Managing single-use land-based plastics in Cameroon: recommendation drawn from global experiences

Etakong Tabeyang

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MANAGING SINGLE-USE LAND-BASED PLASTICS IN CAMEROON:
RECOMMENDATIONS DRAWN FROM GLOBAL EXPERIENCES.

By

ETAKONG TABEYANG

Cameroon

A dissertation submitted to the World Maritime University in partial

Fulfilment of the requirements for the award of the degree of

MASTER OF SCIENCE

In

MARITIME AFFAIRS

(OCEAN SUSTAINABILITY, GOVERNANCE, AND MANAGEMENT)

2018
DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

(Signature): ...........................................................

(Date): 8th October 2018

Supervised by: Professor Mary S. Wisz

Supervisor’s affiliation: OSGM
ACKNOWLEDGEMENT

I am expressing my earnest gratitude to my supervisor, Professor Mary S. Wisz. The outcome of this thesis is courtesy of her unflinching support and encouragement, and above all her corrections and constructive feedbacks.

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Special thanks to Professors Larry Hildebrand, Ronan Long and Ruud Murray for the dedication and patience during lectures as well as for broadening our horizon with new knowledge.

Finally, my indebtedness to my wife for her sacrifice and dedication to lead the family in the right direction during my studies. To my Dad and siblings, I appreciate your love and encouragement during the last 14 months. I also extend my deep and heartfelt appreciation to my mother-in-law, for her continuous prayers and support she gave me during my studies.

To all my friends and classmate, I can only say thank because without you, the journey would have been an illusion, but your presence was the driving force for a successful completion of this thesis.
Title of Dissertation: Managing Single-use Land-based Plastics:
recommendations drawn from global experiences

Degree: Master of Science

This dissertation is a study of the experiences of successful SuPM from across the globe.

A cross examination of single-use plastics (SuP) reveals that since 1950, it has become increasingly indispensable to modern society. The year 2013 marked the turning point in SuP life cycle, with global production amount to 299 MT, resulting to an increase of 3.9 percent, when compared to the 2012 statistics, and a 620 per cent increase compared to 1975 production rate. It increase in usage is a corollary among other factors such as, it low cost of acquisition, increase in demand and world population growth rate. Thus, it ubiquity is felt everywhere including places with little or no human settlement such as Henderson Island, where the maximum amount of plastic litter has been recounted so far in the world.

Over the last decades, Cameroon has become dependent on SuPs due to the above mentioned above, and because of the benefits it provides to society such as food and water preservation and packaging, etc.

An analysis on emerging approaches to single-use plastics management (SuPM) based on a definition of successful intervention criteria was used to evaluate the techniques used by countries across the globe. It was realised that the most promising solutions that are being adopted in many countries in the world are very successful in Rwanda (Complete ban), Ireland (Irish PlasTax), and Australia (voluntary initiatives).

In identifying opportunities for SuPM interventions in Cameroon, these approaches were recommended to be adopted and used simultaneously in order to achieve the desired results. The strength of these methods would be the existence of state machinery / institutions to implement such policies. However, the lack of political will from policy makers and the absence of an international binding convention on SuPM may pose a serious challenge to these approaches.

The concluding chapter presents some recommendations such as awareness raising on negative effects of SuP to society, and proposes solutions using the DPSIR framework to manage SuP in Cameroon.

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<td>DPSIR</td>
<td>Driver, Pressure, State, Impact, Response</td>
</tr>
<tr>
<td>HDPE</td>
<td>High Density Polyethylene</td>
</tr>
<tr>
<td>HYSACAM</td>
<td>Hygiène et Salubrité du Cameroun</td>
</tr>
<tr>
<td>ICMWM</td>
<td>Inter-Ministerial Commission for Municipal Waste Management</td>
</tr>
<tr>
<td>IMO</td>
<td>International Maritime Organization</td>
</tr>
<tr>
<td>LDPE</td>
<td>Low Density Polyethylene</td>
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<tr>
<td>LLPDE</td>
<td>Linear Low Density Polyethylene</td>
</tr>
<tr>
<td>MARPOL</td>
<td>International Convention for the Prevention of Pollution from Ships</td>
</tr>
<tr>
<td>MINCOMMERCE</td>
<td>Ministry of Trade</td>
</tr>
<tr>
<td>MINEPDED</td>
<td>Ministry of Environment, Nature Protection and Sustainable Development</td>
</tr>
<tr>
<td>MT</td>
<td>Metric Ton</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-Governmental Organizations</td>
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<tr>
<td>PET</td>
<td>Polyethylene Terephthalate</td>
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<tr>
<td>PPP</td>
<td>Polypropylene</td>
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<tr>
<td>PS</td>
<td>Polystyrene</td>
</tr>
<tr>
<td>PSC</td>
<td>Plastic Supply Chain</td>
</tr>
<tr>
<td>PVC</td>
<td>Poly Vinyl Chloride</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
</tr>
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<tr>
<td>SDG</td>
<td>Sustainable Development Goals</td>
</tr>
<tr>
<td>SPI</td>
<td>Society of the Plastic Industry</td>
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<tr>
<td>SuP</td>
<td>Single-use Plastics</td>
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<td>SuPM</td>
<td>Single-use Plastics Management</td>
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<td>SuPWM</td>
<td>Single-use Plastics Waste Management</td>
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<td>SuPW</td>
<td>Single-use Plastics Waste</td>
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<tr>
<td>SWOT</td>
<td>Strength, Weakness, Opportunity, Threats</td>
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CHAPTER ONE: INTRODUCTION

1.1 SINGLE-USE PLASTICS: A PROBLEM ON THE ENVIRONMENT

Since 1950s, there have been an increase of plastics on the environment (UNEP, 2016). The global production of plastics has been increasing at an alarming rate every year. As such, 2014 marks the turning point in the history of plastic production because over 300 million tons of plastic were produced globally (Plastic Europe, 2015). In a study by (Ansje et al., 2017), it is estimated that the amount of land-based plastics that culminates in the ocean every year is between 4.8 and 12.7 million tons, thus remaining one of the most conspicuous pollutant affecting oceans with a total negative impact estimated at a minimum of 8 billion dollars per year. Its ubiquity is felt everywhere including places with little or no human settlement such as Henderson Island, where the maximum amount of plastic litter has been recounted so far in the world (Ansje et al., 2017). Because of the indispensable nature of plastics in modern societies, and coupled with the continuous increase in population, it is plausible that production and use of plastic will increase.

Hence, plastics accounts for ecological, economic and aesthetic damages in most countries, and has led to wildlife destruction (ecosystem). In addition, it is important to note that economic actives such as shipping, fishing, tourism and recreation, and aquaculture are among the activities most affected directly by plastic pollution (Ansje et al., 2017).

The extended decomposition period in many case extending hundreds of years, implies an accumulation of the pollutant in the marine environment (ocean), estimated
to the tune of trillions of metric tonnes and, is part of the global pollution problem affecting many coastal states (Jambeck et al., 2015).

SuPs are found on the highest points of mountain tops and at the deepest depths of ocean (Harvey, 2018) As Borrellaea et al. (2017) notes, plastics, are ubiquitous in beaches, oceans, bays, and estuaries in the world especially in most developing countries such as Cameroon

Thus, SuP, which is the focus of this study, should be understood as plastics carrier and packaging bags, beverage and water bottles. They constitute the most common form of plastic pollution in Cameroon.

Single-use Plastics (SuP) in Cameroon constitute one of the most harmful materials to the environment. They are used on daily basis for conservation and wrapping of foodstuffs and water, transportation of materials, etc. (Ndongo et al., 2016), even though they are not environmentally friendly. They pollute the air when burnt; prevent water filtration into the soil and agricultural lands, which in turn affects productivity; and counts for flooding in rainy seasons, because they block drainage systems.

Due to these negative effects of plastics, a joint ministerial order by the Ministry of Environment, Nature Protection and Sustainable Development (MINEPDED) and the Ministry of Trade (MINCOMMERCE) was signed in 2012, banning the use and commercialisation of plastic bags (of thickness inferior to 60 microns) for packaging (Ministry of Trade, 2012).

In spite of this ban, poor waste management and the attitude of littering has made the prospect of a plastic-free environment unlikely or unachievable. Thus, the urgent need to reduce the leakage of SuP into the environment cannot be over emphasized.

1.3 PROBLEM STATEMENT

The ubiquity of SuP litter on the marine environment has worsened in recent years even after the coming into force of MARPOL Convention in 1973. One of the reasons may be attributed to the fact that the convention is silent about land-based plastic pollution. In addition, the reduction of land-based plastic depends on the free will of
states, because of the absence of reduction targets; lack of mechanisms to monitor states’ progress in reducing plastics as well as the absence of policy framework, in most developing countries like Cameroon to curb the phenomenon. Hence, the adoption of SDGs in 2015, especially goal 14.1 which has set a target to reduce marine pollution by 2025, has inspired the need to examine the challenge of single-use land-based plastics in Cameroon.

1.4 MOTIVATION

There has been a growing trend of accumulation of single-use plastic litter in most sub-Saharan African countries over the years (Jambeck et al., 2015). The absence of concrete governmental and regional policies to address this issue, coupled with the adoption of the SDG14.1 in particular with a timeline of 2025 to reduce significantly marine pollution, is the driver for this study.

1.5 AIMS AND OBJECTIVES OF THE STUDY

Having observed the timeline in attainment of goal 14.1 targets, and given the ubiquity of SuP on land in Cameroon, this study discusses the disposal and management techniques of SuP across the globe and proposes the way forward for Cameroon to efficiently reduce and manage SuP. Thus, the objective are:

- to recommend and/or emulate solutions that have been successful in other parts of the world;
- the study also aims to serve as a benchmark for governments, NGOs and private organizations to develop sustainable strategies in dealing with SuPWM.

1.6 RESEARCH QUESTIONS

- **RQ1**: What is the status of SuPM in Cameroon and what part of the plastic supply chain have been targeted for effective management?
- **RQ2**: With reference to the plastic life cycle, what efforts have other parts of the world undertaken to manage SuPW?
- **RQ3**: After defining criteria for “successful SuPM”, which of these efforts were successful elsewhere?
RQ4: Based on the successes of other countries, what policies can be implemented to reduce SuPW in Cameroon?

1.7 METHODOLOGY AND METHODS

1.7.1 Research Methodology

A descriptive and conceptual approach was adopted in this study. In addition, regulatory, economic, and communicative / crosscutting interventions used by Australia and some European, and African countries are considered as benchmark for “successful approaches” in managing SuP for Cameroon. These intervention techniques were selected because they have been successful in the following countries: Rwanda (regulatory), Ireland (Economic) and Australia (for crosscutting approaches). This is evident by the absence of SuP litter on land as well as a reduction on dependency in the use of SuP.

