MASTER THESIS

PLASTICS AND CIRCULAR ECONOMY: AN ANALYSIS OF THE ENVIRONMENTAL REGULATIONS' EFFECTIVENESS IN PLASTIC WASTE MANAGEMENT AND THE INTERGRATION OF CIRCULAR ECONOMY IN HARARE, ZIMBABWE

Pauline Rukani

ENVIRONMENTAL AND ENERGY MANAGEMENT

FACULTY OF MANAGEMENT AND GOVERNANCE

UNIVERSITY OF TWENTE

28/08/2019

EXAMINATION COMMITTEE:

Dr. ir. María-Laura Franco-García

Prof. dr. Michiel A. Heldeweg

PREFACE

Circular Economy (CE) is an economic system aimed at eliminating waste and employs recycling, reuse, remanufacturing and refurbishment to create a closed system. It is better implemented if there is a regulatory framework facilitating easy support and enforcement. In this regard policy makers play a crucial role in making sure that CE is adopted. Most of the negative factors affecting environmental policies currently, do not emanate if CE was integrated into the environmental regulations. Therefore CE will always define the context in which environmental scientists and researchers work.

I am grateful to have had the privilege of completing this thesis, in partial fulfillment to a master program, Environmental and Energy Management at the University of Twente.

I would like to appreciate and acknowledge the full support, patience, advanced knowledge and guidance of the people who were involved throughout my journey of this masters, particularly this thesis. First and foremost, to my supervisors Dr.ir.Maria-Laura Franco-Garcia and Prof.dr. Michiel.A.Heldeweg. Words cannot express how grateful I am for benefiting from their teaching, comments, advice and great scientific writing couching skills. Their diverse approach and amalgamated effort led to the success of this thesis.

I would also like to express my gratitude to the course coordinator Ms. Rinske Koster for her words of encouragement and who played an important role, in me joining the program. Further gratitude goes to the OKP scholarship team, who through their support gave me a chance to study towards this masters. Finally, my utmost gratitude goes to my husband, daughter and family for their love and support throughout this masters.

Moving towards CE is a challenge. As Voltaire said, 'No problem can withstand the assault of sustained thinking'. Therefore challenges towards CE must not make us weary and abandon CE, but they should be a learning stance that will make us strong along the journey of circularity.

Table of Contents

LIST OF ABBREVIATIONS

CE………………………………Circular Economy
CIT……………………………...Contextual Interaction Theory
HMP…………………………….Harare Metropolitan Province
Hp………………………………Harare proper
EMA……………………………Environmental Management Act
EMA……………………………Environmental Management Agency
PET…………………………......Polyethylene Terephthalate
NGO……………………………Non-governmental Organisations
LDPE……………………………Low-Density Polyethylene
HDPE…………………………...High-Density Polyethylene
NEPS…………………………... National Environmental Programme
GHG……………………………Green House Gases
ZACPLAN……………………...Zambesi Action Plan
IUCN……………………………International Union for Conservation of Nature
UNCED………………………... United Nations Conference on Environmental and Development
POPs……………………………Persistent Organic Pollutants
UNEP…………………………...United Nations Environmental Protection
PBT……………………………..Polybutylene Terephthalate
POP……………………………..BDE- Persistent Organic Pollutants- Brominated Diphenyl Ethers
OECD…………………………. Organisation for Economic Co-operation and Development
SMEs…………………………...Small and Medium Enterprises (SMEs)
EPR……………………………..Extended Producer Responsibility
WHO…………………………...World Health Organisation
EU………………………………European Law
UNFCC…………………………United Nations Framework
ZIMRA…………………………Zimbabwe Revenue Authority
SNV……………………………Stichting Nederlandse Vrijwilligers

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

Abstract

The background of the research is on the accumulation of plastic waste in the Harare Metropolitan Province, in Zimbabwe. Plastic waste can be a hazard to the environment, animals, humans, climate and marine life. It can pollute groundwater if disposed-off and if burnt it can cause air pollution which might lead to health problems, contribute to global warming, which further leads to climate change. Plastic waste is caused by people who throw plastic litter everywhere in Harare Metropolitan Province in Zimbabwe. In Zimbabwe, there are several environmental regulations which try to manage plastic waste by imposing penalties and fines to those found violating the regulations. However, in spite of having all these pieces of legislation in Zimbabwe, plastic waste is still mushrooming and none of them addresses Circular Economy (CE), of which CE is a recommendable way of avoiding the plastic waste and keeping plastic within the loop. Moreover, CE can assist in conserving natural resources which have become scarce. This research therefore analysed the plastic waste management regulations to find out their effectiveness by using the Five-E-Approach to see whether they need to be amended or there is a need for a new policy to be put in place. Furthermore the Contextual Interaction theory (CIT) was used to analyse the characteristics of the policy designers and policy implementers, so as to identify the factors that might increase or decrease the chances of CE to be integrated to the current or new policy and regulatory framework. A mixed-method approach was applied to address the related research questions to the purpose to integrate CE principles within the plastic waste regulatory framework in Zimbabwe. From the research methods viewpoint, in-depth interviews and direct observations were used to gather primary data. Interviewees from the relevant Government Ministries, plastic recyclers, plastic producers and other stakeholders who are involved with plastic waste management made part of this study. On the other hand, secondary data from literature review was used in the form of regulatory Acts and other instruments. Qualitative analysis method was used for the analysis in the CIT and Five-E-Approach and other recommendations were elaborated on the basis of those two types of analysis. The major findings were that the plastic waste management regulations were not effective and efficient, however they were ethical in theory since they addressed human rights but in practice the right to a clean environment was not achieved as seen by plastic litter on the environment. Furthermore people viewed CE to be expensive if adopted into the environmental regulations but in conclusion CE can be adopted and designed in a manner that fits the Zimbabwean economic situation and can even improve the economy as well as the current regulatory framework.

Key words: plastic waste and pollution, plastic waste management regulations, Contextual Interaction Theory, Five-E-Approach, Circular Economy

CHAPTER 1: INTRODUCTION

This chapter provides the background of this research in which relevant argumentations about the current plastic waste situation are elaborated leading to the formulation of the problem statement and the objectives of this research. The objectives were translated into research questions that will guide the research design. The background covers the location of the study area, the current state of plastic waste and plastic waste management in Harare Metropolitan Province, as well as the regulatory and legislative situation in Zimbabwe

1.1 Background

Zimbabwe is located in Southern Africa, covers 384,847 square kilometres of land (World meters, 2019). The population stands 17,131,860 based on the latest United Nations estimations (World meters, 2019). The urban population is 5,379,389 in 2019. Harare Metropolitan Province (HMP) has a population of 2,123,132. It comprises of three municipalities that is Harare proper (Hp) (1,606,000), Chitungwiza (365,026) and Epworth (152,116). (HP) is the capital and most populated city of Zimbabwe, with the highest urban population (World meters, 2019). In an interview , EMA (2018), stated that a research done by the Institute of Environmental studies in 2014 ,indicated that Zimbabwe generates 1.65 million tonnes per year (total solid waste) and 12 percent of this is plastic waste (198 000 tonnes).

In Zimbabwe the control of plastic waste is either done through recycling, re-use, or banning and the rest goes to dumpsites, in spite of the fact that some countries all over the world have adopted Circular Economy (CE) principles in their legislations (Bocken et al., 2016). Zimbabwe does not have proper landfills and dispose-off plastic waste in dumpsites for example Pomona Dumpsite. However, a CE is characterised as an economy which is generative by design, with the aim to retain as much value as possible of products, parts and materials. This means that the aim should be to create a system that allows for the long life, optimal reuse, refurbishment, remanufacturing and recycling of products and materials (Ellen MacArthur Foundation, 2016). Furthermore a CE is also an "industrial system that is restorative by intention and design. It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and within this, business models"(Ellen MacArthur Foundation, 2016). According to Hopewell et al., (2009), recycling is one of the most important actions currently available to reduce the impacts of plastic pollution and represents one of the most dynamic areas in the plastics industry today.

The CE offers extensive business possibilities for both existing and new actors. Possibilities open up, for instance, for businesses that provide solutions and services along the plastic cycle (Bromsma and Brennan, 2017). In order to enhance the transformation of companies, industries and whole economies to adapt and succeed in application of a CE, a system-wide innovation changing the whole processes of value creation is often needed, while the CE is grounded to the feed-back rich (non-linear) systems (Bocken et al., 2016). However, Zimbabwe still follows a linear form of controlling plastic waste. Resource consumption targets that reflect environmental constraints should be considered. Unification of national policies would help increase major markets, reducing competitiveness concerns and the expenses of implementation (Preston, 2012). The need for a circular economy is evident given that a significant proportion of non-renewable natural resources is diminishing and natural resources price is increasing (Sheldon, 2012). Therefore there is need to incorporate CE principles into the environmental regulations in Zimbabwe in particular to address the plastic problem. A good example of an African country that has adopted CE is South Africa which is transitioning

towards a CE in the Plastic Industry via extended Producer Responsibility (Preston, 2012). This serves as inspirational opportunity for Zimbabwe and this research aims to facilitate that, at least in relation to plastic wastes. Furthermore, policy makers in Zimbabwe may, for example, regulate the use of certain polymers other chemicals or particular applications of plastics. Policy makers have an important roles to play in setting a direction for the industry and putting in place mechanisms to help to transition to CE (Stern, 2008). They have to set a clear common vision and credible high-level ambitions that drive investment decisions.

Plastic reduction is top of the global agenda and plastics have been used worldwide for different purposes. According to Rayne (2008), plastic bags are used to ferry consumer goods due to their convenience. Most plastic used for packaging and polyethylene terephthalate (PET) bottles are discarded as waste and sent to landfills usually after single use (Perugini et al, 2005). The toxic chemicals added to plastics during manufacturing are released into the air whenever a plastic is burnt and significant releases of toxic chemicals include trichloro-ethane, acetone, methylene chloride, methyl ethyl ketone, styrene, toluene and benzene (Ecology Centre, 2014-2019). If these toxins are inhaled for a long period of time, it can lead to respiratory problems. Moreover, the problem of plastic waste is extremely serious in Africa due to its unique set of socio-economic and political conditions such as poverty, political disputes, corruption and shortage of resources (Njeru, 2006). One of the problems of plastic waste is that it causes the death of domestic and wild animals (EMA, 2011). According to Environmental Management Agency Newsletter (EMA, 2011), thin plastics can be ingested by domestic animals and wildlife, becoming a choking hazard or affect the digestive system. Furthermore the disposal of plastic waste in landfills and dumpsites can lead to the formulation of leachate which can contaminate the soil and underground water in Harare Metropolitan Province.

As mentioned above, ultimately, the most recurrent way to manage plastic waste in Zimbabwe is dumping. This operation has important restrictions due to the world's population increase, which puts additional pressure on land use resulting in the over-valuation of the land (Clapp and Swanston, 2009). With this in mind, it can be said that land will soon become scarce to the point that it will be difficult to find places to dump garbage and it costs millions of dollars every year for clean-up of areas exposed to plastic pollution. EMA Newsletter (2011), stated that thin plastic packaging also tends to clog sewer systems leading to constant sewer bursts exposing people to health risks in Zimbabwe, a finding confirmed by Tsiko and Togarepi (2012). Besides plastics being an environmental problem, a looming hazard has emerged especially in most parts of Harare leading to cholera outbreak in 2005.

The move towards plastic CE requires collaboration from governments, NGOs, industries and cities in Harare Metropolitan Province (Tsiko and Togarepi, 2012). Consumer good companies , plastics packaging producers, businesses involved in collection, sorting, reprocessing and plastic manufacturers would play a critical role, because they determine what products and materials are put on the market (Ghisellini et al., 2016). Furthermore policy –makers can play an important role in enabling the transition by re-aligning incentives, facilitating secondary markets, defining standards and stimulating innovation (Camilleri, 2018). NGOs can help ensure that broader social and environmental considerations are taken into account and collaboration is required to overcome fragmentation (Maignan et al., 2018).

Environmental policy

Modern scholars believe environmental policies started in the 1960s (Rosdiana, 2010). In the late 1960s and early 1970s many industrialised countries adopted important environmental legislation and new organisations were formed that later became central for both policy development and implementation. Japan passed its Environmental Protection law in 1967 (Berry and Rondinelli, 1998)

and the U.S. National Environmental Protection Act was enacted in 1970 (Davis and Mazurek, 1998). In the case of Zimbabwe, several areas of environmental policy can be traced back as much as the 1960s. Zimbabwe is amongst African countries that have advocated for plastic bottles and plastic packaging regularisation because it is one of the highest producers of plastic waste through imports of plastic packaged materials (EMA, 2011). In 2010 embarked on a nationwide plastic bag 'ban' project meant to curb the problems of littering. The former Ministry of Environment and Natural Resources now Ministry of Environment, Tourism and Hospitality resorted to regularisation of plastic bags that are not less than 30microns, save for bread packaging and other consumables. This ban was not "inclusive and did not call off plastic completely from the system but gave minimum restrictions" (Chitotombe and Gukurume, 2014).

African countries like Eritrea, Zanzibar and Somaliland and Asian countries like China, Bangladesh, Taiwan, Thailand, Papua New Guinea, Nepal and India (Clapp and Swanston, 2009). In Zimbabwe particularly in the Harare Metropolitan province, plastic wastes is one of the biggest challenges to be addressed, regardless of the plethora of regulations against plastic waste (Chikobva and Makarati, 2011). Furthermore there is no stand-alone CE regulation or any that includes CE principles in the plastic waste management regulations. Zimbabwe faces a problem of lack of reliable and comparable statistics, no infrastructure, unclear legislation, limited engagement of obliged industry and fight between important stakeholders instead of collaboration. Legislation has to clearly fix the rules and responsibilities for each actor to avoid confusion and conflict of interests in plastic waste management, enforcement and a commitment to provide resources as participation of national and local level governments is essential (Aggeri, 1999).

This study descriptively and prescriptively analyses the existing plastic waste management regulations, in terms of their efficiency, effectiveness, ethicality, evaluations of alternatives using the Five-E approach (defined later). It also aims to find out the characteristics of policy designers and implementers that may increase or decrease the chances of adoption of CE principles as a new policy in Zimbabwe. In the following subsection, a concrete problem statement for this research is described.

