-depth account resulting from document review as well as questionnaire survey.

4.1 Strength

4.1.1 Policies

The policy landscape in Cameroon generally favors environmental protection. Over the years Cameroon has enacted a number of policies on waste management and plastic waste management in particular. (Table 1).Worth noting is the 2014 ban on non-biodegradable plastics. According to the interviewees, this has helped reduce the quantity of plastic bags in circulation. Similarly, Malek, et al. [31], noted that effective policies could aid in reducing pollution, conserve resources, and encourage sustainable waste management practices. The current policies, therefore constitute a key strength as far as the PWM system in Cameroon is concerned.

4.1.2 Presence of Recycling Companies

The presence of recycling companies constitutes a significant strength in addressing plastic waste management issues. they help in diverting plastic waste from landfills and the environment in general. A number of these companies such as NaMe Recycling[1] are engaged in recycling plastic bottles (PET) in PET straps, PET fakes, and PET performs. Others such as RED-PLAST/ECOCOLLECT are engaged in transforming plastic waste into paving stones [13].

4.1.3 Presence of Non-governmental Organizations (NGOs)

There is a high presence of NGOs in Cameroon that are engaged in plastic waste management activities. This number is increasing by the day due to the rising awareness of the impacts of plastic waste on the environment. They are particularly involved in the collection of plastic wastes from the environment and transporting them to recycling facilities for processing. For instance, the Association for Community Awareness (ASCOA)[2], is engaged in the fight against plastic pollution along the Limbe coastline. They organize regular beach clean-up activities where the collected plastic wastes (usually PET) are sent for recycling.

4.2 Weaknesses

4.2.1 Ineffective Enforcement and Implementation Policies

Although Cameroon has a number of waste management policies, their enforcement and implementation, however, has been ineffective. This could be seen in the high level of plastic waste (especially PET bottles and plastic shopping bags) littered in the environment[12].

4.2.2 Absence of Separate Collection System

Although decree No. 2012/2809/PM of 26 September 2012, defines conditions for sorting waste at source, there is, however, no organized system in place for separate collection of waste. Recyclables such as plastic bottles, glass, paper/cardboard, and food waste, are still commingled at collection.

4.2.3 Inadequate Waste Management Infrastructure

PWM infrastructures in Cameroon are limited. There is a conspicuous absence of plastic waste collection infrastructure. The result is that most of the plastic wastes are not being collected, which eventually, ends up as litter in the environment. Additionally, there are no sorting facilities. Consequently, most of the sorting is carried out manually. concerning recycling plants, there are a handful of recycling plants most of which are concentrated in the country's economic capital, Douala, which makes it difficult to have plastic waste from rural areas as well as other cities, a bit further away, to reach these recycling plants.

4.2.4 Inadequate Financial and Technical Capacity

Lack of finance hinders the establishment of proper collection systems, recycling facilities, and the adoption of advanced technologies for plastic waste management[32]. This is the case regarding PWM in Cameroon where mechanical recycling is mainly recycling technology currently being

[1]https://www.name-recycling.com/

[2]ASCOA is a Cameroon based NGO. http://ascoa-cm.org/

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practiced. Inadequate funds result in the inability to adopt advanced technologies for sorting and/or cleaning dirty plastic waste as well as the adoption of chemical recycling technology and Waste-to-energy, which could greatly enhance PWM.

4.3 Opportunity

4.3.1 Circular Economy Potential

The circular economy (CE) concept presents a great opportunity for plastic waste management in Cameroon. There are already a number of companies in the country engaged in designing, and manufacturingpackaging and other plastic products as well as recycling of plastic waste[13]. Thus, by applying the CE model, plastic products would be made durable, repairable, reusable, and recyclable at the end of their useful life thus reducing waste and their subsequent pollution issues.

4.3.2 Research Institutions

The country's research institutions could advance innovative research on the eco-design, of products, sustainable consumption, and innovative recycling technologies that are tailored to the Cameroon context.

4.4 Threats

4.4.1 Geographic Location

Cameroon is located in central Africa. It is bordered by Chad to the North-East, the Central African Republic to the East, Congo, Gabon, and Equatorial Guinea to the South and Nigeria to the West. Amongst all the bordered nations, Cameroon and Nigeria share the longest common border of over 1,600km which stretches from Lake Chad to the Gulf of Guinea. Nigeria is considered the hub for plastic production in the West and Central African regions[33]. Sharing a long and porous border with Cameroon renders Cameroon vulnerable to an influx of plastic products (shopping bags and beverages), usually smuggled into the country. This turn to increase the plastic waste management burden of the country.