1.7.2 Method

To examine the issues associated with plastic litter in Cameroon, published literature and peer-reviewed articles were used. To this, I also added semi-structured interview with key experts working on plastics, given that much of the progress is ongoing, and may not yet be published.

Qualitative data constituted the main source of data collection. The DPSIR framework was used to formulate solution for reducing SuP in Cameroon. This framework depicts the drivers of land based plastic pollution, the pressures, the state of plastic on the marine environment in the country, its impacts on the environment and some responses to address the phenomenon.

1.7.3 Search Strategy

Peer-reviewed scientific articles, reports, internet searches were exploited in the course of this research.
The databases used for the literature search are Science Direct, Scopus, Harzing’s Publish or Perish, EBSCO Discovery Services, Google Scholars, IMO Docs and SDG Knowledge hub.

1.7.4 Search Terms

Primary and secondary search terms were devised to incorporate plastics, marine environment and sustainable development goal. Specific terms were conceived in order to retrieve relevant literature from database according to the study selection criteria.

Primary search terms (plastic, marine pollution; SuP; and waste management) were chosen to identify the sources and causes of plastic pollution in the marine environment and to retrieve the maximum number of studies on the topic. Secondary search terms (Land-based plastic, marine litter and marine environment) were selected to relate to key topic subjects on plastics pollution and to provide an extended scope in order to identify the maximum number of studies.

1.8 KEY LIMITATIONS TO THE STUDY

A rapid assessment method was used (e.g. application of semi-structured interviews rather than more extensive data collection efforts). In addition, qualitative data collected constituted the main source of data needed for this study. Lastly, the lack of adequate existing literature from Cameroon was a major limitation to this research, coupled with the lack of financial resources for any field study and primary data collection in Cameroon. Interviews were carried out remotely and most research was Desk-based.

1.9 INTRODUCTION TO THE STRUCTURE OF DISSERTATION

This dissertation has six (6) chapters and is organised as follows:
Chapter 1 Introduction to the dissertation

Provides a general overview of plastics, and builds the research questions and hypothesis, methods and expected outcome of the dissertation.

Chapter 2 The Plastic Supply chain (PSC)

Over the last centuries, SuP production and use have been increasing at an alarming rate due to the benefits it provides to society. Irrespective of these benefits, enormous impacts of plastics to humans and the marine environment have been uncovered over the last years. This chapter therefore focuses on PSC by highlighting its production phases, and then presenting the complexities associated to its management technics.

Chapter 3 Emerging approaches / intervention of single-use Plastics Management (SuPM): Lessons from around the Globe

Based on internet search and semi structured interviews, this chapter, analyses the intervention techniqus of SuPM based on definition of successful criteria. It further discusses reasons underpinning the successes, and concludes by highlighting the challenges of these interventions.

Chapter 4 Single-use Plastics Waste Management (SuPWM) in Cameroon.

Even though SuPW are numerically of less significant when compared to other forms of plastic litters, they still remain a conspicuous element of litter. This chapter analyses households solid and plastics waste management (due to the absence of sorting before disposal), from the national to the municipal levels. It equally highlights waste collection and disposal methods, and then discusses some challenges hindering the sector.

Chapter 5: Identifying Opportunities for Intervention in Cameroon

Plastics account for one of the greatest forms of pollution on marine environment. Because of these impacts (including on human health), countries are increasingly
formulating polices to reduce its consumption in a bid to eradicate such risks. This chapter explores some successful efforts by countries to manage SuPs and earmarks intervention technics for Cameroon.

Chapter 6 Recommendations, Solutions and Conclusion.

Based on the results of this study, recommendations and solutions are proposed using the DPSIR framework.

Figure 1.1: Summary of Dissertation Structure

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<td>questions and hypothesis, methods and expected outcome of the</td>
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<td>dissertation.</td>
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<tr>
<td>II</td>
<td>The Plastic Supply Chain (PSC)</td>
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<td></td>
<td>• Highlight PSC production phases and presents the complexities</td>
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<td>associated to it management technics</td>
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<tr>
<td>III</td>
<td>Emerging Approaches of Single-Use Plastics Management (SuPM)</td>
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<td></td>
<td>• Analysis of interventions technics to SuPM based on definition of</td>
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<td>successful criteria.</td>
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<td>• Discuss reasons behind successes and challenges for these</td>
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<td>interventions.</td>
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<td>IV</td>
<td>Single-Use Plastics Waste Management (SuPWM) in Cameroon</td>
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<td>• Analysis of households solid and plastics waste management from</td>
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<td>• Highlights waste collection and disposal methods, and discusses</td>
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<td>challenges hindering the sector</td>
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<td>V</td>
<td>Identifying Opportunities for Intervention in Cameroon</td>
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<td>VI</td>
<td>Recommendations, Solutions and Conclusion</td>
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<td>• Recommendations and solutions are proposed using the DPSIR</td>
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CHAPTER TWO: ANALYSIS OF PLASTIC SUPPLY CHAIN (PLC)

2.1 Background and justification

For more than half a century, the global production of plastic has been increasing at an alarming rate. For example, the global plastic production in 2013 reached 299 million metric tons, with an increase of 3.9 percentage, as against the 2012 288 million MT global production level (Gourmelon, 2015). This shows an increase of 620% when compared with the production levels of 1975 (Jambeck et al., 2015). Because of these increased production, experts believe that the low cost of it acquisition, increase in demand, and high consumption rate due to population growth, accounts for increasing production of SuP.

In addition, Accorsi et al., (2014) suggest that sub-standard waste management schemes in most developing countries have resulted to the leakage of many millions of tons of SuP to end up in landfills and oceans on yearly basis. Summary of these leakages is shown on Figure 2.1 on the plastic lifecycle.

In our contemporary societies, a plethora of plastic products for consumers exists, with SuP (which refers to food packaging, plastic carrier bags, and beverage bottles) making a majority of them (Lopez, 2015). Therefore, the increasing concern for marine environmental protection and food security obliges inhabitants and enterprises to reduce plastic waste and, encourage sustainable waste management approaches.

This chapter describes SuP supply chain by: i) reviewing existing literature pertaining to the production, and consumption of SuP; as well as; ii) briefly presents the quandary of its management techniques (consumption and waste). These two aspects are vital to understanding societal dependence and perception of SuP, in the
absence of sustainable alternatives, as well as the intricacies to plastic leakages on the marine environment. However, it should be recalled that literature on SuP is very limited. Therefore, this section relies solely on published and forthcoming research on SuP.

2.2 Methods for Literature Search and Review of Existing Literature.

The search method criteria would be defined as well as the literature on describing the supply chain of SuP will be reviewed.

2.2.1 Search Method and Criteria for Analysing Peer Reviewed Published Papers

2.2.1.1 Search / Selection Criteria

The search criteria includes screening of reviewed papers, reports and articles on topics and types of SuP.

❖ Inclusion Criteria:

The criteria used includes the following:

✓ year of publication, (from 2005- it is a reasonable timeline to evaluate the progress on SuP reduction, which was first banned in 2002 by Bangladesh);
✓ topic of the paper;
✓ study area and type plastic assessed (secondary micro SuP); the type of analysis –qualitative;
✓ location of study area; and
✓ the type of data analysed-primary and secondary data.

❖ Exclusion Criteria:

Papers were excluded if:

✓ they were not related to land-based plastic waste management;
✓ they did not mention plastic without elucidating on how it can be reduced on land and;
they focused on reusable rather than SuP.

From the above, the following sections will expound on the trends of SuP: from production to disposal, as well as the challenges associated to it.

### 2.3 Description of SuP Supply Chain: Production, Consumption and Disposal

As already mentioned in the section on "method of literature search", this section considers studies, which unequivocally frame their research on secondary microplastics. That is, they focus on the production of SuP, its benefits for society, which makes the latter (society) depend on, its management, and disposal phase that constitutes the focus of this study. In addition and as earlier mentioned, carrier bags, beverage, and water bottles are qualified as SuP in this study.

#### 2.3.1 Production of SuP

Vince & Hardesty (2018), estimate that 8,300 metric tons of plastic have been produced since 1950s. They further suggest that if plastic production were to continue as such, an estimated amount of 12,000 metric tons could leak onto the marine environment by 2050. Recent research shows that the annual global production of plastic is estimated at 300 million tonnes, with roughly 50% disposed of after a brief single-use (Xanthos and Walker, 2017).

#### 2.3.1.1 Plastic Bags

Zero Waste Scotland defines SuP as "all carrier bags that are supplied with the intention that they are to be used once, to carry goods away from the point of sale" (Barnes, 2014). Generally, plastics are made up of polymers, which are large molecules made up of repeated units known as monomers. However, the case of plastic bags is different because their repeated units are called ethylene. When the latter is polymerized, they form polyethylene (Lopez, 2015).

Given that many kinds of polythene can be made from ethylene, plastic bags are fabricated from either high-density polyethylene (HDPE), low-density polyethylene (LDPE), or linear low-density polyethylene (LLDPE). As such, the SuP bags, which
is the focus of our study, are those made of HPE found in grocery shops and LLPDE-glossy shopping bags from malls (Lajeunesse, 2004).

Before 1965, the most common way of packaging grocery was paper bags. However, things changed when a Swedish Company - Celloplast designed “a tube of plastic sealed at the bottom, to allow for the packaging of goods, with an open top to insert items into the bag, with handles for convenient carrying” (Song, 2017).

Even though plastic bags are fabricated to be used once, some studies have suggested that they can be reused as bin liners, storage for bottles and cans for recycling, and for carrying household stuffs, etc. (Lopez, 2015; WRAP, 2005).

The reuse of SuP is no guarantee that they will be properly disposed of, because many reused SuP end up in landfill or as waste. To demonstrate this assumption, the general SuP life cycle can be illustrated using the California example (Figure 2.1), which demonstrates how SuP are poorly disposed after use, with only 5 percent of waste being recycled and the rest is deposited as litter or on landfill. This scenario may be applicable to Cameroon, being country with poor waste management scheme.
Figure 2.1: Life Cycle of SuP.


2.3.1.2 Plastic Bottles

The commercialization of plastic bottles started in 1947, but only became widely used when HDPE were created in the 1960s (Song, 2017). Water or beverage plastic bottles are made up of HDPE or PET. Coded as ♯1 and ♯2 for easy identification by the Society of the Plastic Industry (SPI), plastic assigned with code ♯1 (PET) which is our focus in this study, are typical for water and soft drinks, and are highly recycled.

The proliferation of bottled water in Indonesia market was greeted with competition from other companies, because of the tremendous increase in the consumption of bottled water in the country (Lopez, 2015). This may be applicable to Cameroon because of the absence of anti-bottled water campaign, coupled with the poor quality and distribution of drinking water, amongst other factors. This presents the country with a lucrative market for bottled water. As such, the global market for production of plastic materials to meet the demand of plastic bottles and other plastic materials has been increasing tremendously to meet the demand, with Asia having the largest
market. Figure 2.2 below exhibits the global production of plastic materials by regions, measured in percentage for the year 2013.