1.2 Problem statement

Plastic wastes affect negatively the environment: soil and water quality. They also affect the ecosystems and cause health problems to people directly or through the food chain. If plastic is burnt it can cause air pollution releasing toxic gases such as trichloroethane, acetone, methylene chloride, methyl ethyl ketone, styrene, toluene and benzene (Kao, 1994), which when inhaled can cause respiratory problems. Zimbabwe is one of the developing countries which faces challenges of controlling litter especially plastic amid the Global call by United Nations for all countries to reduce plastic pollution (Ziraba et al., 2016). People throw away plastic litter everywhere and heaps of trash are all over especially HMP because of massive population of people, as well as inefficient plastic waste management operations and poor or lack of technology to reprocess it. Harare has the highest population than any other city in the country, and also the most polluted city with plastic waste (Mudzengerere and Chigwenya, 2012). The Municipalities in the HMP are responsible for the collection, transfer, treatment, recycling, resource recovery and disposal of plastic waste. However due to the poor economic situation in the country they are failing to carry out their duties effectively due to lack of resources. In fact, landfill disposal or use of dumpsites is the most common way to manage plastic wastes even though the world is trying to move to CE to reduce their disposal (Ghisellini et al., 2016). Municipal governments have elaborated and put in place regulations on plastic waste management. Examples of these include the (EMA) (Cap 20:27) and the Zimbabwean Constitution, which is the supreme environmental law of the country. There is also the Statutory

Instrument 98 of 2010 called the Plastic bottles and Plastic Packaging Regulations. However even with these regulations, plastic waste is still an enormous problem in Zimbabwe. Environmental law in Zimbabwe criminalizes littering by individuals and companies. Anyone caught littering is liable to a fine or imprisonment. While such clear legislative framework exists, CE has not been introduced in the environmental regulations, neither is there a stand-alone regulation on CE, yet it is well known in most countries that CE can manage plastics effectively. Concern has been raised about the non-enforcement of the regulations (Su et al., 2018). There appears to be some apparent reluctance by government departments and agencies to prosecute local authorities that violate provisions of the legislation. According to Chitotombe and Gukurume, (2014), a total ban of plastics would have been more useful since policy implementation has been difficult due to resistance in particular from the informal sector (Chitotombe and Gukurume, 2014).

1.3 Objectives
The aim of the research are as follows:

- To review the current urban plastic waste management regulations and provide suggestions as to how circular economy principles can be incorporated.
- Review the challenges faced by local authorities in adopting CE principles within regulations' objectives, as well as the expected barriers affecting the implementation and enforcement of these regulations.
- To identify factors that may increase the chances of the incorporation of CE principles within regulations
- Assess the level of understanding of the regulatory framework and CE by the communities.

1.4 The main Research question:
How effective are the environmental regulations' formulation and implementation in managing plastic waste in Zimbabwe and how can circular economy principles (CE) be incorporated in these regulations?

In order to elaborate on this research question, it is necessary to break it down into several sub-questions below:

Sub-Research Questions:

1. How successful are the plastic waste management regulations' formulation and implementation in achieving its stated goals (effectiveness) and what factors affect their enforcement and implementation?
2. How can the existing regulations be improved in terms of effectiveness, i.e. formulation, implementation and enforcement of urban plastic waste management regulations?
3. How are the stakeholders involved in the formulation, implementation and enforcement of the plastic waste management regulations?
4. To what extent are the plastic waste management regulations ethical and efficient?
5. **How can circular economy concepts be expected to be integrated in the current environmental regulations in Zimbabwe?**

1.5 Organization of the research
To provide a general guidance to the researcher in finalizing all steps of this project proposal, the organization of the research is as follows:

13

a) Chapter 1, Introduction: It describes background, problem statement and objectives of this research from which knowledge, insight and information contributing toward problem solving, are obtained after conducting the research.

b) Chapter 2, Literature Review: which elaborates theoretical frameworks and the results of literature research providing the basis for the execution of this research.

c) Chapter 3, Research Methodology: which elaborates the design of this research, including the research framework, sub research questions, research strategy, methods of collecting data, data analysis and research schedule.

d) Chapter 4, Findings and Analysis: which elaborates the information collected during the interview and making clear the direction of this research. The findings also include the information compiled from desk research.

e) Chapter 5, Conclusion and Recommendation: which put together the findings, analysis and the result of this research in the form of a proposed framework.

1.6 Research Methodology

The method of inquiry that informed this study included the following:

- Desk review of the policies that are currently in place in Zimbabwe and how they were formulated, outlining the challenges encountered thereof;
- Qualitative interviews with relevant stakeholders involved in the policy-making process as well as those involved in implementation to establish their perceptions about the policy-making process as well as what could be done to improve them; and
- Analysis of research data for common themes and drawing findings that inform answers to the research question.
- Based on best practices experiences from other countries, provide recommendations on what can be done to improve the policy making process in Zimbabwe

In the following chapter the relevant concepts and theoretical frameworks associated to this research are reviewed by using a scholastic approach. This is the knowledge baseline to further develop the research design that includes the research methods to collect and analyse the information to respond to the research questions.

CHAPTER TWO: LITERATURE REVIEW

This Chapter presents the relevant definitions around the research topic, such as waste, plastic pollution, plastic waste management, constitutional democracy, policy cycle, public policies and institutions. These concepts have been selected because they explain how plastic waste management and regulatory framework is structured in Zimbabwe. The regulatory framework in Zimbabwe for plastic waste management is also discussed, and the principles and benefits of engaging CE in the regulations. As part of the analytical approach to answer the research questions, two main models were selected after a deep literature review: (i) the Five –E-Approach for analysing the existing plastic waste management regulations and; (ii) the Contextual interaction theory (CIT). The CIT is meant to assess the characteristics of the actors involved during policy formulation stage with regards to the possibility of selecting CE principles as a new policy. Moreover the purpose of applying the CIT is to demonstrate how CE selection can be affected by these characteristics of the actors. Finally, an historical situation of plastic waste management in Zimbabwe is presented as case study.

2.1 Plastic Management

According to Ellen MacArthur Foundation (2016) CE principles to global plastic packaging flows can change the management of plastics and avoid negative consequences such as leakage to oceans (Ellen MacArthur Foundation, 2016). Plastics must be re-used so as to preserve the raw materials which are scarce. By re-use it means plastics will not be thrown away after only being used once, but it can be used over and over for different purposes (Stahel, 2016). This is important because in Zimbabwe most of the raw materials for making plastic products is imported from other countries, which is not economical and sustainable, therefore plastics can be re-used to avoid purchasing raw materials from other countries (Ross and Evans, 2003). As mentioned in the first chapter, plastic pollution has increased in Zimbabwe, this is a result of introduction of plastic products into the environment which then upset the existing ecosystems by causing environmental degradation (Hester and Harrison, 2011). Therefore it is important to review the plastic waste management regulations in Zimbabwe, so as to weigh their value and identify gaps that can be filled in by CE. It is also important to describe or define here waste and plastic pollution more extensively.

2.1.1 Waste and Plastic Pollution

Waste is defined as "any substance or object, which the producer or the person in possession of it discards or intends or is required to discard" (Drackner, 2005). In this definition the "producer" is anyone whose activities produce waste or who carries out reprocessing, mixing or other operations resulting in a change in its nature or composition. Plastic pollution is the accumulation of plastic objects (plastic bottles and much more) in the Earth's environment that adversely affects wildlife, wildlife habitat and humans (Fischer and Lindenmayer, 2007). However, the chemical structure of most plastics renders them resistant to many natural processes of degradation as a result they are slow to degrade (Webb et al., 2013). Together, these two factors have led to high levels of plastic pollution in the environment. Therefore it is important to have the environmental regulations that effectively and efficiently manage plastics and reduce plastic pollution, by firm enforcement of said regulations.

2.1.2 Definitions: Regulations, Public Policy and Institutions

Regulatory policy is about "achieving government objectives through the use of regulations, laws and other instruments to deliver better economic and social outcomes and thus enhance the life of citizens and business" (Birkland, 2015). Regulation in EU law, is an instrument of general scope that is binding

in its entirety and directly applicable in all EU countries (Auel, 2007). Policy might take the form of law or regulations, or the set of all laws and regulations that govern a particular issue or problem (Kerwin and Furlong, 2018), Policy is made on behalf of the "public". Public Policy is determined by government institutions, which give policy legitimacy (Andersen and Sitter, 2006). Government universally applies policy to all citizens of society and monopolizes the use of force in applying policy (Remigios, 2010). Government institutions give public policy legitimacy, legal obligations that command loyalty of the citizens (Auel, 2007). Therefore it is important to describe the current public policy, plastic waste and environmental management regulations' situation in Zimbabwe.

2.1.3 Description of current situation of the plastic waste management in HMP, Zimbabwe

The use of plastic products has been increasing resulting in a proportionate rise in plastic waste in solid waste streams in large cities in Zimbabwe (Makwara and Snodia, 2013). Plastic bottles and plastic packaging used to package food and beverages have become widespread in the sub-region. The prominent plastic materials in commerce across Zimbabwe include, (low-density polyethylene (LDPE) commonly called polyethylene films, high-density polyethylene (HDPE) and other plastics such as polypropylene, polystyrene, polyvinyl chloride (PVC) and polyethylene terephthalate (PET) (EMA, 2011). The share of plastic waste in municipal waste in Zimbabwe has been increasing over the years with 198000 kilograms per year (Jeri and Tevera, 2014). Low collection levels and rudimentary disposal methods employed are a cause for concern because they trigger illegal dumping and rampant plastic waste burning, which not only threaten public health but also pollute the environment. The continual increase of plastic waste among solid waste is a result of the huge demand for plastic products in the country, increased selling and trading of single plastic use.

Hove et al., (2013) observes that urban growth in Zimbabwe continues at a much faster rate than the provision and expansion of infrastructure and services. Demographic changes and economic growth contribute to the generation of plastic waste. Consequently, plastic waste management has become extremely ineffective as is evidenced by the rise in illegal dumping and the proliferation of the now seemingly permanent piles of rubbish in some commercial, industrial and residential areas of the urban areas. Jeri (2006) argues that in Zimbabwe, plastic waste collection has virtually collapsed triggering its chaotic and rampant illegal dumping. Newspaper reports have shown plastic waste accumulated in streets, often blocking drains.

Zimbabwe still lacks appropriate and effective technologies in plastic management. In addition, the country's deteriorating infrastructure has resulted in poor waste management which has seen an accumulation of plastic waste and outbreaks of diseases (Jeri and Tevera, 2014). Areas most affected by erratic plastic waste collection are low income residential and informal settlements such as Epworth which receive no formal waste collection at all. At least 70% of the collected plastic waste is crudely tipped at open dump sites, 90% of which do not meet basic environmental standards (Makwara and Snodia, 2013).

Figure 1 below shows the municipalities in the HMP of which the two municipalities that are the major focus for this study are included. These two municipalities are Harare proper and Epworth.

Figure 1: Map showing the Municipalities in Harare Metropolitan Province (Google Maps, 2018)

HMP is one of the ten provinces in Zimbabwe. Its administrative capital is Harare. It includes areas such as Mbare, Machipisa, Highfield, Glenview, Mabvuku, Tafara, Epworth, Hatfield, Eastlea, Mabelreign, Malborough, Warren Park, Kuwadzana, and Dzivarasekwa among others. However Epworth and Harare (proper) have the highest plastic environmental pollution as compared to other municipalities and both have the biggest waste dumpsites within the province. The population for HMP at 1 485 231 as of 2012 (Pindula, 2019). Harare has the highest population followed by Chitungwiza and lastly Epworth (World meters, 2019).

2.1.4 Plastic Waste Regulatory framework in Zimbabwe

Zimbabwe has a number of environmental and plastic waste, pollution, use related laws and policies as well as an economic development blueprint that has direct and indirect implications on handling plastics (Nickerson, 1994). These include the Constitution of Zimbabwe, the Environmental Management Act, the Atmospheric Prevention Act, 1971 and the Plastic Packaging and Plastic Bottles Regulation 2010. However Zimbabwe has not introduced regulation on CE yet.

a) The Constitution of Zimbabwe

The Constitution of Zimbabwe is the supreme law of the country and it overrides any law, practices and conduct that are consistent with it (Maddex, 2014). Section 73 of the Zimbabwean Constitution, makes provisions for environmental rights. It states that every person has the right to: an environment that is not harmful to their health and well-being and to have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures that: i) prevent pollution and ecological degradation, ii) promote conservation and iii) secure ecological sustainable development and use of natural resources while promoting social and economic development. Currently, in HMP, the disposal of plastics is through landfill which cause environmental pollution and degradation, thereby undermining sustainable development and affecting the health and wellbeing of current and future generations. Therefore if CE principles were engaged they might reduce the disposal of plastic by creating a "closed loop system". The constitution require the state to take reasonable legislative and other measure, within the limits of resources available to it, to achieve the progressive realisation of these rights. The mandate should be read in light of the constitutional provision that mandates the state to take cognisance of those international laws which Zimbabwe is accountable (CONSTITUTION, O.Z.A, 2018). Some of the steps that government can take are to encourage the reduction of plastic pollution.

b) Environmental Management Act

Solid waste including plastic waste management in Zimbabwe is governed by the Environmental Management Act (Cap 20:27). Statutory Instrument 6 of 2007 Environmental Management (Effluent and Solid waste Disposal) Regulations, Statutory Instrument 98 of 2010 (Plastic Bottles and Plastic

Packaging) Regulations. The Environmental Management Act prohibits: "the discharge or disposal of any waste in a manner that causes pollution to the environment or ill-health to any person and the transportation of waste except under licence issued by the Agency. It also gives details of who should apply for a waste license, this includes waste transports within Zimbabwe, operators of waste disposal sites or plants and or to generators of hazardous waste. The discarding, dumping, and leaving litter on any place except in containers or places provided for that purpose". It is a requirement that all waste disposal sites should be lined with appropriate lining material specific to the nature of the waste and environmental risks. Statutory Instrument 6 of 2007 compels local authorities to ensure a "waste collection frequency that minimises accumulation and avoids decomposition of waste on collection sites as well as the preparation of waste management plants which consists of an inventory of the waste management situation specifying the quantity of waste produced and the components of such waste. Landfilling must be reduced by offering sustainable end-of-life options for all plastic waste.

c) Plastic Packaging and Plastic Bottles Regulation 2010 (S.I.No.98 of 2010)

These regulations, made by the Minister of Environment, Water and Climate in terms of section 140 of the Environmental Management Act, prohibits the manufacture for use within Zimbabwe, commercial distribution or importation of plastic packaging with a wall thickness of less than thirty micrometres and requires every manufacturer of plastic packaging and plastic bottles, retailer of plastic packaging and plastic bottles or every local authority to set plastic waste prevention targets. Unless it can be provided that they are: 1) Plastic bread packaging and clingy film used as plastic barrier packaging of a wall five micrometres and thirty micrometres or 2) biodegradable plastic packaging. Any plastic product found to be in contravention of section 3(1) and 3(2) shall be recalled from the system. Here CE principles can be included as a way of supporting the innovations from plastic, such as biodegradable plastics. The Agency shall require from time to time, every responsible person to set plastic waste prevention targets and notify the Agency of such targets.