4.4.2 Lack of Public Interest and Participation

There is a general lack of public interest and participation in plastic waste and waste management in general. This could be seen in the reckless waste disposal practices like littering within the country.

4.4.3 Population Growth and Urbanization

Usually, an increase in population and urbanization is associated with an increase in consumption patterns. This will result in increased plastic consumption with a subsequent higher volume of plastic waste generation. This will put additional an burden on the already worrying waste management system in the country.

V. SUGGESTED STRATEGIES TO ENHANCE PWM IN CAMEROON

Based on the identified strengths, weaknesses, opportunities and threats in the previous section, a number of strategies for PWM can be proposed. The notion here is to capitalize on the strengths, and opportunities while translating the weaknesses to strengths, and abating the threats.

5.1 Strategy 1: Promulgating Policies and Ensuring Strict Implementation

Existing regulations in the country, such as the ban on non-biodegradable plastics less than 61 microns, are yet to prove potent in addressing the plastic pollution problem in the country, as one could still spot plastic bags littered in the environment. Thus, a mandatory fee on plastic shopping bags could help in disincentivizing their use, hence reducing possible waste being generated. Additionally, the absence of extended producer responsibility (EPR) policies, especially for PET bottles, has made producers and importers not take responsibilities for the management of their products' end-of-life. Therefore, promulgating policies on EPR will mandate producers and imports to take responsibility for the end-of-life management of their products. This will necessitate the implementation of practical schemes for managing plastic waste as well as outline indicators such as recycling targets, which could be used to measure effectiveness.

5.2 Strategy 2: Setting Up a Separate Plastic Waste Collection System

Currently, there is no separate collection system in place for plastic waste collection. There is a strong need for the government in collaboration with relevant stakeholders, to setup plastic waste collection systems. This will minimize littering while enhancing recycling.

5.3 Strategy 3: Investing in Waste Management Infrastructure

To boost plastic recycling, it is important to effectively sort out different plastic types. This is made possible through waste management infrastructures such as plastic sorting facilities. There is therefore a need for the government to invest in the construction of sorting facilities as to improve on the current plastic waste management.

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5.4 Strategy 4: Provide Subsidies to Plastic Recycling Companies

There is a need for the government to provide subsidies to recycling companies. This could help boost recycling as they can, increase, the plastic collection as well as adopt more advanced sorting and recycling technologies.

5.5 Strategy 5: Adopta National Circular Economy Action Plan for Plastics

This will provide a timeline for transitioning to a circular economy. The action plan should outline measures that would ensure that the manufacture, circulation, and consumption of plastic products follow a closed-loop system. This will allow resources and materials to be retained in the economy as long as possible, thereby reducing waste.

5.6 Strategy 6: Raising PWM Awareness

Public awareness and education is a key component to waste management. These play a key role in changing consumer behavior as well as attitudes with regard to plastic waste management[34]. There is a need to carryout regular public awareness-raising initiatives to motivate proper plastic waste management practices. This could include, door-to-door awareness-raising campaigns, campaigns through audio-visuals, involving short sketches, as well as establishing programs that would result in specific rewards. These could help stimulate public interest and participation in plastic waste management.

5.7 Strategy 7: Strengthen Border Security

With the threat of smuggling unauthorized plastic bags and beverages into Cameroon from neighboring countries, especially Nigeria, there is a need for the government to strengthen border security. This will help reduce plastic influx into the country, hence reducing possible waste regeneration.

VI. CONCLUSION

The purpose of this paper was to provide understandings into the current PWM situation and practices in Cameroon through the lens of a comprehensive SWOT analysis methodology in order to proposed possible enhancement strategies. Following the document review, and survey, the internal and external conditions of Cameroon's PWM practices have been presented. The findings demonstrate that there is a need for Cameroon to capitalize on the identified strengths and opportunities. That is, available policies, presence of recycling companies, presence of non-governmental organizations (NGOs), circular economy potential, research institutions, while addressing the weaknesses and threats posing severe challenges to the country's PWM system, such as ineffective enforcement and implementation policies, absence of separate collection system, inadequate waste management infrastructure as well as inadequate financial and technical capacity, the countries geographical position, lack of public interest and participation and population growth and urbanization which could significantly, undermine effective PWM practices in the country. As a consequence, Cameroon needs to promulgate policies and ensure strict implementation, set up separate plastic waste collection systems, adopt a national circular economy action plan for plastics, invest in waste management infrastructure, provide subsidies to plastic recycling companies, raise PWM awareness, and strengthen border security. With these proposed strategies, an enabling take-off point could be established for enhancing the Cameroonian PWM system with and an anticipated rippling effect of plastic pollution abetment.

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