**Figure 2.2:** Global Production of Plastic Materials, 2013

![Pie chart showing global production of plastic materials by regions in 2013.]

**Source:** Author, 2018, Adapted from Plastic Europe, 2013

### 2.3.2 Consumption (Use) / Dependency of Plastics

In our contemporary society, plastic can be found in every part of our daily life, such as in packaging, beverages and drinking water, buildings and construction, just to name a few. Its dependency / usage in the world today can be justified from the benefits it provides to society. These includes among others; it is lightweight, durable, malleable material and cheap when compared to other plastic materials used for the same function (Andrady & Neal, 2009; IUCN, 2017).

The introduction of synthetic organic polymers in the mid-20th century has favoured the growth of use of plastics, with over 300 million tons of plastics produced every year, and are equally used to manufacture create other plastic objects like toys (IUCN, 2017). When comparing the 1950 plastics production that stood at 1.5 million, to contemporary demands, it long-term average annual growth rate stands at...
approximately 4% (Plastic Europe, 2015). This expansion in usage is equally supported by the discovery of different techniques of an array of polymer production types from petrochemical sources (Hopewell et al., 2009), as well as it ability to be shaped into a variety of products that can be used in different ways (Hennlock et al., 2015).

Global plastic consumption or usage is forecasted to increase. For example, the yearly average plastic consumption _per capita_ for plastic objects (plastic bags and bottles inclusive) for North America and Western Europe in 2005 was estimated at 100kg, which was estimated to increase to 140kg by 2015 (IUCN, 2017; PlasticEurope, 2009). However, data on the exact increment is not available.

A study carried out by Plastic Europe (2008) and highlighted by Hopewell et al., (2008), reveals that about 50 percent of plastics consumed, are for single-use disposal applications like packaging and other consumer disposable items, while approximately 20-25 percent of plastics are used for long-term infrastructure needs such as pipes, cable coating, etc.

The study equally reported that post-consumer plastic waste generated in Europe in 2007 stood at 24.6 MT. SuP consumption and waste generated (in the absence of data on plastic bottles and carrier bags) for the UK in 2000, amounted to 1640 tonnes, representing 37% for usage, and 1640 tonnes representing 58% for waste respectively (Waste watch, 2003). This implies that SuP is the primary source of plastic waste across Europe and the world at large.

In contrast to the above, individual usage for plastic items in Asian countries is lesser. PlasticEurope (2009) estimated that the yearly consumption of plastic per person in 2005 was approximately 20 kg, with an estimated increase 36 kg in 2015. The case of Africa is more interesting as its estimate stood at 16 kilos _per capita_ as of 2015.

Due to the functional properties of plastic materials, and ease to use by society, it is plausible that in the absence of sustainable bio-friendly and cost-effective alternative, as well as a universal binding convention on plastic, the use of SuPs will indeed increase globally in the future, especially in lower income regions as their economies
are growing. Effective management schemes to it after use would be ideal in as science evolves to seek lasting sustainable solutions to the problem.

2.3.3 SuPWM Schemes

In 1960, municipal waste resulting from the use of plastics was highly insignificant or unnoticeable. In some countries like the United States, plastics made up less than 1% of municipal solid waste by mass. By the year 2000, the proportion increased by an order of magnitude. A 2005 statistics based on available country data on solid waste management reveals that 58% (i.e. 61 out of 105) of countries produce at least 10% of solid plastic waste by mass. In addition, 6.4 billion people living in 192 coastal countries (i.e. 93% of the global population) in 2010 generated approximately 2.5 billion MT of municipal solid waste, with approximately 11% (275 million MT) of the waste being plastics (Jambeck et al., 2015).

Recent findings reveal that, 95% of plastic packaging material (valued between or USD 80–120 billion annually) disappears into the economy after a brief single-use. Forty years after the introduction of the renowned recycling symbol, only 14% of plastic packaging is collected for recycling (World Economic Forum et al., 2016). Sampling of population living within 50 km of the coast in these countries, Jambeck et al. (2015) discovered that an estimated 99.5 million MT of plastic waste generated in 2010 emanated from population living in coastal region. The authors further point out that 31.9 million MT of this waste generated were categorised as mismanaged. They also estimated that approximately 4.8 to 12.7 million MT of waste which entered the ocean in the same year (2010) was equivalent to 1.7 to 4.6% of the total plastic waste generated in 192 countries where the research was conducted.

Thus, waste management infrastructure in developing countries poses a challenge compared to the increasing amount of plastic waste to be treated (Lopez, 2015). In this regard, the improvement of waste management infrastructures in developing countries is vital and requires substantial resources and time. Even though developing countries are making strides in enhancing their waste management infrastructure, developed countries could initiate concrete and immediate actions to waste reduction, especially SuPW.
Recycling, which is a waste management technique is obvious and available methods for waste disposal, entails a multi-dimensional approach. It (recycling) is also one of the most vibrant sectors in the plastic industry today and provides opportunities to reduce oil usage, carbon dioxide emissions and the quantities of waste requiring disposal (Hopewell et al., 2009). Therefore, an effective SuPWM scheme would require a technological approach, alongside environmental, social, legal, economic and institutional approaches (Ndongo et al., 2016).

2.4 Results and Discussion

The use of plastics especially SuPs has increased tremendously in last decades, with a mixture of societal and economic benefits, without any suitable plastic waste management systems (GESAMP, 2015).

In most developing countries especially in Africa, even though waste collection companies exist, the problem of waste management in cities remains a major challenge for households in municipalities (Ndongo et al., 2016). Hence, the approach to waste disposal is becoming more individualistic, with most households seeking individual alternatives (long and short term) to waste disposal. In Cameroon for instance, it is common to see denizens disposing their household wastes (including SuPW) in drains or on other parts of the environment. The reasons are many and includes; poor waste disposal schemes, inadequate or no distribution skips poor settlement configuration as well as the lack of fine or punishment for defaulters.

Even though plastics recycling dates back since the 1970s, the amount of plastic properly managed or recycled, vary in space (region), type and application. However, the recycling of plastic packaging materials have increased significantly in many countries of the last decades, and taken precedence over SuP bottles and carrier bags, which are still lagging behind in this process in many parts of the world especially in developing countries with limited waste management technics.

Consequently, technological innovation and changes in systems for collection, sorting and reprocessing of eco-friendly plastics have given room for new opportunities for recycling, and with joint actions of governments, industries, and the people, it will be
possible in the coming decades to divert huge amount of plastic waste destined for landfills, to recycling firms or industries.

2.5 Conclusion

The global share of plastic packaging market has increased in volume from 17% to 25% between 2000 and 2015, with an annual market rise of 5%. The year 2013 marks the turning point in the plastic packaging industry experiencing a market increase of 78 million tonnes, worth USD 260 billion (World Economic Forum et.al., 2016). These statistics portrays societal dependence and usage of different categories of SuPs. This equally means that as long as there are no sustainable alternatives to plastics in general and SuPs in particular; the wastes resulting from their uses will keep on increasing. Therefore, a look at the intervention techniques to plastic waste management would be a watershed in the process of seeking sustainable solutions for SuPWM.
CHAPTER THREE: EMERGING APPROACHES / INTERVENTION OF SUPM: LESSONS FROM AROUND THE GLOBE

3.1 Background and justification

Literature has emerged on plastics, their impact on human health, marine mammals, and the marine environment. Although Interventions for plastics (especially plastic bags) began much earlier in 1991 (Xanthos & Walker, 2017), scientists, politicians and experts subsequently advance have different strategies aimed at reducing single-use land-based plastics. Some of these interventions have been successful in some countries while in other countries, interventions in place to reduce SuP is still in progress or under observation because the success rate cannot be evaluated due to the absence of adequate information / data.

With the existing approaches to SuP reduction, this chapter draws together the opinion and experiences of 08 interviewees (experts and other scientists working on Plastics) with on-going or successful interventions regarding PSC (production, use, and disposal). It also analyses and measures the successful techniques from some countries of the world in managing single-use plastic waste (SuPW). Hence, the methodology in this study is based on review interventions for leakages of SuPs from land, using exclusively publicly available data and semi-structured interview, but not field measurements.

This chapter draws upon information from interviews and a systematic literature search to identify emerging interventions in the plastic supply chain to reduce plastic in the environment. It then applies criteria to evaluate the success of the intervention.
3.2 Methods
3.2.1 Overview of Methods
3.2.1.1 Data Collected

Literature review (from books, peer reviewed academic papers and reports) from google scholar, Science Direct, etc. and eight semi structure interview will constitute the main source of data used in this study.

3.2.1.1.1 Literature Search

Existing scientific literature (books, academic papers) and reports (published and unpublished) on plastic waste management were reviewed and summarized. The objective of the literature search was to analyse data for waste management of SuPs in Cameroon as well as find and analyse global interventions on SuPM (lessons from other countries).

To evaluate plastics management in Cameroon, data was collected from reports produced by public waste management agencies/companies and municipalities. For SuPWM from across the globe, data was collected both from interviews with scientists and experts working on plastics waste management (PWM) in different countries. In addition, reviewed literature and reports on different kinds of intervention to eradicate plastic wastes on land, constitutes a major source of data, and would be analysed in details in the subsequent paragraph.

3.2.1.1.2 Interview

In a bid to acquire appropriate information on SuPM on land, we used the ex-post policy - a method of evaluation that assesses the degree of success of policies implemented. This method was chosen in this study because of the differences in conditions and policies that succeeded in some countries failed in other. Because of this, data from interview was used to fill this gap as well as assess the success of emerging policies using ex-ante (Policy evaluation that attempts to foresee how successful the implementation of an alternative policy will be).
In this regard, this study used semi-structured interviews that provided participants the opportunity to explore they perceived important. The interview was centred around seven (07) general and specific questions with 15 targeted respondents. We successfully had eight (08) interviewees from five countries (Denmark, Sweden, Ghana, UK, and The Netherlands). The conversations that were based on the experiences and opinions of experts, lasted between 30 minutes to 60 minutes, and resulted to 3 hours, 30 minutes of recordings later transcribed for textual exploration. Because of the limited time allocated to conclude this study, the data obtained was considered adequate to arrive at the conclusions of this study.

The interview (opinion based) started with a general discussion on plastics to obtain information about the different kinds of plastics, which society uses on daily basis, the governance issues associated to it, and its impacts on marine environment. It then proceeded by asking seven opinion guided based questions (as indicated in Table 3.1) to direct the discussion. Participants responded to these questions based on their own experiences.

3.2.1.2 Criteria for Defining Successful Interventions Technics to Reduce SuPs on Land

The four criteria described in Table 3.1 below have been considered for analysing successful land-based SuPs reduction technics. Further analysis using these criteria is elaborated in Table 3.3.