The plastic waste prevention targets shall provide for any of the following as may be appropriate: a) the disposal of plastic waste by the responsible person in designated receptacles or sites; or b) the design of plastics containing few pollutants, are recyclable and durable when put to their intended use, or c) the use of biodegradable plastics or d) the creation of the mode of distribution and return systems that reduce plastic waste to a minimum. Any responsible person who contravenes sections 3, "shall be guilty of an offence and liable to a fine not exceeding level fourteen or one year imprisonment". CE principles might be added to support design or redesign of plastics.

d) Atmospheric Pollution Prevention Act of 1971

The Zimbabwean government's efforts to protect air quality are channelled primarily through the Atmospheric Pollution Prevention Act of 1971. This Act provides for the control of air pollution caused by noxious and offensive gases, smoke dust, fumes and from internal combustion engines. The Zimbabwean's Ministry of Health is the Agency responsible for administration of the Act. In cases of pollution caused by smoke or dust, the Minister of Health also has the authority to declare any area to be a smoke or dust control area. If the Minister of Health identifies such a control area, then the Health Ministry or any local jurisdiction in which the Minister Vests authority may treat smoke and dust emissions as nuisance. Thus any office vested authority may notify persons of their violations and within thirty days may implement measures necessary to abate the nuisance, including entry onto the alleged violators' premises. Once a proper authority measures to abate a nuisance, the authority may recover the costs of such measures from the violator or from the state.

e) Regulation of Hazardous Substances

Zimbabwe regulates hazardous substances primarily through the Hazardous Substances and articles Act. A hazardous substance is defined in the Act generally as anything that may endanger the health of human beings or animals because of its toxic, corrosive or irritant, sensitizing, inflamability or radioactive nature by notice in the official government publication, the Gazette the Minister of Health may declare any such substances to be a group 1, Group 11, or Group 111 hazardous waste substances. The Hazardous Substances Control Board established under the act provides general policy directives to the regulated community, advises the Minister of health concerning all pertinent matters related to hazardous substances and exercise discretionary authority in the approval or denial of licence applications. The act also creates a licensing officer for hazardous substances who is responsible for implementing administrative tasks delegated by the board. The Officer performs only ministerial, non-discretionary functions such as processing applications and registering individuals or premises with licenses. The central problems in this area are that the regulations concerning disposal of hazardous material are limited and enforcement is sporadic. Zimbabwe needs to examine and strengthen its hazardous substance regulations.

j) Treaties and Conventions in Zimbabwe

A convention is a legally binding international treaty that may be ratified/endorsed by member states (see article 2, Geneva conversions on treaties). Conversions are aimed at collectively addressing specific issues by a number of member states. Zimbabwe is presently a party to the following treaties and conventions listed in Table 1 which shows the names of the conventions and treaties as well as their function with regards to the environment and their relationship to plastic waste management.

Table 1: Environmental Conventions ratified by Zimbabwe

Conventions	Function
International Conventions on International Trade in Endangered Species (CITIES)	A multilateral treaty drafted as a result of a resolution adopted in 1963 at a meeting of the international Union for conservation of nature (IUCN), opened for signature in 1973 and came into force on 1 July, 1975. The aim of the treaty was to: encourage member states to be the best protectors of their wild fauna and flora, from over exploitation through international trade, ensure that international trade in a variety of wild animals and plants does not threaten the survival of the species in the wild, CITIES protects more than 34,000 species of animals and plants
Agreement on the Action Plan for the Environmentally sound Management of the Zambezi River System (ZACPPLAN)	The plan shall be endorsed by the Council of Ministers of the Southern African Development coordination Conference. The objective of the (ZACPLAN) is to promote the development and implementation of environmentally sound water resources management in the whole river system and to overcome the following problems: a) soil erosion and water conservation, b) deforestation, c) lack of adequate drinking-water supply and proper sanitation facilities, and d) inadequate river basing planning, e) inadequate coordination both at national and river level, f) degradation of flora and fauna, g) degradation of wetlands, h) inadequate dissemination of information to the public. The following main areas shall be the elements: Environmental assessment, Environmental management, Environmental legislation, Supporting measures.
United Nations Framework Convention on Climate Change	This is an international Environmental Treaty negotiated at the United Nations Conference on Environmental and Development (UNCED), informally known as the Earth Summit held in Rio de Jenairo from 3 to 14 June 1992. Its objective is to stabilise greenhouse gas concentrations in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system.
Kyoto Protocol	It is an international agreement linked to the UN Framework Convention on Climate Change which commits its Parties by setting internationally binding emission reduction targets. Recognising that developed countries are principally responsible for the current high levels of GHG emissions in the atmosphere as a result of more than 150 years of industrial activity, the Protocol places a heavier burden on developed nations under the principle of 'common but differentiated responsibilities'.
The Bamako Convention	A Convention of African nation which bans the importation into Africa and the control of transboundary movement and management of hazardous waste within Africa. It was negotiated by twelve nations of the Organisation of African Union in Bamako, Mali in January 1991 but came into force in 1998. The objective was to prohibit the importation of hazardous (including radioactive) waste
The Stockholm Convention on Persistent Organic Pollutants	Better known as the POPs Treaty, the agreement is a legally binding and meant to protect human health and the environment from some of the most dangerous chemicals on earth. POPs are defined by their persistence in the environment, their bioaccumulation in nature and in people, the harm they can cause often far from the source and adverse impacts. This Treaty was signed in 2001 but was effective May 2004. Zimbabwe ratified it on 31 March 2011. It calls on parties to eliminate the production of POPs, minimise unintentional sources, clean up and safely manage remaining stockpiles and waste.

From table 1, it is remarkable that Zimbabwe is a signatory to several International Environmental Treaties and protocols, of which it derives most of its policies in its regulations (Tsiko and Togarepi, 2012).

2.1.5 Key stakeholders affected by the plastic waste management regulations

United Nations Environmental Protection (UNEP) applies the nine major groups approach, based on the categories of stakeholders as outlined in Agenda 21, in decision SS/ILS of 15 February 2002. UNEP acknowledges the diversity of views among stakeholders and in striving for more openness, will facilitate that different voices are heard, including those outside of the nine Major Groups, to embrace the full spectrum of actors of civil society, including the UNEP National Communities.

UNEP recognizes the following categories of stakeholders:
1. Nine major groups: farmers (including small-scale farmers, fisheries, fisher folk, pastoralists and foresters), women, scientific and technological community (including research and academia), children and youth, indigenous people and their communities, workers and trade unions, business and industry, non-governmental organisations, local authorities.
2. Environmental NGOs, as organisations that work solely on environmental issues,
3. Other stakeholders, such as local communities, volunteer groups and foundations, migrants and families, older persons, and persons with disabilities.

For this research the following stakeholders are the major focus:

1) Government institutions whose activities influence plastic waste management in Zimbabwe: Ministry of Health and Child Welfare, Ministry of Environmental, Water and Climate Change, (EMA), Municipality
2) Private plastic recycling and plastic producing companies
3) Academics and professionals (researchers) who are expert in the subject of waste management, University of Zimbabwe
4) Informal plastic waste collectors
5) NGOs dealing with plastic waste management
6) Community members affected by plastic waste
7) Consumers producing plastic waste

2.2 Circular Economy (CE)

A CE is an economic system where products and services are traded in closed loops or cycles (Kraaijenhagen et al., 2016, Ellen McArthur Foundation, 2016). It is based on three principles: Design out waste and pollution, keep products and materials in use, regenerate natural systems (Geissdoefer et al., 2017). The concept recognises the importance of economy needing to work effectively at all scales-for large and small businesses, for organisations and individuals, globally and locally. CE represents a systemic shift that builds long term resilience, generates business and economic opportunities and provide environmental and societal benefits. The model distinguishes between technical and biological cycles. For plastics, the technical cycles recovers and restores products, components and materials through strategies like reuse, repair, remanufacture or (in the last resort) recycling (Ellen MacArthur Foundation, 2017)

Fig two below represents the CE model of the biological and technical sides of material within a loop system. With regards to plastic management in this case the focus is on the technical side where value material can be recovered from plastics.

Figure 2: The Circular Economy Model (Ellen McArthur Foundation, 2017)
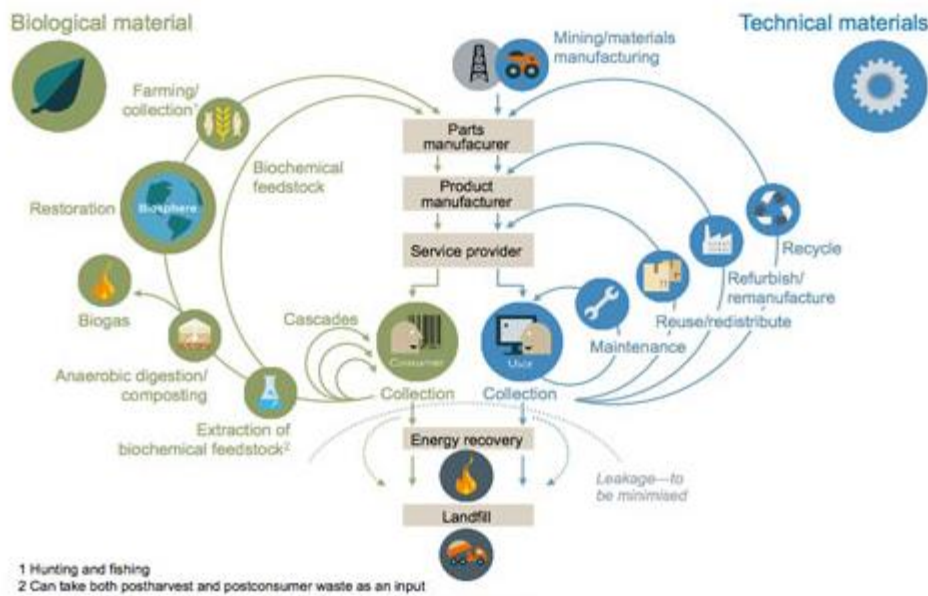
According to Figure 2 above the following terms in the diagram are explained below:

a) **Re-use of goods**: The use of a product again for the same purpose in its original form or with little enhancement or change.

b) **Products refurbishment**: A process of returning a product to good working condition by replacing or repairing major components that are faulty or close to failure, and making 'cosmetic change' to update the appearance of a product.

c) **Component remanufacturing**: A process of disassembly and recovery at the subassembly or component level. Functioning reusable parts are taken out of a used product and rebuilt into a new one.

d) **Cascading of components and materials**: Putting materials and components into different uses after end-of-life across different value streams and extracting, over time, stored energy and material coherence

e) **Material recycling**: It is divided into three parts; functional recycling, upcycling and down-cycling). Functional recycling is a process of recovery materials for the original purpose or for other purposes, excluding energy recovery. Down-cycling is a process of converting materials into new materials of lesser quality and reduced functionality. Upcycling is a process of converting materials into new materials of higher quality and increased functionality.

f) **Energy recovery**: The conversion of non-recyclable waste materials into usable heat, electricity or fuel through a variety of so called waste-energy processes, including combustion, gasification, pyrolysis, anaerobic digestion, and landfill gas recovery.

g) **Landfilling**: Disposing of waste in a site used for the controlled deposit of solid waste onto or into land.

Van Eygen et al. (2018) states that plastics, especially from packaging, have gained increasing attention in waste management, driving many policy initiatives to improve the circularity of these materials in the economy to increase resource efficiency (Van Eygen et al., 2018). Stahel (2016), mentioned that a CE would turn goods that are at the end of their service life into resources for others, closing loops in industrial ecosystems and minimizing waste. It would change economic logic because it replaces production with sufficient reuse, recycle, and repair and remanufacture (Stahel, 2016).

According to Singh and Ordonez (2016), current product design is facing a new challenge of anticipating social, economic and environmental challenges to realise the goals of a CE. This is because in practice the material collection system in place is waste management, rather than manufacturing-centred take back systems (Singh and Ordonez, 2016). Ellen MacArthur (2013), believes that the CE provides a coherent framework for systems level design and as such offers an opportunity to enable a positive, restorative economy. According to Franco-Garcia et al. (2019), the CE concept is regarded as "the inspiration to guide public, civil societal and private sectors towards zero waste practices". Franco-Garcia et al (2019), further mentions that, zero waste is also considered an alternative solution for waste management problems and a way to close the loop in the CE is to ban landfilling. Furthermore when looking at adopting CE within regulations, China seems to standout and lessons can be drawn from their best practices.

2.2.1 CE definition and best practices in China

In China an 11th five-year plan was enacted which identified economical use of resources as China's basic national policy to promote a CE, preserve the environment, establish a resource-saving and environmentally friendly society, and achieve a harmonious balance of economic growth, population, resources, and the environment (Fang and Zeng, 2007). However, there were barriers at the initial stage of China's attempts to achieve a CE, barriers that required administrative and legal means to be removed. According to Zhijun and Nailing, (2007), legal measures, therefore play an indispensable and irreplaceable role. Legislation is fundamental for CE development. In July 2006, the Standing Committee of the National People's Congress of China initiated legislation procedures to draft a proposal for CE. The government was thus committed to a CE by legislation. CE legislation must take the following principles: compliance with a scientific development philosophy, due attention to the CE in other legislation, consideration of economic measures, enforceability, and drawing on foreign experience, public participation and vital clauses (Naustdalslid, 2014). Table 2 below shows the principles used by China to produce a CE legislation, which can be adopted by Zimbabwe and implemented by the HMP.

Table 2: Principles used by China to produce a CE legislation (Zhijun and Nailing, 2007)

PRINCIPLES OF CIRCULAR ECONOMY LEGISLATION (CHINA)	EXPLANATION
Compliance with a scientific development philosophy	A CE helps to integrate populations, resources and the environment, prevent environmental poverty, promote social justice at higher level, and narrow the income gap and thus in line with the scientific approach to development
Due attention to the circular economy in other legislation	To enhance CE legislation, attention must be paid to the CE in other legislation
Consideration of economic measures	International practices reveal that economic measures remain one of the most effective means of conserving the environment and resources, therefore the application of economic measures must be promoted by inclusion in CE legislation
Enforceability	Poor enforceability has been a serious problem in Chinese legislation that must be solved. Clauses must be specific, well defined, and unambiguous, and when necessary, quantified terms should be included to avoid generalisation and

24	abstractness. When legislators are confronted with tough problems, consultation with experts and the public is essential to solving them
Drawing on foreign experience	Environmental problems in one nation may have something in common with those in others. China's lack of experience in CE legislation makes it necessary to draw on foreign experience.
Public participation	In CE legislation, public voices must be heard, their wisdom absorbed, and their motivation and creativity retained. The problem is that despite hearings held by legislatures that produce sound suggestions from experts and the public, legislators will ignore these suggestions when conflict with departmental interests arises, making such hearings nothing more than formalities.
Vital clause	CE legislation mainly consist of defining the duties and responsibilities of the governments and parties concerned, compulsory administrative measures, economic measures and incentives and measures to encourage public participation.