**Table 3.1**: Description of Selection criteria for Plastic Reduction Intervention

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Decrease Observed</td>
<td>It implies plastic litter on land / marine environment prior to the introduction of policy or technic is no longer visible or seen.</td>
</tr>
</tbody>
</table>
b) In-Progress and / or Too Soon to Evaluate.
This means either the program is still ongoing or it just started and significant progress is still unknown or cannot be assessed.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What efforts have been made in other parts of the world to manage land-based plastics?</td>
<td>We tried to throw light on practices of other countries in managing land-based single-use plastics, ranging from economic, social and regulatory.</td>
</tr>
</tbody>
</table>

3.2.1.3 Interview Methodology
3.2.1.3.1 Interview Questions

The interview questions (07) focused on three key elements: a) policies or methods applied by countries with plastics to reduce plastic waste on land; b) methods that could be applied by a country without plastic policy to curb the phenomenon; and c) the alternatives that exist to reduce plastic wastes on land (behavioural change or alternative products (e.g. bio-based products). The table below presents the interview questions and expected outcomes.

Table 3. 2: Interview Questions and summary outcomes
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. What is the evidence of a successful land-based plastic management?</td>
<td>Here, countries that have made enormous strides in dealing with land-based plastics dominated this part of the interview. Some earmarked countries came from Europe, Asia and Africa as pace setters in this exercise.</td>
</tr>
<tr>
<td>3. What part of the plastic supply chain can be managed within a country without a plastic policy?</td>
<td>Closing the tap (production) was the focus. However, the debate was carried forward to include incentives for post-usage management (proper disposal schemes).</td>
</tr>
<tr>
<td>4. What area of the supply chain can policy intervene to reduce the dependence on plastics and where have you seen that work?</td>
<td>Interventions aimed at reducing plastic production and installing proper waste management schemes as well as education and raising of public awareness on the negative effects of plastic could reduce the phenomenon drastically.</td>
</tr>
<tr>
<td>5. What is the scope of regional policies, which can support the plastic solution?</td>
<td>It is assumed that effective and sustainable solutions to eradicate plastic litter cannot be achieved without a regional approach to the problem.</td>
</tr>
<tr>
<td>6. What are the promising possibilities that can be used as alternatives to plastics?</td>
<td>Aside from biodegradable plastics, it has been proven that reuse plastics will reduce the amount of waste generated from the consumption of single-use plastics.</td>
</tr>
<tr>
<td>7. What are the most productive ways to change the public and practical perception about plastics?</td>
<td>This question focuses on the future of plastic litter from single-use sources. The aim of the question was to link perception and/or mind-set to global environment problems (Plastics). Here, education of denizens through broadcasting on the effects of plastics to health and environment is one of the most promising and practical way and to change public perception about single-use plastics.</td>
</tr>
</tbody>
</table>
3.2.1.3.2 Interviewees or Respondents

On the respondents, 08 semi-structure interviews were arranged and conducted between May and July 2018, even though the initial target was 15 interviews. The respondents were mostly scientists and experts who are knowledgeable on marine and land based plastics and are currently working on plastics reduction programs. NGOs were equally included because they have knowledge on the subject matter. Nevertheless, majority of the NGOs and experts and scandinavia scientists contacted are located in Western Europe. One of the scientists interviewed is currently working on a project to reduce marine plastics in West Africa.

For ethical reasons, the identity of the respondents cannot be revealed, and with reference to the specific themes and excerpts they mentioned, the interviewees would be referred to as R1, R2, R3...R8.

3.2.1.3.3 Interview Transcription

The Interviews conducted were recorded using a voice recorder, transcribed manually and coded. Given that the identification of theme is vital in portraying the recurrent unifying concepts or statement within data (Abigail & Murray, 2016), themes were formulated drawing expressions used in existing and reviewed literature. As the interview transcripts were scrutinised, I updated the themes, and adapted them to repeated terminologies of the respondents to enhance clarity.

3.2.1.3.4 Identification of Interview Themes

From literature reviewed and upon analysis of the respondents’ feedback from the interviews, the following themes that emerged have been selected under the following sub heading.

They include: a) Economic Instruments (Taxes to both producers and consumers; and charges); b) Regulatory measures such as complete and limited plastic ban; c) communicative or crosscutting approaches which refers to education, awareness raising, behavioural change, partnership and promotion on alternatives to plastics.
3.3 Results and Analysis of Successful Management Technics for Single-Use Plastics in other Parts of the World

3.3.1 Results: Literature Review and Interviews

From the literature reviewed and the interviews conducted and analysed, the recurrent and recommended intervention technics to reduce land based plastic pollutions is categorised under economic, regulatory, and communicative or cross cutting instruments. Details on the specific type of instrument will be further elaborated in each intervention technic.

3.3.1.1 Economic Instruments

- Tax Paid by Producers

Despite its limited plastic bag consumption, Denmark has taxes on plastic packaging borne by producers, to reduce the amount of material used in manufacturing plastic and paper bags. With this system in place, producers have successfully and indirectly shifted taxes to retailers who in turn have passed it to consumers (UNEP, 2005).

- Tax Paid by Consumers

For direct taxes (at the point of sale) to be paid by consumers, Ireland was the first country in the world to introduce product tax on plastic bags (including biodegradable bags) – Irish “PlasTax” in 2002, to link pricing with the Irish government’s anti-litter policy (Peppa, 2016). The purpose of the tax is to enable consumers of plastic bags to be aware of their responsibility in littering and embrace a behavioural change thereof. According to 2014 statistics, it has been revealed that the yearly consumption of plastics per person was 14 bags in Ireland (Peppa, 2016).

- Charge / Fee Paid by Consumers

In 2003, because of litter degradation to touristic resorts and threat to marine mammal, South Africa imposed a ban on plastic bags thinner than 30µm, and imposed a levy to be paid by customers at the point of sales. This instrument, which seem like a photocopy of the Irish “PlasTax”, was short lived even though it recorded a brief success in reducing plastic litter. This is because users became used to paying the
fee charged for plastic bag, and increased their usage of plastic bags (Dikgang et al., 2012).

From the interviewees' (experts and scientists) perspectives, they believe that deposit-refund schemes (for plastic bottles only) on the point of sale and extended producer responsibility schemes (R1, R2, R5, & R8) are effective economic instruments to manage plastic wastes on land. They opine that these technics will make producers more responsible for waste generated from use of their products, and would be obliged to clean-up. R2 specifically stressed that the waste management can be done through franchising local NGO.

3.3.1.2 Regulatory / Policy Strategies

- **Complete Ban**

To reduce the production of single-use plastic, a complete ban best suits the strategy. This policy targets a rapid change in behaviour of plastics users, while at the same time forces retailers to switch to plastics alternatives if they exist.

As pace setter in this exercise, Bangladesh in 2002 was the first country in the world to ban the production and consumption of single-use plastics carrier bags. This decision came as result of the blockage of the drainage systems by plastic carrier bags in most parts of the city, causing floods for many months in 1998 (Synthia & Kabir, 2015; Peppa, 2016).

Following the footsteps of Bangladesh, Rwanda in 2008 became the first African country to ban the non-biodegradable plastic bags with a thickness inferior to 100µm. By this ban, she has equally inserted plastic bags into her 2020 national vision of sustainable middle-income country, and thus, they are considering placing a ban on other types of plastics (Guardian, 2014).

- **Partial Ban (on thinner and non-biodegradable plastic bags)**

This form of instrument aims at restricting the plastic bag production in order to reap some environmental gains, and modify the manufacturing of the products to support local economy. This system effective in Italy (2011) and France (2016), where in
recent years their governments have placed a ban on light-weighted non-biodegradable SuP bags in favour of biodegradable plastic bags. It should be recalled that both countries are advocate for the creation of a bio-based packaging industry, because of the economic opportunities it provides (France24.com 2016; Euronews.com, 2016; Peppa, 2016).

As such, experts and scientists opine that bans are practical ways of reducing societal dependence on plastics (R1, R2 & R5), but should be accompanied with rethinking of its impact on the marine environment (R3). To these, the inclusion of reduction targets, encouraging reusable plastics as alternatives, and the development of the recycling industry, couple with the surge of the circular plastic economy (R2, R7 & R8) could significantly reduce societal dependence on plastics.

3.3.1.3 Communicative or Crosscutting Techniques

➢ **Awareness Raising**

To foster awareness on responsible plastic usage and waste management behaviour in Australia, students have assisted their government to develop and distribute brochures to sensitize the public on the need to have a change in mind-set on SuP bag usage. In addition, television advertisements, radio programs created greater awareness on the negative effects of plastics usage, while boat ramp signs were erected to promote responsible waste management behaviour.

Although there is an increasing number of organizations working to foster awareness on plastic debris, it is important to note that communities’ involving in environmental issues is key to people of all ages (Van der Velde et al., 2017).

➢ **Education Programs**

To change public perception on plastic usage and reduce littering thereof, marine literacy education is key, especially if included in the academic curriculum of the younger generation R2 & R3). Experts believe that knowledge on environmental issues especially plastics will reduce its pollution on land (R5, R6 & R8).
For example, Australia in 2002 initiated measures to reduce plastic carrier bags through the Reef Guardian Schools and Reef Guardian Councils. In the Reef Guardian Schools Program, approximately 200 schools have been educated on the need to reduce plastic usage. The trickle-down effect of the program has been the education on environmentally friendly practices and usage of plastic carrier bags by these students to their communities.

➢ **Promotion of Alternatives to Plastics**

Australia (since 2002) has been a model in promoting alternatives plastic carrier bags and encouraging recycling. Initially their target was to reduce usage of plastic bags by 50% and increasing recycling. In achieving their targets, Australia embraced voluntary measures by introducing the National Code of Practice for the Management of Plastic Retail Carrier Bags - an initiative that advised retailers on the possible methods of promoting alternatives to plastic bags, while encouraging plastic recycling (Peppa, 2016). The result was a reduction in consumption of plastic carrier bags to 41% and recycling to 3% by 2005 (Nhamo, 2008).

In Europe, smarter use of plastic - using less plastics and recycling more is considered the most suitable and sustainable way of managing plastics according to some scientists (R1). They believe that only a small portion of bio-based plastic materials is biodegradable. In this regard, the alternative to plastic will depend on its use because some alternatives are suitable for a specific type of plastic use but, are not suitable for another use of the same plastic polymer (R2).

### 3.3.2 Analysis of successful interventions for Single-use plastics based on Literature Search and Interviews

The table below summarizes some successful intervention technics by countries with plastic policy to reduce the amount of land-based SuP litter on the environment.
Table 3. 3: Analysis of Interventions for Single-use Plastics

<table>
<thead>
<tr>
<th>Type of Intervention</th>
<th>Purpose</th>
<th>Degree of Success</th>
<th>Country</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Economic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 Literature</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Special tax on beverage containers (PET bottles).</td>
<td>- To encourage the use of refillable beverages packaging on behalf of disposable.</td>
<td>- Decrease Observed</td>
<td>- Norway, Finland, Denmark</td>
<td>- Hennlock et al., 2015</td>
</tr>
<tr>
<td>2. Fee /levies for using plastic materials in Packaging.</td>
<td>- Reduce usage of plastic carrier bags.</td>
<td>- Decrease Observed</td>
<td>- Norway</td>
<td>- Hennlock et al., 2015</td>
</tr>
<tr>
<td>3. Taxes paid by consumers</td>
<td>- Reduce litter from plastic bags.</td>
<td>- Unknown / No Data Exist</td>
<td>- South Africa</td>
<td>- Dikgang et al., 2012</td>
</tr>
<tr>
<td>4. Incentives: Tax Incentives.</td>
<td>- Enable consumers be aware of their responsibility in littering and embrace a behavioural change.</td>
<td>- Decrease Observed</td>
<td>- Ireland</td>
<td>- Peppa, 2016</td>
</tr>
<tr>
<td>1.2 Interviews</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Tax on Plastics Production &amp; bag.</td>
<td>- To replace production with plastic bag recycling</td>
<td>- Decrease Observed</td>
<td>- Sweden, Norway, Denmark, Finland.</td>
<td>- Hennlock et al., 2015</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Norway**, **Finland**, **Demark**
- **Norway**
- **South Africa**
- **Ireland**
- **Sweden, Norway, Denmark, Finland.**
- **Rwanda**
- **UK**
- **R1, R7, & R8**
2. Extended Producer Responsibility.

3. Deposit-Refund Scheme for plastic bottles and cans only.

- To make producers accountable for the waste from their products consumed
- Keep plastic wastes out of nature

- Decrease Observed.
- Decrease Observed

- Denmark
- Sweden, Germany, Denmark, Ireland, Norway.

- R1, R2, R5, & R8

2. Policies/ Regulations

2.1 Literature

1. Ban
   a) Ban on single use plastic bags.
      To become the first plastic-free Nation.
      - Waste reduction on marine environment.
      - Make producers'/ Importers liable for plastic wastes from their products.
      - Enhance behavioural change & reduce plastics production and use.
      - Decrease Observed
      - Decrease Observed
      - Decrease Observed
      - Decrease Observed
      - Long-term /in-progress
      - Rwanda
      - Kenya
      - Sweden
      - Indonesia
      - Xanthos & Walker, 2017;
      - Vince & Hardesty, 2018;
      - Hennlock et al., 2015

2. Producer / Importer responsibility on packaging.


2.2 Interview
<table>
<thead>
<tr>
<th>1. Ban (complete)</th>
<th>- Reduce Plastic production &amp; litter.</th>
<th>- Decrease Observed</th>
<th>- Rwanda, Kenya.</th>
<th>- R1, R2, R3 &amp; R5.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Limited Ban</td>
<td>Reduce use of plastic bags</td>
<td>Decrease Observed</td>
<td>France &amp; Italy</td>
<td>R8, R1, &amp; R6</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>3. Communicative Instruments</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3.1 Literature</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Education &amp; awareness initiative on use of plastic bag.</td>
<td>- To address the negative impact of plastic bag litter on the community and the Australian environment.</td>
<td>- Decrease Observed</td>
<td>- Australia</td>
<td>- Regulatory Impact Statement (RIS, 2007.</td>
</tr>
<tr>
<td>2. Awareness campaigns.</td>
<td>- Foster awareness on responsible plastic usage and waste management behaviour.</td>
<td>- Decrease Observed</td>
<td>- Australia</td>
<td>- Van der Velde et al., 2017.</td>
</tr>
<tr>
<td>3. Promotion of Alternatives</td>
<td>- Reduced Plastics and increase recycling.</td>
<td>- Decrease Observed</td>
<td>- Australia</td>
<td>- Nhamo, 2008; Department of Environment and Heritage (Australia) 2008 Plastic bags; R1; R2.</td>
</tr>
<tr>
<td><strong>3.2 Interview</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Awareness Raising</td>
<td>Change of mind set on plastic use</td>
<td>Decrease Observed</td>
<td>Rwanda &amp; Ireland</td>
<td>R1, R4, R5 &amp; R8</td>
</tr>
<tr>
<td>2. Education</td>
<td>Negative effects of Plastics.</td>
<td>Decrease Observe</td>
<td>Australia &amp; Sweden</td>
<td>R7, R1, R3</td>
</tr>
<tr>
<td>3. Promotion of Alternative</td>
<td>Reduce dependence on plastic carrier bags</td>
<td>- In-Progress / too soon to Evaluate</td>
<td>Kenya, France</td>
<td>R1, R7, R4, R2.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.4 Discussion

An analysis of the different approaches used to reduce plastic usage and marine litter reveal that the degree of success will greatly depend on level of multi-stakeholder involvement and effective communication. In Rwanda, plastic ban was successful because the government took concrete measures to communicate significance of the ban through media outreach programs to its citizens Peppa (2016). In addition, billboards and voice messages were communicated to external stakeholder (such as tourists) in airports about the plastic ban, and severe punishments and fines were enacted to offenders. Importantly, tax incentives were given to manufacturers to replace production with plastic bag recycling. The proof of success of this method is the disappearance of litter from the streets and Kigali (capita of Rwanda) is nicknamed as Africa’s cleanest city.

Furthermore, in Ireland, the Irish “PlasTax” is today considered to be the most successful plastic bag policy in the world since the policy was comprehensively advertised since it came into force. Prior to the introduction of the policy, the Irish government consulted retailers. Transparency regarding the use of the levy was the underpinning factor to the success of the policy (Xanthos & Walker, 2017), given that citizens were informed that the levy will be reinjected to same or new environmental projects (double-dividend). Finally, the regulation has strict penalties (including imprisonment) to offenders for non-compliance (Convery et al., 2007).

Similarly, though Australia does not have a national plastic bag policy, its voluntary approach to eradicating plastic litter and encouraging recycling has been very successful because they consulted their stakeholders (retailers) prior to the introduction of the voluntary plastic scheme they had the support of their stakeholders). In addition, alternatives to plastic bags are available and affordable while the community approach (education and awareness raising, implementation of community recycling programs, storm water management and clean-up of beaches and waterways) was crucial to their success.
Even though some countries have been successful in their efforts to reduce land-based SuP usage and litter, others are still facing challenges in dealing with the phenomenon. The same approaches have yielded different results in different parts of the world. A case in point is Bangladesh, despite being the first country in the world to place a ban on SuP carrier bags, the threat of plastics have not ceased to increase. Peppa (2016) argues that Bangladesh’s ban on plastics was not successful because of the illegal and uncontrolled sale of plastic bags (black market). Another reason was the lack of enforcement of the decision (Larsen & Venkova, 2014), and the expensive nature of jute bags that were provided as alternative to plastic carrier bags (Australian National Plastic & Shopping Bags Working Group, 2002).

In the same vein, Italy and France’s approaches cannot be considered successful because currently, raw materials for bio-based plastic production is not enough. Therefore, there is possibility that production may still be combined with fossil fuel. In addition, due to disputes on European Union trade laws, Italy has not fully implemented its ban (Xanthos and Walker, 2017).

Moreover, South Africa has been facing a challenge in enforcing the ban on plastic bags. This is because they did not organize awareness campaigns before the ban, and the government failed to win the trust of manufactures. Furthermore, there was no consistency in the levy to customers by retailers. Finally, the acceptance of the levy charged on consumers has favoured increased consumption of the product (Xanthos and Walker, 2017).

3.5 Conclusion

Most of the literature and data collected from interviews are experiences from Europe and Australia as well as South and East Africa. The existence of limited literature on the status of plastics management in West Africa poses a challenge in the understanding and analysis this phenomenon in this study. In attempting to fill this knowledge gap and in a bid to map a plastic policy for Cameroon, reference to the successful plastics intervention policies from other parts of the world is inevitable.
CHAPTER FOUR: SINGLE-USE PLASTICS WASTE MANAGEMENT (SUPM) IN CAMEROON.

4.1 Introduction

Plastics are composed of very large molecule consisting of smaller units known as monomers, joined together in a chain through a process termed polymerization (Manga et al., 2007). In general, the composition of polymers are carbon and hydrogen, which may sometimes include oxygen, nitrogen, chlorine or fluorine. Even though natural plastics (such as shellac, tortoiseshell, etc.) exist, the term plastic mostly refers to materials fabricated for our daily use. They are either synthetic or semi-synthetic including but not limited to; clothes, construction materials, automobiles, packaging (including single use carrier bags) and plastic bottles.

Over the last few decades, Africa in general and Cameroon in particularly have become dependent on plastics, whose role in society cannot be over emphasized. The significance of their uses amongst others includes products packaging, fabrication of daily used and consumed products. It is also used for preserving food and mineral water prior to consumption. In most cities and villages in Cameroon, plastic packages are used for preserving foodstuff (such as corn fufu) in order that they remain warm before being serve (Fonja, 2017).

Hence, the wastes from single-use plastic bags and bottles are numerically of less importance (when compared to other forms of plastic litters), but remains a conspicuous element of the litter because they are highly visible on the marine environment, and easy to disperse.

This chapter analysis solid and plastics waste management from households (including plastics) from the national to the municipal levels. It equally presents the
waste collection and disposal methods and then discusses some challenges hindering the sector.

4.2 Methodology
4.2.1 Data Collection
4.2.1.1 Data from Literature Review

The data used in analysing this chapter is based on review of existing literature on waste management in Cameroon. In addition, official reports from government, existing laws, degrees, and ministerial decisions on plastic and waste management as well as other published articles were accessed to obtain information that would be relevant to propose a plastic management policy in Cameroon.

4.2.1.2 Data from Semi Structure Interview

Furthermore, through telephone conversation with some experts working with the waste management company known as “Hygiène et Salubrité du Cameroun” (HYSACAM), in three cities (Yaounde, Buea and Douala) in Cameroon, and government officials in the ministry of Environment, Nature Protection, and Sustainability (MINEPDED) data on the present status of waste (including SuP) management in Cameroon was gotten. The intention was to compare the data from literature with my personal observation after visiting waste dumpsites (landfill) in Yaounde and Buea, and recommend succinct policy recommendation for consideration.