Table 2 above shows important elements that have to be adopted for CE to be a successful policy. According to Yuan and Moriguichi (2006), the following elements are vital to the legislation of CE: legislation must be implemented in coordination with environmental planning, incorporated into economic and social planning at national and regional level, and provide with budgetary support (see table 2 above). Furthermore, legislation should encourage the establishment of diversified investing mechanisms, reward recycling, and reuse efforts, and readjust corresponding taxes, credit and loans and financial policies (Su et al., 2013). The legislation should explicitly stipulate the recycling and reuse of products and associated rewards and accountability, in the design and production of a product, the enterprise should view the possibility of reusing that product after consumption as a key indicator of its business performance. Organisations of an intermediary nature should build up a network of businesses interested in recycling products and their packaging, with release and exchange of information, thereby connecting individuals, enterprises, and governments. Consumers should also be partially responsible for recycling of consumed products (Park et al., 2010). This will encourage the public to acquire attitudes and habits about consumption in keeping with environmental protection measures.

2.2.2 Plastic CE and Regulations

According to Su et al. (2013), CE implementation started in Germany, 1996, accompanied with an enactment of a law: "Closed Substance Cycle and Waste Management Act". This law provided for managing waste in a closed cycle and ensuring environmentally compatible waste disposal. In 2000, Japan became the second country that issued a law to promote CE nationally. The Japanese government tried to transform the society featured with high production, high consumption and high waste into a "recycle-oriented society" (Xanthos and Walker, 2017). The Paris Agreement adopted in 2015, lays fundamental groundwork for the world to take action on climate change. More than 200 countries promised to regularise the throwing away of plastic packaging that is clogging oceans and threatening marine ecosystems (Rhodes, 2016). More recently, according to the Srilankan Environmental Minister (Jern and Sreeja, 2018), Sri Lanka has banned plastic bags and are working to reduce the number of plastic bottles in the country. It is clear from the above that for plastic CE to function properly there is need for well implemented and enforced regulations. The next section will

verify how policy makers, businesses, governments and other stakeholders can encourage CE in plastics to be adopted in Cities.

2.2.3 CE for Plastics and involvement of stakeholders

The move towards plastic CE requires collaboration from governments, NGOs, industries, consumers and cities. Consumer good companies, plastic packaging producers and plastic manufactures, would play a critical role because they determine what products and materials are put on the market (Ghisellini et al., 2016). Cities control the after-use infrastructure in many places and materials are often the source of innovation. Business involved in collection, sorting and reprocessing are an equally critical part of the puzzle. Consumers have to engage with processes put in place to promote re-use. Policy-makers can play an important role in enabling the transition by realigning incentives, facilitating secondary markets, designing standards and stimulating innovation (Geels, 2005). In the development of a common vision of a more effective system, policy makers can be provided with relevant tools, data and insights related to plastics and plastic packaging. NGOs can help ensure that broader social and environmental considerations are taken into account. Collaboration would be required to overcome fragmentation and a growing number of governments have implemented or are considering implementing policies related to plastic packaging (Clapp and Swanston, 2009).

2.3 Policy Cycle

Policy creation/cycle is a process that typically follow a sequence of steps or stages as shown in table 3 below.

Table 3: Phases in Policy cycle

Elements of a Policy cycle	Explanation
Identification of a problem and demand for government action	At this stage stakeholders raise concerns regarding a policy or issue that affects the public or Organisation. The problem is then defined in clear terms and mass media, parties or interest groups raise it in relevant forums for consideration
Agenda setting	The problem identified is pushed through various organs in order to get discussed. This push for discussion eventually leads to allocation of time for discussion by relevant authorities.
Formulation of policy proposals by various parties	Solutions or policies are made at this stage in order to deal with the problem. Proposals maybe written by citizen groups, congressional parties, think tanks, interest groups, lobby groups, NGO. Policy designers create policy alternatives, that is, alternative options for how government action can be brought to bear on some identified problem. The alternatives are composed of different sets or combinations of the policy elements described below: policy goals, objectives, aims, policy means, tools and calibrations or settings
Policy selection/ adoption and legal enactment	This is the legal enactment of a selected policy by elected officials and houses of representatives. At this stage, policy legitimation is conferred upon the selected policy solutions
Budgeting	Once a policy is authorised, relevant authorities can then allocate resources or money toward its implementation. This is called budgeting since it involves resource allocation for many policies

Policy Implementation	It involves civil servants, putting the selected policy option into practice. Depending on the choice made by the executive or legislative branch, this could involve creating new regulations (or removing existing regulations), creating new laws, creating a new government program or service, creating a new subsidy or grant. According to Matland (1995), a policy can be defined as the "programmatic activities formulated in response to an authoritative decision. These activities are the policy designer's plans for carrying out the wishes expressed by a legitimating organisation, be it a legislature, a judicial agent or an executive body" (Matland, 1995). Successful implementation, according to Hill and Hupe (2002) requires compliance with statute directives and goals, achievement of specific success indicators, and improvement in political climate around a program
Policy evaluation	This is done after a policy has been in place for a year or several years, civil servants or an independent consultant firm assesses the policy, to see if the goals were achieved or if the policy was implemented effectively. Evaluation is based on empirical evidence and typically on social research methods thus on the process of collecting and synthesising evidence (Tranfield et al., 2003). It may aim to identify what works, for whom, in what respects, to what extent, in what contexts and how (Pawson and Tilley, 2004).

Policy planning and formulation are important steps in the policy cycle (see table 3). Policy planners are expected to contribute sound technical analysis regarding means, behaviour, cost, implementations, strategy and consequences, good or bad. Many actors can be important in the public policy process, but government officials ultimately choose public policy in response to the public issue or problem at hand. In so doing government officials are expected to meet "public sector ethics and take the needs of all project stakeholders into account" (Peters and Pierre, 1998).

2.3.1 Policy Analysis

Policy analysis is a technique used in public administration to enable civil servants, activists, and others to examine and evaluate the available options to implement the goals of laws and elected officials. Policy analysis is also defined as the process of "determining which of various policies will achieve a given set of goals in light of the relations between the policies and the goals" (Hajer et al., 1993). This study attempts to explain existing (analytical and descriptive) policies and their development analysis for new policies (prescriptive), involved with formulating policies and proposals is conducted (Dunn, 2015).

2.3.2 The Five-E Approach (Model)

The Five-E-Model is a descriptive model for analysing how existing environmental regulations effectively address the issue of plastic waste, meets peoples' needs and achieves its goals. Again policy analysis for this study is the prescriptive analysis (using the Contextual Interaction Theory which is presented in section 2.3.3) of the characteristics of policy designers or implementers in adopting the CE principles as an alternative to management of plastic. It is important to analyse the existing regulation so as to identify the gaps that might require new policies, in this case CE. Kirst-Ashman (2015) used the Five-E-Approach for studying social welfare policies. The model can be used for analysing existing and proposed (not yet existing) policies. For this study the focus of analysis is the management of plastic waste in Zimbabwe. The model examines a policy in terms of:

a) **Effectiveness:** effectiveness involves the extent to which a policy accomplishes its goals. What are the outcomes of the policy? How well does the policy's program implementation achieve its stated goals? It is important to use critical thinking and ask questions to seek information.

What are the program's strengths, and weaknesses? What empirical data are available to support program effectiveness? What benefits do recipients attribute to the policy and program implementation? Do workers administering the program support its effectiveness? In this study it is important to find out the effectiveness of the environmental regulations in managing plastic waste in HMP.

b) **Efficient**: Policy efficiency is the extent to which a policy and its implementation through a program are economical. To what extent does the policy address the problem or issue it intends to with the least expenditure of time, effort and money? In this case for example, the Plastic ban' in Zimbabwe, led to lots of inspections in the plastic manufacturing companies to enforce the policy, however the cost for inspectors to going from company to company to enforce compliance proved prohibitive.

c) **Evaluations of alternatives**: How good is it compared to other approaches? Have all the relevant other approaches been consulted? In this study, this will be looking at the gaps within the existing policies. In this case the gaps might be filled in by CE principles which are not found within the plastic waste management regulations. Furthermore it's necessary to measure how successful current regulations are in Zimbabwe in reducing plastic waste compared to, CE principles to do the same.

d) **Ethical**: To what extent does the policy and the program implementing it, respects peoples' rights to dignity, confidentiality, and self-determination? Is the policy honest and straight forward in its stated intent? Do people who might be affected by the policy clearly understand it and its implications? Does it concur with current legal requirements? With regards to plastic waste management regulations in this case, some people in Zimbabwe's illiteracy levels makes it difficult for them to understand the ambiguous language with which the regulatory instruments are written, therefore they constantly find themselves breaking the law.

e) **Establishment of recommendations for positive change:** How can the policy be amended so that it becomes effective, efficient and ethically sound, or should this policy be eradicated and a new one developed to replace it? In this study, this could be the formulation and implementation of a new CE regulation or incorporating the principles of CE into existing regulations.

For the development of a new policy such as CE, requires an assessment of the characteristics of actors involved during the policy formulation and implementation stages within the policy cycle. Engaging stakeholders informs proposals for alternative policies by policy designers or implementers. The Contextual Interaction Theory is used to analyse the characteristics of actors, particularly looking at the factors that might advocate possibilities for additions or changes to the existing regulations of plastics.

2.3.3 Contextual Interaction Theory (CIT)

CIT is a simplified model which was developed by Bressers et al., (2009). For this study the model provides a way for systematically identifying and addressing factors that policy implementers or policy designers have some chance of influencing. In this case, these factors might increase or decrease the chances of Circular Economy (CE) principles to be selected as an alternative solution for managing plastics or the incorporation of these principles into existing regulations. CIT draws provable conclusions by reasoning, using a social process approach that makes use of several variables including the policy tools (instruments). The Government assessment tool has its basis from the CIT (Bressers, 2004, 2009), which is a theory of implementation. CIT views implementation processes as a multi-actor interaction process driven by actors involved. However for this study it is modified to suit the possibility of formulation, selection and implementation of CE principles within the plastic management regulations in Zimbabwe, based on the characteristics of the actors involved during these processes. The basic assumption of the CIT is that the course and outcome of the policy process

depends not only on inputs (in this case the characteristics of CE principles in managing plastics), but more on the characteristics of actors involved for examples citizen groups, congressional parties, think tanks, interest groups, lobby groups and NGOs (implementers and policy designers).The characteristics are influenced by their motivation, information (cognition) and power (having resources).

In Figure 3 below the CIT concept is shown diagrammatically and clearly illustrates the layers of actor characteristics.

Figure 3: The Contextual Interaction Theory: Layers of contextual factors for actor characteristics (Bressers et al., 2009)
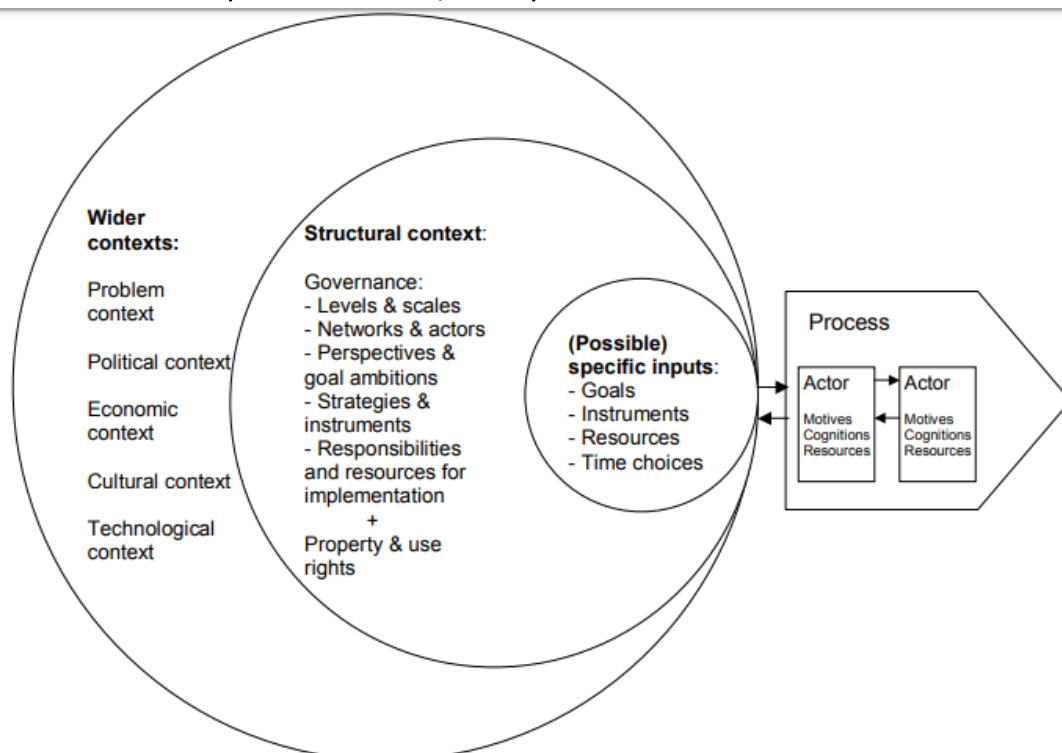
Figure 4: Contextual Interaction Perspective: **Dynamic interaction between the key actor-characteristics that drive social interaction processes and in turn are reshaped by the process (*Bressers et al. 2009*)**
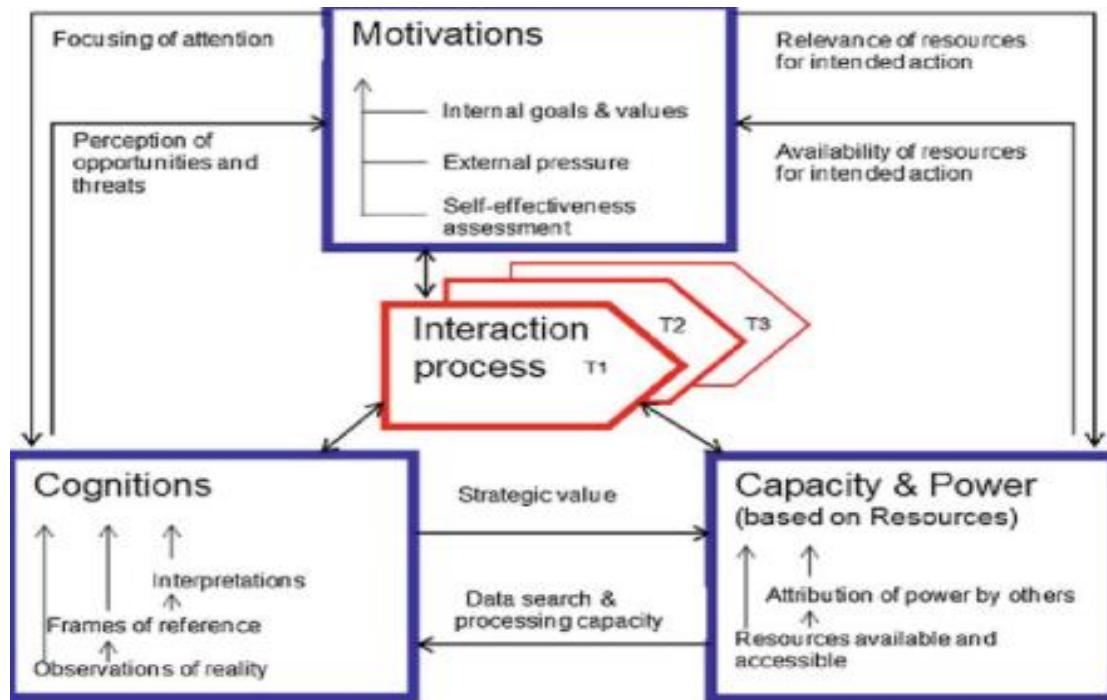
According to Bressers (2009), the theory acknowledges the value of a multiplicity of possible factors, but claims that theoretically their influence can best be understood by assessing their impact on the motivation, information and power of the actors involved.