4.3 Result
4.3.1 Presentation of Cameroon

The Republic of Cameroon, located in the central of the Gulf of Guinea lies between latitudes 2° and 12° N and between longitudes 8° and 16° E (Manga et al., 2007). It has a surface area of 475,440 Km², making it the 54th largest country in the world, and inhabited by approximately 25 million.
4.3.2. Overview: Waste Management Techniques in Cameroon

4.3.2.1 Status of solid Waste in Cameroon

Waste management is generally connected to human activities such as urbanization, agriculture and economic development. In Cameroon even though not in every city, waste management (from collection to disposal) is carried out by HYSACAM in at least six regions (out of ten) including their regional capitals and other cities within these regions. Currently its activities are been felt in Yaoundé, Douala, Buea, Maroua, Bafoussam, Limbe, Ebolowa, Bertoua, Bangou, Ngaoundere, Bangate, Meyomesala /Sangmelima, Kribi and Garoua (Mbeng, et al., 2016).

MINEPDED in its 2006 report reveals that the average daily household solid waste production per person in Cameroon is estimated between 500g and 600g. Despite of the efforts in reducing land pollution by waste management institutions, household wastes deposited on the marine environment is increasing at an alarming rate.
According to MINEPDED (2011), 200.4 tons of garbage is produced daily in Yaoundé and 1.60% (amounting to 119.8 tons) is discharged into the environment.

One of the major problems of waste management is the indiscriminate burning of waste in Cameroon. This is because the consequences associated to such actions are environmental pollution and health hazards. Even though the laws on environment prohibits such practices, the population still prefers this option of waste disposal because they consider it as the most efficient method of disposing their non-biodegradable household wastes.

4.3.2.2 Status of Plastic Waste Management in Cameroon

➢ Brief Overview of Plastics

Plastics in this study refers to a sub-category of the larger class of polymers (GESAMP, 2015). Therefore, they are composed of very large molecule consisting of smaller units known as monomers, joined together in a chain through a process termed polymerization (Manga et al., 2007). Generally, the composition of polymers are carbon and hydrogen, and may sometimes include oxygen, nitrogen, chlorine or fluorine. Even though natural plastics (such as shellac, tortoiseshell, etc.) exist, the term plastic mostly refers to materials fabricated for our daily use. They are either synthetic or semi-synthetic including but not limited to; clothes, construction materials, automobiles, packaging (including single use carrier bags) and plastic bottles.

4.3.2.3 Common Type of Plastics Used in Cameroon

As earlier stated, plastics are grouped into synthetic and semi synthetic materials, which are further, are further divided into thermosets and thermoplastics.

➢ Thermosets

Thermoset are plastics most used in electronic devices. When melted and soften, they take shape only once and even when heat is reapplied on them, they retain the shape they were first transformed into. However, they will not be considered in this study even though they are part of the plastic waste managed in Cameroon.
Thermoplastics

They are plastics that have the capacity to be repeatedly soften and melted down with heat and can solidify into new plastics materials when cooled (See Table 4.1).

Table 4. 1: Thermoplastics Frequently used in Cameroon.

<table>
<thead>
<tr>
<th>Polymer Type</th>
<th>Low Density Polyethylene (LDPE)</th>
<th>Poly Vinyl Chloride (PVC)</th>
<th>High Density Polyethylene (HDPE)</th>
<th>Polypropylene (PPP)</th>
<th>Polystyrene (PS)</th>
<th>Polyethylene Terephthalate (PET)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example</td>
<td>garbage bins and bags</td>
<td>cordial, juice or squeeze bottles</td>
<td>shampoo containers or milk bottles</td>
<td>Lunch boxes, take-out food containers, ice cream containers</td>
<td>foam hot drink cups, plastic cutlery, container, &amp; yogurt</td>
<td>Fruit juice and soft drink bottles.</td>
</tr>
</tbody>
</table>

Source: Author, Adapted from GESAMP, 2015).

They are classified as such based on the type of polymer they are composed of, and the fact that they are mostly reprocessed.

Hence, the focus of this study will be on PET plastic materials, and other single use plastic carrier bags found in grocery shops and supermarkets because they are frequently used and poorly managed. PET are contained in bottles for mineral water, food trays and roasting bags, as well as in some plastic carrier bags, and other plastic objects that are also used for storage of food and packing of mineral water in some cities and rural areas in Cameroon.

4.3.3 Legislations on Plastic Waste Management at National Level

To control plastics production, use and waste in Cameroon, the government has formulated a plethora of legislation. The 1996 environmental management law is the
main instrument that regulates environmental activities in Cameroon. However, subsidiary bodies exist (such as the Inter-Ministerial Commission for Municipal Waste Management (ICMWM)) alongside other instruments like Prime Ministerial Decree (Decree No. 95/230/PM) in 1995. (Manga et al., 2007).

In light to the above, several supporting instruments and Institutions for practical implementation of the 1996 Environmental law have been established. From now on, we are going to focus on the instruments in Cameroon that deal with SuPs only. They include:

- The first is Joint Ministerial Order No.0041/ MINEPDED/ MINCOMMERCE of 24 October 2012, relating to the manufacture, importation and commercialization of non-biodegradable packages.
- Circular No.096/c/CAB/MINEPDED of 10 April 2014, relating to the control of conformity and the repression of the violators of Joint Order No.004/MINEPDED/ MINCOMMERCE of 24 October 2012, relating amongst others to the prohibition of plastic packages inferior to 61 microns.
- Circular No.00036/NC/CAB/MINEPDED of 28 August 2014, relating to small scale violators of Joint Order No.004/MINEPDED/ MINCOMMERCE of 24 October 2012 relating amongst others to the prohibition of plastic packages inferior to 61 microns.

Fonja (2012) notes, the Joint Order of October 2014 took into consideration Section 58 of the Environmental Law of 1996. The Order jointly signed by MINEPDED and MINCOMMERCE, regulates the manufacture, importation and commercialization of non-biodegradable packages. It equally regulates the management of non-biodegradable packages and the obtaining of a license.

Form this, it is would be relevant to understand the operational waste management technics in Cameroon.

**4.3.4 Operational framework for Municipal Waste Management**

As part of their responsibilities, Municipal Councils ensure that waste management services and other maintenance infrastructures are available. They provide and
maintain waste infrastructure such as waste disposal facilities, street sleeping, collection, transportation and disposal of household waste through the health and safety departments of the Hygiene and Sanitation Units of their Councils (Manga et al., 2007). Municipal Councils also have the responsibility for creating and managing these units, with partial responsibility for waste management or they may subcontract the responsibilities to third parties such as specialized waste management companies.

4.3.4.1 Collection Methods

The waste collection mechanisms are carried out through the following ways. Manga et al., (2007) distinguishes three methods of waste collection, which is synonymous to waste disposal for the population:

✓ Pre-collection. In this process, waste including plastic is taken from points of generation to municipal waste collection skips or bins.

✓ The door –to-door waste collection system is movement of waste collection trucks into different neighbours or residential areas, inviting citizens to come and empty their wastes directly into these trucks by hooting. This system also encourages wastes to be kept in points of generation for a limited period before it is disposed of.

✓ Fixed point waste collection. In this system, large communal waste collection bins are kept in specific locations of the city for denizens to empty their wastes. The waste is later picked up at specific hours of the day.

4.3.4.2 Disposal Methods

In some cities in Cameroon, that I have personally observed, household waste after collection is dumped in landfills. In some areas, Takougand, (2008) reveals that 56 uncontrolled landfills were observed on an area of 8.5 km² for a total volume of 12 278.93m³. This implies that there is minimal supervision and environmental consideration in this exercise. In choosing the dumpsites or landfill in some parts of Buea and Yaounde, the convenience of the waste company is given priority over slums, unplanned settlements, and environmental risk assessment. This is because most dumpsites are located very close to such neighbourhoods including streams and rivers. For example, in Limbe, the “Newmarket” and Slaughterhouse dumpsites
is located in swampy land where flooding is common in the rainy season (Manga et al, 2007). In this city like in other cities in Cameroon, the method is periodic burning of waste as a means of disposal. Also, dumping of waste such as plastic water bottles in drainage systems as shown in 4.1.

Figure 4. 2: Dumped plastic bottles clogged in drainage passageways in Yaoundé, Cameroon


4.4 Discussion
4.4.1 Challenges for Enforcing Plastic Law
Many reason accounts for the ineffectiveness in the regulation of plastic policy in Cameroon. They include, regulatory challenges, lack of stakeholder involvement, lack of alternative, manpower, awareness of the ban by the public, just to name a few. In this section, focus will be on regulatory challenge and lack of stakeholder involvement.
4.4.1.1 Regulatory Challenges

The creation of a body (ICMWM) in charge of waste management reveals government’s attempt to reduce household waste and litter on land. However, very little progress has been recorded in terms of change of littering habits litter and waste disposal.

As Manga et al., 2007 notes, the existence of plastic waste management instruments and regulations are either not fully respected or enforced. For instance, article 7 of the Joint Ministerial order prohibiting the importation, manufacturing and commercialization of non-biodegradable plastics is not respected because the ministries in charge with the implementation of such decisions are unable to meet the expectations of their duties (Fonja, 2017). The lack of personnel to undertake field visits and enforce this aspect of the law possess a serious challenge.

Furthermore, even though article 9 of the 1996 Law on Environmental Management in Cameroon unequivocally prohibits the burning of plastic in open air as a means of disposal or to throw them into nature, or bury them in landfills, this section of the law is not respected. It is common to see inhabitants acting contrary to the law without punishment.

4.4.1.2 Lack of Stakeholder Involvement

At the time of the drafting of the regulation on plastics, the major stakeholders such as manufacturers, importers, retailers were excluded or were not consulted. The decision to ban plastics was somehow imposed on the population. These accounts are resistance and the non-respect of the ministerial Order. This proof of this resistance is the fact that in markets where plastics below 61 microns are prohibited, they are overtly commercialised.

For reasons similar to this, and in the spirit of encouraging sustainable plastic waste management schemes, the report of an inter-ministerial meeting by MINEPDED (2012) came out with the following observations:

- that SuPs are to a greater extent accountable for public health related problems through the promotion of diseases such as cholera, and malaria;
that they are a threat to food security because they block water infiltration into agricultural farm lands, and are responsible for the death of cattle herds since they ingest it as food;
they block the drainage systems, which causes flooding in some city areas.

To corroborate the points, the report also reveals that 58% of plastics users dispose their plastic wastes on their environment. While 22% of consumers empty their waste through the appropriate method (waste collector / bin), a further 20% dispose their wastes through open air burning.

4.4.1.3 Challenges Related to Waste Collection and Disposal Schemes

The process of waste collection itself is not sustainable given that the collection process by HYSACAM is void of sorting of plastic bags from bottles. Moreover, there is no public information on the need to separate plastic bottles for instance from other waste materials, couple with the fact that separate waste skips for paper, plastic bottles or can and other rubbish do not exist in Cameroon.

Majority of wastes is household waste disposed is unmanaged while those managed is dumped in open landfills (Figure 4.1 below). For this reason, plastic bags which are light weighted in nature are blown by the wind to other parts of the city while in some areas like the River Mfoudi in Yaounde, they block most drainage systems in cities and accountable for flooding (Edmond, 2015). This can lead to health diseases like malaria.
Thus, with these revelations on plastics in mind, it is obvious that the data gap on plastic recycling in Cameroon is very wide and unpublished or unavailable, making analysis of the phenomenon very challenging.

4.5 Conclusion

As human impacts on environment increases in Cameroon and the world at large, there is urgent need to address risks connected to these pollutions. The losses of single-use plastics into landfill is a cause for concern because of the high clean-up cost that maybe associated to it in future if neglected. Therefore, addressing these challenges should be a priority for the government of Cameroon. Since global problems needs global solutions, formulating a plastic policy intended for implementation at national level would be a watershed in the process of synergizing with the international community to eradicate plastic from land and the marine environment.
CHAPTER FIVE: IDENTIFYING OPPORTUNITIES FOR INTERVENTION IN CAMEROON

5.1 Introduction

Over the last century, plastics (carrier bags and bottles) have become one of the leading causes of plastic pollution on the marine environment. The reason can be attributed to its increase in production and use in the world. Current estimate reveal that global plastic production per day is estimated at one trillion, with only three (3%) to five (5%) percent being recycled (Fonja, 2017). Consequently, many countries around the world are developing regulations to reduce its consumption, despite the absence of an international legal binding instrument aimed at addressing the issue.

Despite having enacted many laws relating to environmental management, especially the 2014 joint Ministerial Order prohibiting the manufacturing, importation and commercialization of non-biodegradable plastics inferior to 61 microns by MINCOMMERCE and MINEPDED, the sale and use of plastics have increased tremendously. With the devastating effects emanating from the use of plastics, the question that comes to mind is what kind of policy framework can be introduced to country facing the effects of use of plastics, despite having adopted regulations to contain the phenomenon?

The chapter investigates the strategies used by some countries to successfully implement and manage plastics use in their society, using the DPSIR framework, with data from literature search and interview from scientists. It also assesses using SWOT analysis the proposed policy framework for plastic management in Cameroon.
5.2 Methodology

Number of studies have examine the impacts of SuPs on land in other countries and describe policies for it management, very limited studies have so far examined impacts or review policies to manage SuPs in Cameroon. This chapter reviews the existing strategies pertaining to economic trends, regulations, and communicative instruments with a specific focus on (Rwanda, Ireland and Australia), to provide recommendation for Cameroon’s efforts to mitigate the challenges posed by SuPW. Furthermore, the data for this chapter draws upon results from semi-structure interview (discussed in Chapter 3) as well as literature search from peer-reviewed and grey literature. In addition, SWOT analysis was used to evaluate the effectiveness of these approaches in Cameroon.

5.3 Results: Strategies adopted by Rwanda, Ireland and Australia

With a view towards addressing efficient SuP interventions for Cameroon, Rwanda, Ireland and Australia will serve a benchmark for analysis. This is because there have been enormous progress recorded in reducing and consuming SuP through these three approaches (Regulatory, Economic and Communicative / crosscutting), which they are nowadays being adopted by many countries in the world.

5.3.1 Best Practice: Strategies Used by Rwanda, Ireland, and Australia

5.3.1.1 Justification of Selected Countries

The following countries have been earmarked in this study because of the following reason;

- Rwanda stands as a model for successfully implementing a ban on plastics consumption, with the evidence being the absence of plastic litter on land. From the analysis in chapter 3, it approach has been successful as in Chapter 3.

- Ireland has successfully reduced the consumption of plastics to 14 bags per person, per year through the implementation of Irish “PlasTax” (Xanthos & Walker, 2017).

- Australia, having no plastic policy relied on voluntary initiatives from NGOs and other organizations to reduce plastic consumption and litter on land.
It should be noted that these are not the only successes recorded by countries in the fight against plastic pollution on land. In addition, these strategies are pragmatic and cost effective for a country like Cameroon without any plastic policy, and having limited resources.

5.3.1.2 Strategies Used to Curb the Consumption of Single-Use Plastic

The policy instruments used by Rwanda, Ireland and Australia can be classified as regulations, economic instruments, and crosscutting instruments. Even though Cameroon already have some regulations on single-use plastics management, for the regulation to be effective, economic and cross-cutting instruments would be use to educate consumers, instil in them the ability to think independently, and make decisions to reduce plastic waste on land (Hasson, Leiman & Visser, 2007). These approaches (commonly used, as seen in Table 5.1), which can either be implemented independently or jointly, would be used to formulate a policy framework for Cameroon to help her successfully managed land based plastics.

Table 5.1: Approaches for Reducing Land based Plastic Pollution

<table>
<thead>
<tr>
<th>Regulations /Policies / Legislation</th>
<th>Economic / market-based Instruments</th>
<th>Communicative/Crosscutting Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Complete ban;</td>
<td>- Tax paid by Producers;</td>
<td>- Awareness Raising;</td>
</tr>
<tr>
<td>- Partial ban (on thinner and non-biodegradable plastic bags).</td>
<td>- Charge / Fee Paid by Consumers;</td>
<td>- Education Programs;</td>
</tr>
<tr>
<td></td>
<td>- Tax Paid by Consumers.</td>
<td>- Promotion of Alternatives to Plastics.</td>
</tr>
</tbody>
</table>

Source: Author, Adapted from Peppa, 2017.
5.3.1.3: Operationalization of Strategies by Rwanda, Ireland, and Australia

The table below (Table 5.2) explains the successful strategies adopted by Rwanda, Australia and Ireland in reducing consumption on plastics bags. It also reveals that in attempting to reduce SuP consumption, there is no uniform approach applicable to all cases because the trends and consumption habits of countries is specific to their realities and cultures.

Table 5.2: Strategies Used to Reduce Plastic Consumption

<table>
<thead>
<tr>
<th>Country</th>
<th>Strategies Adopted by Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rwanda</td>
<td>❚ Legislation: Ban on Non-Biodegradable Plastic Bag</td>
</tr>
</tbody>
</table>

As pace setter for Africa in reducing plastic bag consumption, Rwanda in 2008 placed a ban on non-biodegradable plastics of thickness less than 100 µm. It achieved the desired results, which is evidenced by the absence of litter on land, Rwandan Government also included ban on plastic bags in it 2020 National Vision, which aims at making the country a sustainable middle-income nation (Xanthos & Walker, 2017).

Peppa (2016) outlines the strategy used by Rwanda to record such a tremendous success in reducing the dependence and consumption of plastic bags:

- Firstly, a nationwide media campaign was organised to explain the importance of the ban;
- tourists and other visitors to the country to be informed about the ban through signposts and voice messages in airports, and in other points of entry into Rwanda through sign posts only;
- Incentives were provided to manufactures of plastics to develop recycling of plastics, while heavier penalties (fines and imprisonment) were meted on
defaults, coupled with constant search (by police and custom) at other border control points to avoid smuggling (Pilgrim, 2016).

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**Economic Instrument: Levy for plastic bags in Retail Shops**

Being the first country worldwide in 2002 to place a tax on plastic bag, Ireland witnessed a decrease in plastic bag consumption from 328 to 21 bags per person per year (Peppa, 2016). The Irish PlasTax was initiated to raise consumer awareness in littering, and to change their behaviour thereof. The tax (levy) which stood at 15 euro cent per bag in 2002, was increased to 22 euro cent per bag in 2007 because of the increase in consumption of plastic bags to 31 per person. However, 2014 statistics indicated a fall in consumption to 14 bags per person over one year. PlasTax is applicable to all plastic bags including biodegradable, and has reduced plastic bags consumption by 90%. The reasons for its success are:

- Extensive media campaign before the introducing the levy (PlasTax) was done, especially about the aim and the use of the levy;

- Stakeholder consultation and participation;

- Low cost of administration (3% of total revenue);
- Finally, severe punishment (fine and imprisonment) for non-compliance was included, with local authorities given the mandate to verify if vendors implemented the levy.

影音

Crosscutting Approach: Voluntary Measures

With the aim of increasing recycling by 50% and reducing plastic bags consumption, Australia in 2002 introduced a series of voluntary measures to combat the use of plastic bags. These measures among others includes:

- Sensitization campaigns in some 200 students to their communities on best environmental accepted practices on use of plastic bags under the Relief Guardian School Program;

- The adoption of the National Code of Practice for the Management of Plastic Retail Carrier Bags which advises vendors of plastics bags on the possible methods of promoting alternatives to these products, as well as promoting plastic recycling. Nhamo, (2008) reports that this program by 2005, had succeeded in decreasing use of plastics bags to 41% and recycling to 3%.

From 2009, plastic ban was imposed in other parts of Australia such as Australia Capital Territory (2011), Northern Territory (2011), and Tasmania (2013), just to name a few (Clean-Up Australia, 2015).

5.4 Discussion

For the proposed policy framework on SuPM to be effective in Cameroon, it would be important to identify the internal and external factors that may favour or hinder the realisation of the objective of a proposed SuPM strategy like the one under scrutiny.
5.4.1 Strength of these Policies (Regulatory, Economic, and Crosscutting) to Cameroon

The wide media coverage of these strategies (Complete ban, Irish Plastax and communicative approaches) and sensitization campaign in our case studies (that is Rwanda, Ireland and Australia), accounts for the success of the technics. This method favoured great understanding of the policy, and a national sense of belonging (national ownership of the policy). In addition, stakeholder consultation (Ireland) and incentives (Rwanda) put the government in a privileged position to implement these intervention technics to curb SuPs use, which today it is considered a success is worthy of imitation by Cameroon.

The severity of penalties (fines and imprisonment) imposed for non-compliance, couple with routine checks at border control points (the case of Rwanda) and empowerment of local authorities to verify the implementation of levy by vendors (Ireland), is a good lesson for Cameroon to emulate. In addition, the existence of a Joint Ministerial Order prohibiting the Commercialization and use of SuP carrier bag inferior to 60 microns in Cameroon, as well as the presence of government institutions for further plastics policies to be adopted offers glimmer of hope in emulating examples of Ireland, Rwanda and Australia.

5.4.2 Weakness of these Policies

Adopting a legislation banning (Plastic ban -Plasban) the use of SuP has been the approach used in many countries (such as Rwanda, and Kenya) even though other countries have resorted to economic interventions such as levy / charges, or producer and consumer taxes (the case of Ireland). It worthy to note any individual method cannot yield the maximum desired results even though there are some exceptions (Ireland). As such, other technics aimed at changing public perception on the use of single-use plastics must accompany the already existing regulations on plastics.

In addition, even though Rwanda and Kenya are considered today as successful in their efforts to reduce the consumption of SuPs, one of the greatest challenges has been the absence of sustainable and accepted alternatives of plastic carrier bags at the time the ban was imposed. For this reason, there is the establishment of a black
market for plastic carrier bags from neighbouring countries like Uganda, despite the existence of huge penalty for non-compliance. This could be a huge challenge for Cameroon in its approach to manage Sup and using Rwanda and Kenya as her benchmark. Therefore, the geographic characteristics of Cameroon should be considered if a technique of this nature should be adopted. In addition, the lack of political will to formulate concrete policies to address the management of SuPs is another weakness for such a policy to be realised in Cameroon.