According to CIT the factors influencing the implementation process are interactive, meaning that they are interlinked in essence. The influence of any factor, whether positive or negative, depends on a particular contextual circumstances, facts that surround a particular situation or event. The theory distinguishes a set of 'core circumstances or major facts related to the actors involved, which together contribute to policy formulation or implementation. The 'core circumstances' are:

a) **Motivation**: The value, importance and rating an actor gives to a particular policy or program and the degree to which the policy or program contributes to their goals and objectives affects formulation and implementation of alternative solutions to plastic management in Zimbabwe. If policy designers and implementers give first priority or high value to CE, and they are aware of the benefits of its principles compared to those of other alternative policies which manage plastic waste they might propose CE as an alternative to managing plastics, promote CE principles select CE as an alternative solution to plastic waste reduction. Moreover, the policy designers who do not value or prioritise CE principles will not choose it as an alternative solution to reducing plastic waste. Therefore if implementers or policy designers have low motivation regarding a CE, they may ignore the policy, issue a 'symbolic policy' not supported by a serious commitment of resources. If motivation is examined it helps stakeholders to understand the perspectives of policy designers and implementers, their belief systems, value priorities and the perceptions of the importance and magnitude of specific problems and policy solutions, often revealing the root causes of formulation or implementation hindrances (Sabatier, 1991).

b) **Information**: Information about CE is important to those involved during the policy formulation and implementation stage for the selection and successful implementation of CE.

29

In this cases, if policy designers or implementers are not aware about the benefits of CE over other available options in plastic waste reduction, they will never appreciate the value of CE nor write a proposal for its recommendation. If education campaigns on CE principles are targeted at implementers or policy designers, then new policy proposals are more likely to be drafted in favour of CE principles, CE chosen as alternatives, and implemented as a policy. Such programs could include technical knowledge of the CE principles, levels and patterns of communication between actors. At times implementers might not know whom they should be working with and who the beneficiaries (target group) are. They might not know the department assigned to lead the implementation and how the program will be monitored. In this case there are many government Ministries in Zimbabwe directly or indirectly connected to plastic waste management. There is the Ministry of Health, Ministry of Environment, Water and Climate Change and Municipality. All these Ministries have various departments within them. If implementers do not know the roles and responsibilities of each department, selection of CE principles or implementation might not be possible. Furthermore, implementers might not know how the program will be monitored nor cognisant of the culture and processes of other organisations in their network. Moreover if there is no information on the development of guidelines and protocols or their availability, or how information and communication between actors is channelled and coordinated that could affect selection of CE principles and their implementation.

c) **Power**: Power may be derived from formal sources (such as legal or regulatory systems or informal sources such as being dependent on another party for the achievement. Resources are important to provide the actor with the capacity to perform their duties (Bressers, 2009). Resources can be monetary, materials, time energy, services, staff, knowledge or assets. These are meant to support the actor's actions. If power is not supported by resources, then it is weakened. The dependency of an actor on the resources of another actor gives them power. Therefore those empowered and have access to resources have greater chances of having their proposals for a CE policy approved. Therefore if an actor has resources while others do not have resources but they need to gain power, then they might collaborate. In most interactive processes, informal sources of power may be highly important and can at times balance the more formal powers of the implementing authorities. In this case if an implementer or policy designer who supports CE principles has power in whatever form, then their choice or alternative will tend to be selected.

Interaction

Interaction between actors is very important for analyses of the selection of CE principles as an alternative solution to reducing plastic waste instead of plastic waste management regulations. For example in a case where there is not enough interaction between the implementer and policy designer, there is a possibility that if one of them does not understand CE principles or appreciate them, then is unlikely that CE principles be selected to be a new policy nor implemented well. There are three types of interaction that is cooperation, opposition and joint learning.

a) **Cooperation**: active cooperation occurs when both parties share a common goal (including the goal of blocking implementation of a policy). For example if a local Municipality, and the community share the same goal of having a clean environment free of plastic litter, everyone will make sure they support the goals of CE, hence it might be selected as a new alternative solution to reduction of plastic waste. Passive cooperation refers to one or more actors adopting a relatively passive cooperation to formulation or implementation of the policy instrument. Forced cooperation is a form of passive cooperation imposed by a dominant

actor. If the Minister of Environment, Water and Climate Change gives a directive that CE principles be adopted and implemented, then the policy designers and implementers will choose CE principles and will implement it well. The Minister has power to force the policy designers or implementers to cooperate.

b) **Opposition**: Opposition occurs when one actor tries to prevent implementation or selection of an alternative solution or program by another actor. If the citizens, implementers or policy designers in Zimbabwe are against the selection or implementation of CE principles as a new policy, then CE principles might not be selected as an alternative solution, neither will they get a chance to be implemented.

c) **Joint learning**: if most stakeholders are not aware of the guidelines, protocols or responsibilities of others, or channels in the hierarchy of formulating or implementing a policy of CE, then all of them can learn by finding information, then implementation will be feasible. Actors at a particular organisation or level within a network are aware of their roles and responsibilities and also those of the organisation which implements a policy or program, but the implementing organisation can't see the interactions of others in the entire large network. This makes it difficult for individuals or single organisations to fully identify how CE principles are implemented (Bressers et al., 2009). The examination of networks within which policies (selected solution) and programs are implemented is very important, to identifying whether the policy is effectively implemented. Furthermore, it is important to realise that the relationship of different actors within these network have different levels of interdependency. Some have high dependence others low (Bressers, 2007).

To conclude, the deductions from salient literature have already been identified above, that is, the identification of terms and also the rudimentary concepts which assisted in the understanding of the effectiveness of plastic waste management regulations. From the view-point of CE, this chapter included the relevant and fundamental literature which portrayed the essential aspects which can improve the plastic waste management regulations. In addition it provided the models which were used in the analysis to be better understood. The next Chapter 3, explains the research design, what and how the research was carried. The definition and research framework used are paramount for the in-depth study required in this research.

CHAPTER 3: RESEARCH DESIGN

Van Wyk and Toale (2015) define research design as the overall plan for connecting the conceptual research problems to the pertinent (and achievable) empirical research. In other words, the research design articulates what data is required, what methods are going to be used to collect and analyse this data, and how all of this is going to answer the research question. Research design also reflects the purpose of the inquiry, which can be characterised as one of the following: exploratory, descriptive, and prescriptive explanation, evaluation and history. However for this study the focus is mainly on the descriptive and prescriptive explanation. Descriptive explanation focuses on the analysis of the plastic waste management regulations whereas prescriptive explanation focuses on how CE principles can be incorporated into these existing regulations.

3.1 Research framework

Research framework, based on Vershuren and Doorewaard (2010), means schematic presentation of the research objective. It includes step by step activities to achieve research objective. Research framework consists of seven steps:

Step 1: Characterizing briefly the objective of the research project

The aim of the study is:

- to improve the effectiveness of the environmental policies, especially those related to plastic waste management in Zimbabwe and also reducing plastic waste through adoption of CE principles.
- to identify gaps within the plastic waste management regulations that can be solved by CE.
- to find out the factors affecting the effective implementation of environmental regulations in managing plastic waste. The identified factors indicate whether the regulations were implemented effectively or not, hence leading to solutions.

Step 2: Determining the research object

The research object are the plastic waste management regulations, in the Harare Metropolitan Province, in Zimbabwe.

Step 3: Establishing the nature of research perspective

The research evaluates the existing environmental regulations using the Five-E-Approach. The evaluation of existing regulations, will enable the researcher to recommendations on whether the existing regulations need modifications or not, or a new policy is required. Therefore, the research deals with a problem-analysis research and intervention research. The research also views the selection and implementation of an alternative solution (CE principles) in plastic management as a multi-actor interaction process driven by actors involved, through a conceptual model of the Contextual interaction Theory. The assumption is that the course and culture of the policy process depends not only on the characteristics of environmental regulations that manage plastic waste but more on the characteristics of actors involved. The actors being the implementers and policy designers in this case. The influence of actors can best be understood by assessing their impact on the motivation, information and power of the actors involved. Those three factors can lead to the interaction between actors which is important for analyses of formulation and implementation of CE principles in the management of plastics. There are three types of interaction that is cooperation, opposition and joint learning which may lead to effective or ineffective implementation of a policy.

Therefore the research perspective utilises a model which consists of the Five-E-Approach and the Contextual interaction Theory.

Step 4: Determining the sources of the research perspective

The research uses scientific literatures to develop a conceptual model. Theories to be used in this research are:

Table 4. Sources of the Research Perspective

Key Concepts	Theories and Documentation
Level of Influence and interaction of multi-actors in the formulation of new policies Achievement of policy goals and objectives in existing policies.	Contextual Interaction Theory Five-E-Approach Preliminary research

Step 5: Making a schematic presentation of the research framework

The research framework shows the Five E' Approach, which comprises of the effectiveness, efficiency, ethicality, establishment of recommendations and evaluation of alternatives. This assisted in the analysis of the effectiveness of the plastic waste management regulations and identification of whether alternatives such as CE are necessary or not as new policies that can reduce plastic waste. The CIT model shows the factors that may affect the characteristics of the actors involved in policy formulation and may further positively or negatively affect the selection of CE. These factors are motivation, cognition and power. The actors' interactions within the network for reducing plastic waste are also important in selecting CE as a new policy. The research framework is described in figure 5.

Figure 5: Schematic presentation of research framework
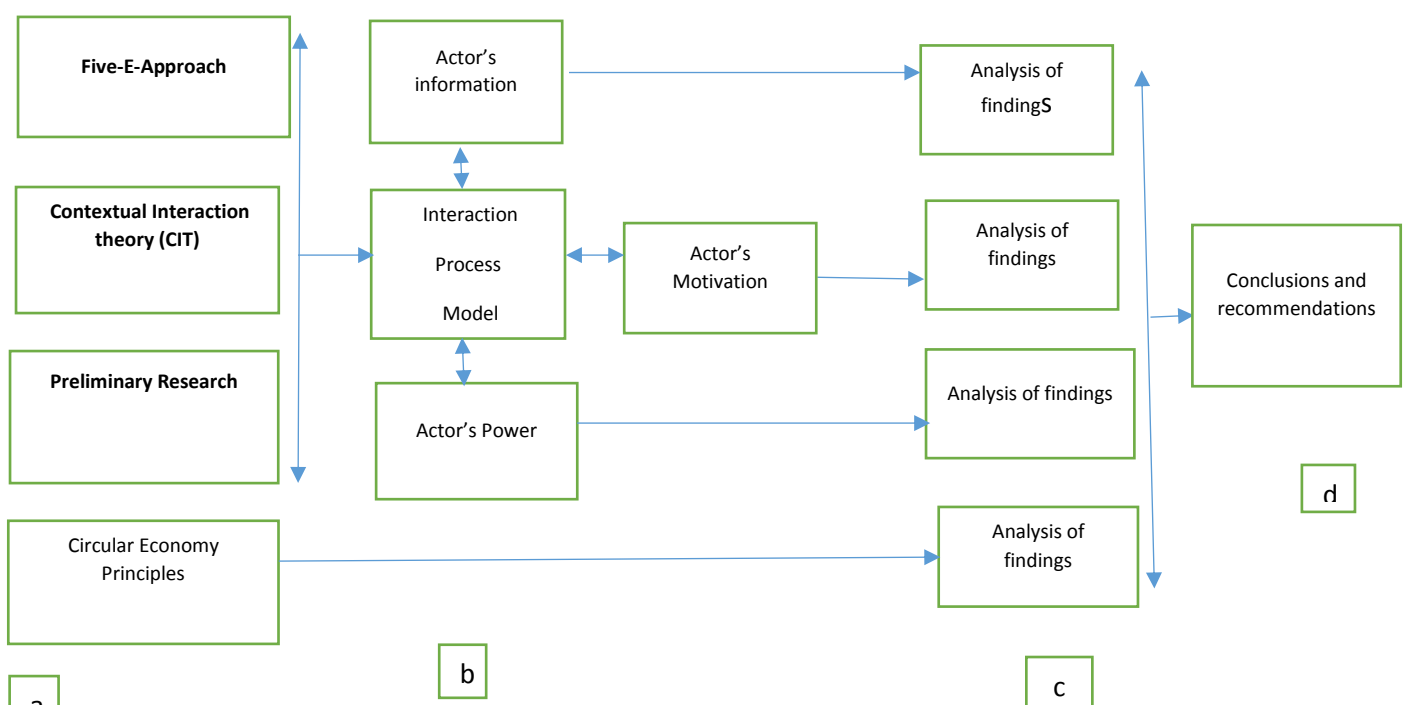
Step 6: Formulating the research framework in the form of arguments which are elaborated

a) An analysis of the Five-E-Approach and preliminary research on environmental regulations that manage plastic waste. Also analysis of characteristics of implementers involved using the CIT, so as to find out the conditions under which CE principles might be selected as the alternative solutions for plastic management in (HMP) Zimbabwe

b) Means by which the research object are identified

c) Confronting the result of the analysis as the basis for recommendation

d) Recommendations indicate what can actually be implemented, is it (better amend, replace, remove, or add a policy? Recommendations solves the problem.

Step 7: Checking whether the model requires any change

There is no indication that any change is required.

3.2 Research strategy

The research uses the single case study approach as its strategy. This case is considered a "single case" because the research evaluates the regulatory frameworks within the (HMP). It means the research is focusing on this one case in depth. An in-depth study is applied by using various methods for generating data.

3.2.1 Research Unit

Due to the limitations of the research, two municipalities were used as the actual units of analysis: one municipality (Harare proper) and one municipality (Epworth). These two municipalities were chosen on the basis that they have the highest production of plastic waste, squatter settlements and illegal dumping of waste.

3.2.2 Selection of Research unit

Selection of the informant and respondent in two Municipalities of (HMP) is based on the following criteria:

- The Head of Environmental Department (HOD) within the two Municipalities in the Harare Province.
- The Environmental Officer within EMA in Harare Province
- The District Environmental Officer within the Ministry of Health and Child Care in Harare Province
- The local representative of the communities of Epworth and Harare proper within the Harare Province.
- The community members within the two municipalities
- Representatives of private companies

The limitation of this research were time and accessibility limitation. Other informants were taken through snowball techniques in addition to the ones selected above (see 3.2.2). Snowballing sampling is a nonprobability sampling technique where existing study subjects recruit future subjects from among their acquaintances. Thus the sample group is said to grow like rolling snowball (Biernacki and Waldorf, 1981).

3.2.3 Research boundary

The geographical boundaries of this case is the HMP largest two municipalities (Epworth and Harare proper) for practical reasons. Due the diversity of the regulations in Zimbabwe, the research was limited to Environmental regulations that manage plastic waste. Consequently, the scope of this research is to analyse the environmental regulations that manage plastic waste in the two said municipalities to find out their success rates in reducing plastic waste. Recommendations were drawn from the results, to show whether the regulations require amendment or a new policy. The implementers was analysed in terms of their characteristics which show the conditions under which CE principles was selected as an alternative solution to plastic management.

3.2.4 Research Limitations

Due to time limit, the research scope has been restricted to enhancing the execution of the research, some of these "restrictions" are:

a) To address how effective the plastic waste management regulations have been, the research has been restricted to HMP, as a representative of Zimbabwe. Two Municipalities, Harare proper and Epworth, which have highest population and contain two major waste dumpsites within the province were selected to represent the whole province. Furthermore they have presented with most plastic waste combustions and have the most number of informal plastic waste collectors due to the presence of dumpsites.

b) The regulations of focus are restricted to the environmental regulations especially those that deal with plastic waste management. This will allow deep analysis of these plastic related regulations.

c) The availability of stakeholders as respondents was limited, due to the narrow time-frame of the research.

d) The concept of CE is restricted to plastics management only so as to promote sustainability and environmental protection.

3.2.5 Assumptions

a) The objects selected is assumed to depict how effective the plastic waste management regulations are in reducing plastic waste. The rationale which defines the object is that the most polluted municipality with plastic waste can have more barriers that affect the effectiveness of the plastic waste management regulations.

b) The Five E- Approach determined the effectiveness of the existing plastic waste management regulations and the Contextual Interaction Theory by Bressers (2009), revealed the characteristics that affected the selection of CE to be a new policy or be incorporated into the existing plastic waste management regulations. The identification of these characteristics enabled the derivation of recommendations on how to go about the introduction of CE in Zimbabwe, particularly the HMP.

3.3 Research methodology

Methodology refers to the systematic way of collecting, analysing and interpreting data in order to produce a result relating to a research problem. Not all methods are suitable for collecting the data needed in relation to the approach. Choice of methodology therefore needs to be based on the

problem and the theoretical approach, which in turn affects the perspective a researcher holds on the real world (Creswell and Creswell, 2017).

In table 5, those research sub-questions (Column A) are associated to the research methods (column B) and target groups (column C) to gather information and data to respond them. In the last column (d), the expected output is displayed per sub-research question (Q1- Q4)

Table 5: Research methodology

A Sub-question	B Research method	C Target group	D Output
Q1. How successful are the plastic waste management regulations' formulation and implementation in achieving its stated goals (effectiveness)? What are the factors affecting their enforcement and implementation?	-In depth interviews with semi structured questionnaires -literature review Participant observation	-Government -Community members -Private Companies -Informal waste collectors -NGO -Academic researchers	-Definition of the problem dimension. -Specific data about plastic waste streams -Information on effectiveness of the regulation
Q2. How can the existing regulations be improved in terms of effectiveness, i.e. formulation, implementation and enforcement of urban plastic waste management regulations?	-Literature review -In depth interviews with semi structured questionnaires	-Government -NGO -Private Organisation	-Practical solutions and recommendations to improve the regulations -Recommendations to close gaps in regulation enforcement
Q3. How are the stakeholders involved in the formulation, implementation and enforcement of the plastic waste management regulations?	-In depth interview with semi-structured questionnaire Literature review	-Government -NGO -Private sector -Community members	-List of priorities and strategies of stakeholders regarding plastic waste -List of roles and responsibilities of stakeholders in terms of reducing plastic waste
Q4. To what extent are the plastic waste management regulations ethical and efficient?	-In-depth interview -Literature review	- Government -Academic researchers -Community members Private companies	-Identification of regulatory ethical statements and information on efficiency
Q5. How can Circular economy concepts be expected to be integrated in the current environmental regulations in Zimbabwe?	-In-depth interview -Literature review	-Government -NGO and researchers -Private Companies -Community members	-Understanding of CE and its principles. -List of recommendations on how CE can be included in regulations -Benefits of CE principles

From the research questions, the following project learning goals are contemplated:

- To identify the factors affecting effective implementation and enforcement of the plastic management regulations
- To come up with practical solutions, approaches, interventions to the improvement of these regulations in Zimbabwe's urban areas.
- To review the current urban plastic waste management regulations and provide suggestions as to how circular economy principles can be incorporated,
- Identify the benefits of including CE principles in plastic waste management regulations
- To find out if the policy of plastic management produced its intended outcome and impact
- Assess the level of understanding of the regulatory framework by the communities

3.4 Ethical statement

Scientific research requires that researchers conduct themselves according to ethical principles. The relation between the researcher and the informants is very important in qualitative research because the informants can be affected by the research in several ways. Within the research community, several ethical principles are recognized (Touitou et al., 2004**). The information provided in advance to the interviewee will address the following**: the voluntariness of participation; the nature and purpose of the investigation, including if the data collection is meant only for training purposes; any reasonably foreseeable factors regarding the nature, purpose, and duration of the research that may influence participants' willingness to participate (such as the extent of strain, potential risks, and discomfort); the right to decline to participate and withdraw from the research at any time, without any negative consequences, and without providing any reasons; any recording of voices and images (where applicable); confidentiality protection and the limitations thereof; procedures for incidental findings (where applicable); additional insurance guarantees (where applicable); period of time to which the consent applies; time and nature of data storage; re-use of specified data in the current, future or other research; incentives for participation; names and details of the responsible researcher and contact person(s) for questions about the research and rights of research participants

a) **The informant's approval:** The most important principal concerns the informant's approval, which implies that the informant has to volunteer to become involved in the research process, and has the right to be informed about the aim of the study. In addition, the informant has the right to interrupt their involvement in the research process. This contributes to ensuring that the informants have control over their own participation in the research process. Therefore a written consent form would be issued to the participant prior the interview, to read and sign where necessary. The researcher fully explained the details of the information in the consent form in the preferred language by the participant.

b) **Confidentiality:** The principle of confidentiality aims to secure that the information given by the informants is kept confidential. This means that the researcher has to preserve an informant's anonymity if the informant requests this. The information is kept secure by using hard to guess password to stop hackers cracking into researcher's system. Moreover the information obtained is not be shared to anyone and when it's no longer necessary to keep it, the information is disposed- off. Encryption of all confidential information that is, keeping sensitive information inaccessible from prying eyes was done. Moreover the information obtained will not be shared. Computer equipment used will keep security software up to date to protect against malware, viruses and hakers. In the event devices used are lost, a remote wipe facility will be used to delete data on those devices.

c) **Consequences:** The third ethical principle involves the consequences the research can have for the informants. Those who take part in the research process should not be exposed to physical or social embarrassment. It is therefore important that the researcher does not ask the informant's questions that are too probing and which can lead to that the informants having problems after the interview. The interview is therefore going to be arranged in a way that preserves the informant's integrity, where the researcher takes the informant's evaluations, motives and self-respect into consideration (Touitou et al., 2004).

3.5 Research Methods

This research methods are going to be elaborated upon in this section:

a) Desk research

Desk research (Literature review) is the research method that consists of identifying and reviewing the existing materials (secondary sources of information) on the topic of the case study (Romania et al., 2013). Through this method, documentation analysis was done whereby documents were interpreted by the researcher to give a voice and meaning around the research topic. Public documents that is ongoing records and annual reports were used as well as personal documents such as professional journals, newspapers and journals, so as to find out the effectiveness of the plastic waste management regulations and gaps that can be filled in by CE.

b) Participant Observation

Observational research (or field research) is a type of correlational (non-experimental) research in which a researcher observes ongoing behaviour (Baker, 2006). Systematic data collection approach was used by the researcher whereby people were examined in their natural settings and natural occurring situations by use of all senses. This was done so as to identify the culture of the people when it comes to managing plastic waste and to find out whether the plastic waste management regulations were being followed. Case study (Eisenhardt, 1989) is a special types of observational research which was used to gather information by focusing on the events that has to do with plastic waste management in Harare Metropolitan Province, Zimbabwe.

c) In-depth interview with semi-structured questionnaire

This is a qualitative research method that consists of using a semi-structured questionnaire to interview respondents who can provide in depth information about the aspects associated with the research topic. This method was used to gather information from respondents involved with plastic waste management, the plastic regulations as well as environmental policy makers. Interviewee approval was sought out, through the use of a 'consent form for interviews' and every respondent who agreed to be interviewed had to sign it. This is an important component of the ethical procedure at UT when the research involves people.

3.6 Data analysis

Data analysis means data evaluation process through logical and analytical framework as presented in the following

3.6.1 Methods of Data analysis

Qualitative Content analysis was used since the research is a qualitative research. Content analysis is a research technique used to make replicable and valid inferences by interpreting and coding textual

material. By systematically evaluating texts (documents, oral communication, and graphics), qualitative data can be converted to quantitative data. Although the method has been used frequently in social sciences, only recently has it become more prevalent among organisational scholars (Mayring, 2004). Table 7 shows the data required to answer the question and the method of analysing.

Table 6: Data and method of analysis

Data/Information required to answer the question	Method of analysing
- Definition of the problem dimension	**Qualitative**- as input for analysing the problem of plastic waste
- Specific data about plastic waste streams	**Qualitative**-as input for analysing the sources of plastic waste
- Information on effectiveness of the regulation	**Qualitative**- as input for analysing the effectiveness of plastic waste management regulations
- List of priorities and strategies of stakeholders regarding plastic waste	**Qualitative**- as input for analysing the stakeholder priorities and strategies in reducing plastic waste
- List of roles and responsibilities of stakeholders in terms of reducing plastic waste	**Qualitative**- an input for analysing the roles and responsibilities of stakeholders with regards to plastic waste reduction
- Practical solutions and recommendations to improve the regulations	**Qualitative**- as input for analysing possibility of improving plastic regulations in Zimbabwe
- Recommendations to close gaps in regulation enforcement	**Qualitative**- as input for analysing alternatives that can improve the enforcement of regulations
- Understanding of CE and its principles	**Qualitative**- as input for analysing the how CE principles function
- List of recommendations on how CE can be included in regulations	**Qualitative**- as input for analysing the possibility of CE regulations in Zimbabwe
- Benefits of CE principles	**Qualitative**- as input for analysing the benefits and value of CE principles

3.6.2 Validation of Data Analysis
Qualitative data analysis

Validation of data analysis is done by triangulation. In order to avoid researcher bias, triangulation technique is first conducted by comparing the result of research and the perspective from the theory that is relevant to the research. Second triangulation technique is carried out using different method and sources to find the data of research. The result of the triangulation are taken as a consideration for this research.

Figure 6: Analytical framework: A schematic presentation of analytical framework

The analytical framework in Figure 6 below shows how the CIT, Five E' Approach models as well as literature review is used to analyse the findings and also answer the main research question and the sub questions. The Five E' approach is used to answer sub question 1-3 during analysis and the CIT is used to answer sub question 4 during analysis. The information from literature review was analysed to answer question 1-3 as well. Recommendations were then derived from the analytical framework (figure 6) which can be adopted to assist in solving some issues which would have emanated in the findings.