5.4.3 Opportunities

The increasing attempts of adopting of SuP policies in most countries in the world brings hope because the use of biodegradable plastics materials would be addressed on a global basis and the problem of smuggling and black marketing of SuP products is susceptible to be eradicated. In addition to this, there is glimmer of hope because any attempt to adopt a universal binding convention on sups is likely to succeed since the most countries across the globe are unilaterally adopting policies to phase out SuPs that is already affecting the marine environment (See Figure 5.1)

**Figure 5.1**: Countries having Policies to Phase out light weighted Plastics (SuPs Inclusive)

- Plastic bags banned; ■ Taxes on some plastic bags; □ partial tax or ban (municipal or regional levels)

**Source**: Xanthos and Walker, 2017
In addition, the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) of 1973 signed by 134 countries (Xanthos & Walker, 2017) buttresses the possibility opportunity for a binding international agreement for plastics eradication.

5.4.4 Threats

The absence of strict plastics policy in neighbouring countries is a hindrance to the effective implementation of SuPM instrument. In addition, transboundary pollution may challenge the implementation of plastic waste free society. Therefore, Cameroon could consider these threats in her attempts to adopt and implement policy instruments aimed at reducing plastics consumption and waste.

5.5 Conclusion

While many countries in the world are adopting strategies to ban or reduce SuP usage, Cameroon should avail itself of this opportunity to join the bandwagon and reap the benefits thereof. This is because the adoption of plastics policies by countries around the world may favour the adoption of an international treaty / convention on SuPs eradication.

In addition, the presence of a well-functioning government machinery (Parliament and judicial and legal systems) in Cameroon favours the adoption of a rigorous SuP. In so doing, any future policies aimed at reinforcing the already existing Joint Ministerial Order should take into consideration the introduction of alternatives.

The absence of sustainable alternative to plastics carrier bags, coupled with the lack of political will by the government of Cameroon to strengthen the existing Order poses an challenge and may further weakens future plastic policies in the country. Finally, the absence of plastics policy in countries bordering Cameroon, coupled with the porous nature of it borders may give room for smuggling and black marketing, which may hinder interventions by government to manage plastics pollution.
As such, proposing some recommendation based on the main findings of this research would further strengthen our understanding of the current and future plastics management techniques available for Cameroon.
CHAPTER SIX: RECOMMENDATIONS, SOLUTIONS, AND CONCLUSION

6.1 Introduction

After attempting to propose a policy framework for SuPM in Cameroon based on experiences from other others, it was discovered that these policies have some challenges (weaknesses and threats) that needs to be addressed. Because of this, the DPSIR model, which addresses the cause and effect of environmental issues, is suitable for such exercises. The elements of DPSIR are as follows: drivers (urbanization, leisure, preservation of gods and demand for food); pressures (Consumerism, tourism and waste generation); State (plastics pollution on land); impact (human health, flora and fauna, aesthetic destruction and litter); and responses (complete ban, clean-up, education and awareness campaign, partnerships, availability of alternatives, among others).

Thus, this chapter assesses the main findings of this study, proposes policy recommendations, and solutions through the DPSIR model. Our analysis focuses on the responses only as shown in figure 6.1. However, it will be important to mention the other elements of the DPSIR model to enhance clarity and understanding.
6.2 Method

The responses (recommendations and solutions) for reducing SuPs usage in Cameroon in this chapter was inspired by the DPSIR model. This model also exposes the factors contributing to consumption of SuP as presented above. In addition, input from interviews results was added to this approach (DPSIR) to attain the objective of this study and propose policy recommendations and solutions.

Figure 6. 1: DPSIR Conceptual Model for SuPs.
6.3 Findings

The main findings of this study would revolve around a thorough examination of the four research questions. From these analyses, recommendations and solutions to the management of SuP in Cameroon will ensue logically.

6.3.1 What is the status of single-use plastics management in Cameroon?; and what part of the plastic supply chain have been targeted for effective management?

- The ubiquitous nature of SuP has become the panache in most cities in Cameroon. This is due to poor waste disposal by denizens in different parts of the country as well as the poor management solid household waste in general and single-use plastics in particular.
- The study also revealed that the production of single-use plastics carrier bags have been targeted through a Joint Ministerial Order, prohibiting the commercialization, use and distribution of non-biodegradable single-use plastic carrier bags. It is worth mentioning that single use plastic bottles, which equally poses serious environmental pollution problems, have not been targeted.

6.3.2 What efforts have been undertaken to manage SuPs in other parts of the world?

It is important to note that countries around the world have adopted regulatory principles, economic instruments and communicative or crosscutting mechanisms in an attempt to reduce single-use plastics consumption and waste generation. Of these approaches, legislations of banning the consumption of plastics have been the most used intervention techniques. While some countries have adopted complete ban (e.g., Rwanda and Kenya), others have resorted to partial or limited ban (France and Italy).

It is worth mentioning that the adoption or use of a single intervention technic cannot significantly reduce dependence and consumption of SuPs, neither can it reduce waste emanating from the use of the product. Using these technics jointly or simultaneously is the ideal way of solving the problems associated with SuPs.
6.3.3 After defining criteria for “successful SuPM”, which of these efforts were successful?

A throw back at the successful efforts used by states in managing single use plastics, it is important to stress that demographic difference, culture and differences in educational systems in different societies to some degree accounts for the success of one approach against another in a given circumstance, and with everything being equal. In light of the above and with reference to Table 3.3, taxes (to producers and consumers), bans, education and awareness raising, and charges or levies to consumers of SuP products stand out tall as the most used and successful approaches to SuPM. Nevertheless, the success rate differs from country-to-country due to the differences earlier mentioned.

6.3.4 Based on the successes of other countries, what policies can be implemented to reduce SuPW in Cameroon?

The policies that can be implemented by Cameroon or any other country facing similar challenges (e.g. limited resources, excess use of plastics, poor waste management scheme, etc.) like Cameroon, should be a joint or combination of the regulatory, economic and communicative instruments. The instrument when applied at different phases will recoup enormous benefits to her efforts on SuPM. Thus, the limited ban, which the country has already adopted, offers glimmer of hope in the process of sustainable SuPM, subject to the implementation of the other instruments suggested above.

6.4 Recommendations

The recommendations that emerged from this study can be clustered under three salient themes, which are presented as follows;

6.4.1 Fostering of Awareness on the negative impact on the use of plastics.

Stakeholder (e.g. manufacturers, retailers, and consumers) participation in raising awareness on the risk associated with the use of SuPW is vital in changing public perception about plastics as well as reducing its dependence. Therefore, any attempt
to gauge behavioural change and perception on SuPs must consider demographic, educational and cultural dynamics.

6.4.2 Turning end-of-life plastic into a resource
The objective here is to turn plastics into a resource, by developing recycling industries along the surge of circular economy (R1 and R7). By so doing, unwanted SuPW which would be been discarded as waste will be seen as a resource because of the commercial value associated to it by the circular economy (GESAMP, 2015). Collaborating with Parley, Adidas manufactures products from ocean plastics as well as those plastics on land that are susceptible to end up in the ocean (R1).

In addition, such an approach will reduce the reliance of landfilling as a mechanism for managing single-use plastic wastes.

6.4.3 Inclusion of SuPW bottles in legislations or bans on SuP carrier bags.
Further attempts to reinforce and regulate the consumption of SuPs in Cameroon should include plastic water bottles. In the current Joint Ministerial Order that regulates plastics is silent about the use plastic bottles even though they just like plastic carrier bags pose significant risk to human health and the marine environment. Nevertheless, the exact extent of such risk is unknown or undocumented.

6.5 Solution
Referring to the aforementioned recommendation and figure 6.1, my proposed suggestions for a strengthened plastic policy for Cameroon are as follows;

6.5.1 Action Oriented Approaches

➢ Availability of Alternatives to Plastics
For Cameroon to reduce plastics, it must provide alternatives, which are affordable and available. The absence of alternatives in Rwanda and Kenya have led to the creation of smuggling, black markets and corruption of border control officers. For example in the border between Rwanda and DR Congo, it has been reported that
enforcement officers (Custom and Immigration officials) exchange sex for sanctions (Pilgrim, 2016). Therefore, any ban on single-use plastics with the aim of reducing its consumption must propose readily cheap and available alternatives.

- **Closing the tap and Clean up**

This entails placing a ban on commercialization of single use plastics, followed by proper clean up. This approach has been very successful in many countries facing plastics land-based pollution. A case in point is the Pasig River in the Philippine, where clean up was done from tributary-to-tributary with the help local communities. The installation of waste management plants and information awareness campaigns accompanied this process. The same intervention technic has been used in the Galacticos Island. Even though the technique is expensive, it remains handy and ideal for a country like Cameroon having enormous plastics waste on land.

**6.5.2 Pre-emptive or future Approaches**

- **Recycling**

Countries such as Cameroon that rely mostly on importation of SuP should consider developing the recycling industry. Recycling to users means sorting the waste and disposing the waste in the appropriate bin. To this, educative and sensitization campaigns aimed at changing the behavioural change and eradicate the throw away culture in Cameroon needs to be instilled. This will largely reduce plastics on land.

- **Public-Private Partnership**

Fostering and support public-private partnership as a way of eradicating single-use plastics management is ideal an approach for Cameroon. The government should provide incentives to private companies to provide SuPM services such as recycling and recovery facilities, initiatives encouraging reusing of plastics as well as the organisation of clean-up (repair) campaigns. As Manga et al (2007) notes, such partnerships could be formed through public consultation (audiences and tailored workshops), concertation and dialogue with agencies in charge of plastics management (government ministries and municipal authorities) on one hand and
private firm and organisations (NGOs, plastics producers and vendors, etc.) on the other hand.

6.6 Conclusion

This study represents attempt to educate public opinion on the severity of the plastic phenomenon in Cameroon and the need for adopting stringent policies to curb its increasing dependence in Cameroon. By examining some successful approaches in different parts of the world, this study have equally formulated some policy recommendations to local authorities as well as proposed solutions to deal with SuPs in Cameroon.

For example, the study recommends that awareness raising is one of the efficient methods to management SuPs on land. To this approach, it also recommends that future legislations banning plastics should include SuP bottles, which equally have damaging effects like SuP carrier bags.

In fact, the study presents an improved understanding of the magnitude of the problem of SuP, and the need to adopt an internationally binding convention to deal with the problem at the global level. Therefore, what is known about plastics use in Cameroon have been stated even though there exist some uncertainty that requires further research. In this light, policy makers now have a working document to guide them when formulating plastic policies pertaining to SuPM in Cameroon.
REFERENCES