Figure 6, Analytical framework: A schematic presentation of analytical framework
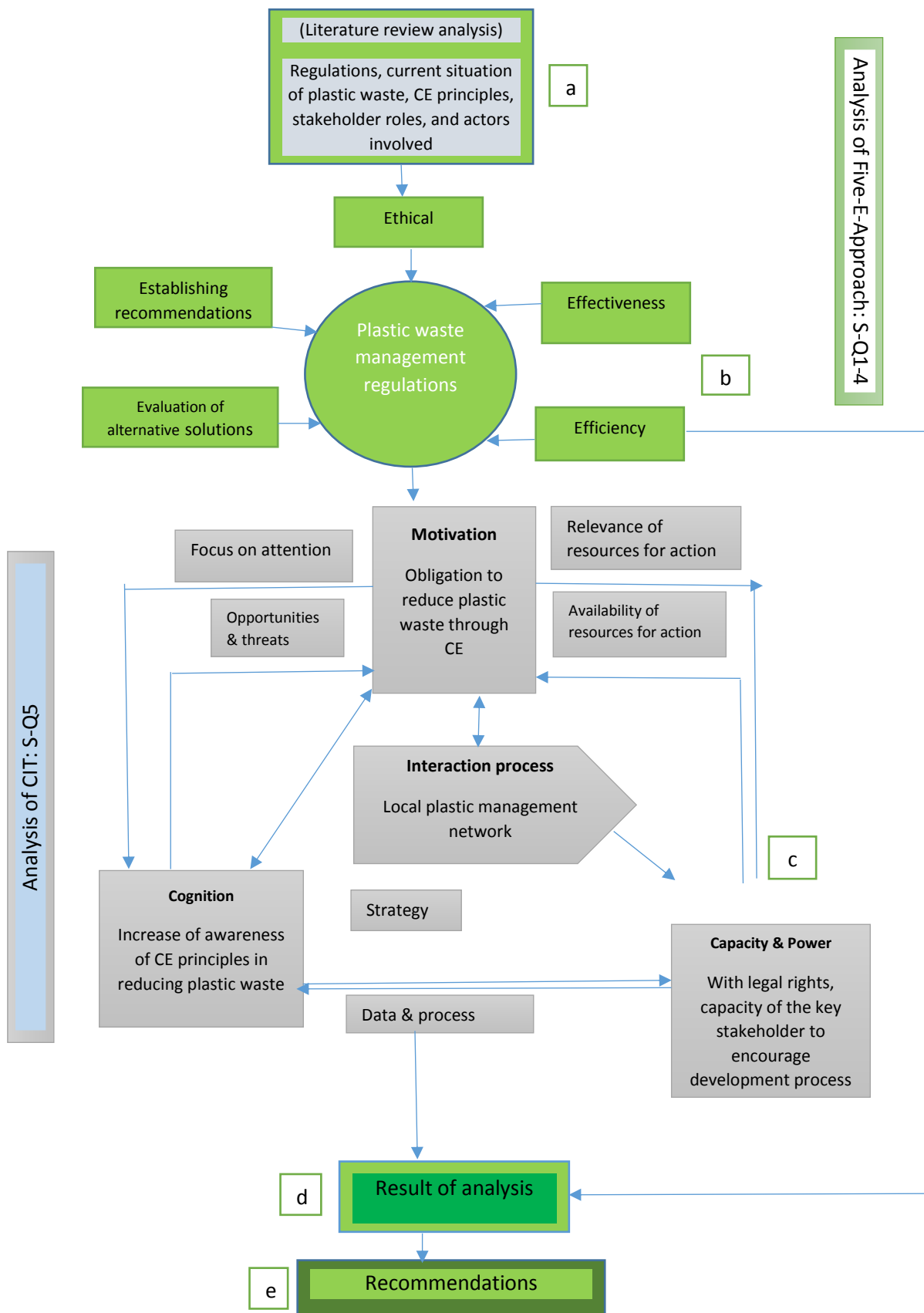
CHAPTER FOUR: FINDINGS AND DATA ANALYSIS

This chapter explores and identifies important standpoints in the analysis of environmental regulations that address plastic waste management in HMP, Zimbabwe. The findings and analysis of the results were based on interviews and review of scientific journals/articles. It shows how and the extent to which, this study specifically addresses the research questions. Results further examines gaps, extent of effectiveness, efficiency and ethicality of the plastic waste management regulations using the Five E-Approach. The gaps are ideally supposed to be filled in by CE principles and the benefits of CE in reducing plastic waste are also accentuated. The factors affecting the effectiveness of these regulations are also discussed. Finally the analysis of the characteristics of the policy formulators and implementers are assessed using the CIT.

4.1 Current situation of plastic waste in Zimbabwe

Plastic waste management has emerged as one of the greatest challenges facing HMP, Zimbabwe (see figure 7). The volume of plastic waste being generated is speeding up than the ability of local authorities to allocate financial and improve technical resources needed to parallel this growth (Mahamba, 2015). Single-use plastic is pervasive in Zimbabwe. Government funding and donor community play a crucial role in subsidising the operations of cities and yet the funding is not consistent with the operations and this results in failure to deliver the services (Mandevere, 2015). As mentioned in Chapter one, sanitary landfill is regarded as the most cost-effective method to protect human health and environment in HMP. The researcher believes the integration of CE within the plastic waste management regulations would encourage the production of zero waste. In a CE challenges can be turned into opportunities. A smart, innovative and sustainable plastics industry, Agranoff and Mcguire, (2004), where design and production fully respects the needs of reuse, repair, and recycling, brings growth and jobs to Zimbabwe.

Figure 7: Plastic waste on the Environment in Harare

Environmental plastic pollution as a failure of recycling plastic, hence the need for CE.

Figure 7, Fieldwork, 06/05/2019

Loss of value in plastic material is shown in Figure 7 above. A linear economy approach results in many environmental challenges: resources become depleted and end up as waste and emissions. One of the key strategies to overcome these problems is using plastic waste as a resource that is evolving toward a CE (Stahel, 2016). There is need for CE to be incorporated in the plastic waste management regulations in Zimbabwe.

4.2 The Plastic Waste Management Regulations in Zimbabwe

As mentioned in Chapter 2 of this research, Zimbabwe has a number of environmental and plastic related laws as well as an economic development footprint that has direct and indirect implications on handling plastics (Nickerson, 1994), yet none of these regulations addresses CE. The concept of CE challenges the current unsustainable model, its prerogative is resource conservation and it has the potential to fully close the loop.

In the initial stages, the research planned to analyse descriptively and prescriptively the existing plastic waste management regulations in Zimbabwe as highlighted in Chapter 1 and 3 of this study, using the Five E- Approach discussed in chapter 2. Its five criteria that is, effectiveness, and efficiency, and ethicality, evaluations of alternatives and establishment of recommendations. These criteria are used to describe waste management regulations. In the process CE principles are prescribed for the gaps identified against criteria. First research question on the '*effectiveness of the formulation and implementation of the plastic waste management regulations and factors affecting their enforcement and implementation*' will be addressed. Table 7 below and appendix 2 summarise the assessment of the regulatory design.

Table 7: Effectiveness of the plastic waste management regulations in HMP

Regulation	Effectiveness
Plastic Packaging and Plastic bottles Regulation S.I 98, 2010	The specifications in these regulations do not cover bread packaging which may have a thickness of 25 micrometre and may cause plastic pollution (see appendix 2). The regulation only cover plastic waste disposal which is a form of linear model and do not address CE. CE can be included so as to avoid plastic waste disposal and avoid dumping. The use of thin film plastics can be excluded by including CE in the regulations at design stage of any plastic product, banned for example in supermarkets.
Importation and Transit of hazardous Substances and waste Regulations S.I 77, 2009	These regulations promote landfilling. HMP has no standardized landfills, instead they use dumpsites (see appendix 2). Landfilling can be done in a more controlled manner, so as to reduce negative environmental impacts using leachate capturing systems, biogas conduction systems and protecting the ground qualities by using an impermeable layer between the ground and plastic wastes in the landfilling site. In addition, the waste should be covered with soil on a daily basis to avoid plastic litter being blown away. CE can also be incorporated into these regulations to achieve zero waste production.
Hazardous substances, pesticides and Toxic substances Regulations S.I, 2007 and Hazardous waste management Regulations S.I 10, 2007	These regulations promote disposal of plastic waste and landfilling (see appendix 2). CE can be incorporated into these regulations in order to reduce the production of plastic waste. This can be done at design stage and throughout the value-chain. The importation and exportation of hazardous waste and waste oils is also regulated by this Statutory Instrument.
Effluent and solid waste disposal regulations, S.I 6, 2007	Pollution is promoted through the polluter pays principle (see appendix 2), because polluters will produce plastic waste and include payment of fines for pollution which are not very high in their cost model. This is a weakness in the regulations compounded by weak enforcement.
Environmental Management Act (EMA) (Chapter 20: 27	These regulations prohibits: "the discharge or disposal of any waste in a manner that causes pollution to the environment or ill-health to any person and the transportation of waste except under licence issued by the Agency (see appendix 2). It also gives details of who should apply for a waste license, this includes waste transports within Zimbabwe, operators of waste disposal sites or plants and or to generators of hazardous waste. The discarding, dumping, and leaving litter on any place except in containers or places provided for that

	purpose". However, the regulations have not achieved their objective of reducing plastic waste through landfilling. Dumpsites are the only waste management methods HMP uses.
The Zimbabwean Constitution	Section 73 of the Zimbabwean Constitution (see appendix 2), makes provisions for environmental rights. It states that every person has the right to: an environment that is not harmful to their health and well-being and to have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures that: i) prevent pollution and ecological degradation, ii) promote conservation and iii) secure ecological sustainable development and use of natural resources while promoting social and economic development. This has implications on the production, consumption and disposal of plastics. The disposal of plastics is currently through dumping which cause environmental pollution and degradation, thereby undermining sustainable development and affecting the health and wellbeing of current and future generations in contravention of their constitutional rights.

It is important to note that the plastic waste management regulations which endeavour to attain effectiveness must meet their objectives on which their formulation was based on. The results on effectiveness from the Table 9 above show that basically most of the environmental regulations related to plastic waste management have not achieved their stated goals. The formulation of the regulations was made in such a way that controlled landfilling engulfs the plastic waste produced (see Table 7), however, implementation on the ground is a failure. (HMP) has no controlled landfilling, open air dumping has been identified through observations by the researcher as the norm (see figure 7), which may pause environmental and human health hazards. To prevent open air dumping, CE principles can be introduced to avoid the production of plastic waste. CE enforces eco-design, waste prevention, recycling and energy efficiency, which helps tackle the environmental pollution problem (Stahel, 2016). Designing eco-friendly, easily recyclable and energy efficient plastic products by using fewer resources would enable manufacturing of durable products that could be recycled into quality recyclables.

Information gathered through open sources (see table 9), shows there are also a number of challenges affecting the enforcement and implementation of the plastic waste management regulations. These challenges are identified as gaps in plastic waste management regulations related to policy formulation. If policy formulation or policy making process has loopholes, this negatively affects implementation and enforcement in the long run. The challenges are highlighted below as follows:

4.3 Challenges to implementation and enforcement of the plastic waste management regulations in (HMP), Zimbabwe

The enforcement and implementation of environmental regulations in Zimbabwe is characterised by challenges some of which are encountered at the various stages of the policy cycle. The following are some of the challenges addressed against the criteria of efficiency, ethicality and evaluation of alternatives as mentioned in chapter 2.

    a) **Efficiency of the regulations:** Ensuring that adequate resources are available is key for the success of the policy process. However, lack of adequate funding for policy making of the plastic waste management regulations remains the major challenge to Zimbabwe (Tsiko and Togarepi, 2012). The issue of funding has had a direct impact on the level of consultations with key stakeholders, which would have allowed Government to tap into wider sources for information, perspectives and potential solutions in order to meet the challenges of policy making (Makwara and Snodia). However, CE offers through its principles, the conservation of natural resources, improved economy, and increased profits and encourages the use of plastic material that is already in circulation instead of importing raw materials from other countries, which is expensive (Stahel, 2016). Therefore there is a case for integrating CE principles in the regulations in Zimbabwe.

b) **Ethicality of the regulations:** It was revealed through findings (see table 9), that the public that is affected by the plastic waste management regulations themselves do not know the regulations (see appendix 3), therefore they do not know the pros and cons of the regulations (Chitotombe, 2012). This leads to the public not appreciating these regulations since they do not understand them. The public needs to be educated on the importance and benefits of these regulations and CE so that they follow them. Findings (see appendix 3), show that the more people familiarise themselves with CE principles and knowledge, the more it becomes appreciated. This gives encouragement for CE to be incorporated into future regulations. Implementation of the regulations is generally poor and formulation of policies was not done in consultation with end-users. It would appear policy formulation was a mere formality, just to have regulations, without research. Research is important because it enables the discovery of important aspects like CE that can benefit the Zimbabwean economy if adopted in the regulations and enforced.

c) **Evaluation of alternative solutions**: Zimbabwe's regulatory system is failing to capture the economic benefits of plastics. Alternative solutions to plastic waste reduction such as CE have not been fully embraced (see table 14). Plastics are used once and then thrown away as seen by the massive amounts of plastic waste in dumpsites. It is imperative that Zimbabwe moves away from the linear model which encourages disposal of plastics and also moves society out of that mind-set (Stahel, 2016). Fundamental rethink is required.

4.4 Factors affecting effectiveness of the plastic waste management regulations

To gather more information of the factors affecting effectiveness of the plastic waste management regulations, interviews were carried out with 29 respondents including government, NGOs, researchers, plastic recycling companies, plastic manufacturing companies, government parastatals, and community members as well as the informal waste collectors from (HMP). The participants were identified based on the divergence of professions and their willingness. It was shown, that participants were mostly dominated by the community members. This would also assist in improving the plastic waste management regulations by addressing and reducing the negative factors. Table 8 summarises type and number of participants in this research and table 9 shows barriers to effectiveness of the plastic waste management regulations.

Table 8: List of Interview respondents

Participants									
Participants	Community members	NGO	Government Representative	Local Authority	Government parastatals	Informal waste Collectors	Plastic manufacturing companies	Plastic recycling companies	Environmental Researchers
Totals	15	1	2	2	1	3	1	2	2

Inquires (as presented in appendix 1), were constructed around the effectiveness of the plastic waste management regulations and the integration of CE. The idea is that questions could lead to the identification of the extent of effectiveness of the plastic waste management regulations and the reasons for ineffectiveness identification of gaps that can be filled by CE within regulations.

Table 9: Summary of factors causing ineffectiveness of the plastic waste management regulations

The table below illustrates the negative factors emanating from design, formulation, implementation and enforcement of the plastic waste management regulations, hence leading their ineffectiveness.

No	Description of factors
1	No consultation of end-users (public) during policy formulation
2	Policy formulators did not look at the poor economic situation
3	No alternatives are available when looking at the plastic waste management regulations
4	Regulations are more on the banning side, no alternatives are put in place
5	Policy implementers are part of the people buying plastics
6	No effective implementation because of lack of implementation strategy.
7	Zimbabwe does not have devolution for policy formulation at provincial level, only at national level
8	Not everyone is involved
9	Existing formulation was just made for formality
10	Implementation is affected by lack of funding
11	Lack of enforcement of the regulations
12	Public do not use waste bins, they ignore them
13	Implementers do not know the regulations
14	Public do not understand the regulations
15	Informal market is smuggling in thin plastics into the country
16	Lack of resources for implementation
17	Lack of awareness to the public about the negative effects of plastics
18	Public does not have a culture for protecting the environment
19	Public lacks knowledge in terms of environmental pollution hence they throw away plastic litter in the environment
20	No punitive measures are put in place for punishing those who pollute the environment.
21	Plastic waste management regulations are not strict enough
22	No reduction of plastics entering the country
23	No incentives to the public and recycling companies to motivate them
24	Policies are on paper (in theory) but practically they are not followed
25	CE has not been consulted
26	High population of people therefore any campaign cannot be spread to everyone
27	Shortage of trucks to collect litter
28	Public do not appreciate the need for a litter free environment
29	Large population hence no adequate places to put plastic litter
30	High population of people buying food covered in plastics
31	Buying food packaged in plastics from street vendors because of shortage of public eating places
32	Public walks long distances to find bins
33	Public do not obey the laws
34	Public do not participate in clean-up campaigns

It must be noted from Table 9 that there are a plethora of factors which affect the implementation, enforcement as well as effectiveness of the plastic waste management regulations. Based on interview responses and observations, implementation of the plastic waste management regulations have not achieved their stated goals as seen by the amount of plastic litter that is still found on the environment in the HMP (see figure 7). People do not know the negativity of plastics on the environment and some companies deliberately manufacture thin plastic. In terms of consumer behaviour, implementation is poor because of bad habits from the public who are used to throwing plastic litter on the ground, partly due to poor provision of bins. There is lack of resources in order to carry out implementation of the policy, making it difficult for the policies to achieve their stated goals (see appendix 3). Therefore, despite the efforts made by some policy implementers to try and reduce plastic waste, it is not effective. The enforcement is poor as seen by lack of follow ups and weak penalties of offenders. (see table 9).

Having addressed the challenges or rather stumbling blocks in attaining effectiveness of the plastic waste management regulations, this brings forward the 2nd research question on *'the ways of improving the plastic waste management regulations in terms of effectiveness and closing the gaps'*

Table 10: Improving the plastic waste management regulations' effectiveness

The results of this study reckoned that there are several ways of improving the plastic waste management addressed below:

Issue addressed	Solution
Inefficiency of policies	Educating the policy makers about CE and its benefits in plastics, so that they appreciate its value towards a country's economy. Circular business models enable economically viable ways to continually reuse products and materials using renewable resources where possible and CE aims to increase the efficiency of resource use on plastic waste (Ghisellini et al., 2006).
Lack of enforcement and compliance	According to OECD (expand) Regulatory Enforcement and Inspections Toolkit (2004) there are Practice Principles for Regulatory Enforcement and Inspections: 1) Evidence-based enforcement, 2) Selectivity: meaning that promoting compliance and enforcement rules should be left to market forces, private sector actions and civil society activities, 3) Risk focus and proportionality: meaning that enforcement need to be risk-based and proportionate, 4) Responsive regulation: that is, inspection enforcement actions should be modulated depending on the profile and behaviour of specific business, 5) long term vision: that is Governments should adopt policies on regulatory enforcement and inspections, and establish institutional mechanisms with clear objectives and a long term strategy, 6) Co-ordination and consolidation of inspection functions, 7) transparent governance, 8) Information integration, 9) Clear and fair process for rules and processes for enforcement and inspections, 10) Compliance promotion, 11) professionalism and 12) reality check , that is regulatory enforcement and inspection system as a whole should deliver the levels of performance expected from them. All these principles are meant to make enforcement and inspections less costly (OECD, 2004).
Lack of cooperation from the stakeholders	Cooperation of all stakeholders is important, this can enable effective implementation of the plastic waste management regulations. Some stakeholders for example, the Zimbabwe Revenue Authority (ZIMRA), who have the responsibility of preventing the entry of certain banned and illegal goods or items can assist by making sure that the thin plastics or single use plastics are not brought into Zimbabwe from other countries by informal market. The Police can assist by making sure that no smuggling in of the thin plastics is done by the informal market by arresting those smuggling in the thin plastics and making them pay hefty fines. The City Health Council in Harare, can assist by making sure that awareness campaigns are done frequently to inform the public about plastic waste management regulations and their objectives. This would assist in the implementation process of these regulations since the community members would be aware of the consequences of polluting the environment with plastic litter and also the negative effects of plastics on the health of humans and animals.
Change of consumer behaviour	Changing the consumers' behaviour through re-using plastic bags, avoiding buying take-away food and eating on the streets, having a culture of keeping the environment clean. Lessons can be learnt from Japan whereby in some cities bins are not provided because people do not eat on the street and they carry their packaging for disposal in their homes. However this assumes proper provisions at home which is not the case in Zimbabwe.
Lax regulations	Strengthening the provisions of the regulations by increasing penalty fees on polluters and jail terms and making sure that regulations are enforced.

Table 10 illustrates some of the solutions that can be adopted to solving the barriers that affect effectiveness of plastic waste management regulations. Based on the interview findings and from literature, it has been revealed that CE has so many economic benefits (see Table 11), which can be realised whilst protecting natural resources and preventing environmental pollution and can contribute to the improvement of the plastic waste management regulations. In Table 8 of this Chapter and Appendix 2 it has been identified through analysis of the contents of the plastic waste management regulations, that these regulations have not incorporated CE. Incorporating CE can

improve plastic waste management regulations effectiveness. The following section looks at the benefits of CE which could reduce significantly the production of plastic waste and improve the country's economy were they were adopted.

Table 11: Expected benefits of integrating Circular Economy into Plastic Waste Management Regulations

The table below shows that CE has a diverse number of benefits that can improve the Zimbabwean poor economic situation.

Author	Benefits of Circular Economy (CE)
Preston, 2012	Smart-regulation can reward private-sector leadership and align incentives along the supply chain.
Ghisellini et al., 2016	Increases the economics, quality and uptake of recycling, it can also improve redesign and convergence of materials, formats and after use systems to substantially improve collection, sorting and processing yields, quality, innovation and economics.
Doranova, 2016	Enables secondary markets for recycled materials through the introduction and scale-up of matchmaking mechanisms, industry commitment and policy interventions.
Gao and Wang, 2016	Adds up to the adoption of reusable packaging within business-to-business applications as priority, but also in targeted business-consumer applications such as plastic bags.
Shogren et al., 2019	Scales-up the adoption of industrially compostable plastic packaging for targeted applications-such as garbage bags for organic waste and food packaging for events.
De Angelis, 2018	Improves after-use collection, storage and reprocessing infrastructure in high leakage countries and also increase the economic attractiveness of keeping materials in the system. Creating effective after-use plastics economy contributes to a root cause solution to leakage.
Uitto, 2018	Improves innovation investment towards creating materials and formats that reduce the negative environmental impact of plastic packaging leakage. Some companies have started changing their habits for example Unilever has promised that by 2025, all its plastic packaging will be fully re-usable, recyclable, or compostable in a commercially viable manner.

As shown in Table 11 above, CE is gaining growing attention as a potential way for society to increase prosperity while reducing demands on finite raw materials and minimising negative externalities. Such transition requires a systematic approach (Ghisellini et al., 2016). An analysis carried out by the Ellen MacArthur Foundation found that transition to CE will reduce air pollution and create opportunities for new value and economic growth (MacArthur, 2016). Strategies, legislation and policy tools such as eco-design, eco-labelling, extended producer responsibility and green supply chains will also help address plastic management. Eco-industrial initiatives, which close industrial loops by turning wastes at one-point in a value chain into inputs at another point, are gain growing interest as a solution to the problem of sustainability of industrial systems (Matthews and Tan, 2011). Lessons can be learnt from packaging companies in various companies listed in table 12 below:

Table 12: Adopting CE principles in commercial packaging

The non-biodegradable packaging system in Zimbabwe can improve by introducing biodegradable plastics as shown below.

Companies	Innovations with plastic
In February 2016, the Plastics Trade Association launched the Zero Net Waste program, which recognises plastic companies that takes steps to reduce net waste in manufacturing.	Edible packaging for water- water bottles pollute substantially because of their frequency of use, therefore scientists have invented a seaweed package that allows consumers to eat a sphere of water with no waste leftover (Andrady, 2003).
Kraft Heinz announced in July 2018, that it aims to make 100% of its packaging globally recyclable, re-usable or compostable by 2015	Edible cutlery is another invention because disposable cutlery which is common nowadays produces more plastic waste (Rashid, 2019). Bakeys invented cutlery that can be eaten.
American Chemical Council's Plastics division announced targets of 100% of plastic packaging being recyclable or recoverable by 2030 and 100% of plastics packaging being reused, recycled or recovered by 2040 (Hopewell et al., 2009)	The technology developed by Loniqa in Eindhoven is able to convert PET waste, including coloured bottles, into transparent "virgin grade material", according to Unilever. It does this by breaking the material down to its base molecule level and separating out the contaminants before converting it back into the original polymer bringing it full circle. This means the molecule can be used again as packaging and avoid incineration and landfill (Zhang and Casciatto, 2006).

Plastic packaging is a priority area when it comes to design for recyclability (see table 12). Design improvements could halve the cost of recycling packaging. Table 13 below contains information from interviews which shows varied responses on how people in the (HMP), perceive and view CE, particularly with regards to the probability of CE being incorporated into the existing plastic waste management regulations.

Table 13: Perceptions on CE in relation to plastics and regulations

People perceive CE differently in HMP as shown in table 13 below, this shows CE principles knowledge gap.

Views from Respondents
It has been revealed by the academic researchers (see appendix 3), that in Zimbabwe relevant alternative approaches have not been consulted, actually no alternatives were put in place during the formulation of the plastic waste management regulations. Furthermore, Plastic waste management regulations may be improved by the provision of other alternatives and include probably CE. Moreover, CE will allow the re-use, refurbishment, remanufacture of the plastic containers and re-thinking about the design of these containers, because currently Harare is recovering most plastic waste from landfills and dumpsites which somehow promotes the use of landfills instead of moving away from landfills.
The academic researchers were also of the opinion that CE is done on voluntary bases for example Petrecozim Recycling Company has the idea of CE through recycling plastic. The problem with CE is that not all players are coming on board, some retailers are not cooperating as they export the plastics from other countries (see appendix 3). Some companies are after profits and are not willing to put a certain percentage

of tax for plastics to Petrecozim yet they are the producers of large volumes of plastic waste (see appendix 3).
Academic researchers viewpoint (see appendix 3), was that CE can be incorporated into the existing regulations, the 7R model (reduce, reuse, refurbish, rethink, recycle, remanufacture, repair), has enhanced the whole model for instance by redesigning packaging, it can be taken back to the retailer after use, curbs cycle for example can be done so that people are incentivised.
The information gathered from the NGOs (see appendix 3), was that, plastic waste management is the generation, use, then disposal of plastic waste but CE involves reuse, and should be taken back to the producer (see appendix 3). It was further mentioned that, possibilities for CE principles to be incorporated into existing plastic regulations or be a stand-alone policy are there, however for any policy to be effective the public needs to be consulted during formulation.
Beverage companies (see appendix 3) stand-point was that, CE may require very new objectives and there is need for a new policy and may require a complete change in how people and companies do business and it means that companies need to start afresh. It was further mentioned that if money is involved people get motivated (see appendix 3). It was further noted that the re-use of plastic is a challenge because most plastic waste is recovered from landfills and cannot be used again for food packaging.
Plastic manufacturing companies in Zimbabwe, believe the move towards CE is going to be expensive (see appendix 3), because it requires redesigning of industries to cater for CE, it requires lots of capitalisation. The viewpoint again of manufacturers was more business profit and if CE will make their business more profitable then they can adopt CE. Convincing them that CE is the best way to do business can lead to companies following CE principles.
The National government representatives in Zimbabwe pointed that the country does not have the capacity in the form of resources to do CE, and once put in the regulations, it means it has to be followed (see table 9). It was further noted from government again that if plastics are banned completely, Zimbabwe does not have other alternatives for packaging that can be used (see appendix 3). Furthermore their notion was that, CE for one to comply they have to put mechanisms that come cheap and are affordable, because of the poor economic situation in Zimbabwe. Moreover, it was mentioned by national government again that the regulations concur with the current legal requirements and that CE model, cycle and some of these developments are for developed countries (see appendix 3).
According to national government parastatals in Zimbabwe, CE is another way of managing plastic waste by promoting the non-production of plastic waste and also it is an efficient way of managing plastic waste (see appendix 3). Furthermore technology is not in the country for processing the plastic waste so they sell it to other countries. Moreover, CE can reduce plastic waste to a large extent, and the challenges with implementing the plastic waste management regulations is that plastic manufacturing companies who are facing financial constraints, are not following the regulations, making it hard for implementers to implement the regulations. In addition CE calls for technological advancements' and it also calls a lot to do with changing design of plastic manufacturing industries (see appendix 3).
According to national government parastatals again, Zimbabwe can only move away from landfilling in the far future because it goes back to the issue of the poor economic situation of Zimbabwe (see appendix 3). It was further mentioned that, plastic CE models can reduce plastic waste production and the regulations should be amended with time.
From the plastic recycling companies angle, in Zimbabwe the problem is that education about the dangers of plastic waste on the environment, humans and animals   must start with the little ones so that they grow with it (see appendix 3). CE can create jobs and can reduce plastic waste and it was further revealed through the same source that there is no infrastructure for CE.
Based on researchers observations the verdict was, some plastic recycling companies do not have much information about CE, even though they conscientise for environmental protection through recycling of plastic waste.

Information in table 14 above suggests people relate CE to increase of costs rather than saving and creation of new business opportunities. This might be that most of the respondents from plastic manufacturing companies, community members/consumers are not aware of CE and its benefits. However, it was revealed in interview findings (see appendix 3), that the academic researchers and

51

NGOs are in full support of CE and have more knowledge about CE. The government in Zimbabwe is aware of CE but indicated that they do not have the resources to implement CE if incorporated into existing plastic waste management regulations. However, through policy formulation, Zimbabwe would improve if it engaged academic researchers for advice.

Stakeholders also play an important role in the plastic waste management regulations achieving their stated goals by collaborating and cooperating, which brings us to the 3rd research question on *'stakeholders engagement in the formulation, implementation and enforcement of these plastic waste management regulations.*

4.4 Roles of Stakeholders in formulation and implementation of Plastic waste management regulations.

The roles and involvement of stakeholders is important to describe in order to identify how they can assist in reducing plastic waste. The roles will be assessed using the CIT criteria: power, motivation and cognition.

Power: The Ministry of Environment, Tourism and Hospitality in Zimbabwe has the legal power to formulate the environmental regulations as well as any new environmental concerned policy. The public professionals are the implementers of formulated policies and have power to enforce regulations. The plastic manufacturing companies as well as the public are supposed to abide by the rules stipulated in these regulations and have a role in making the regulations effective.

Cognition: The role of Parliament includes legislative and executive oversight functions, which involves coming up with legislation as well as scrutinizing the policies and activities of the executive and to hold the Executive accountable for its actions (Karuuombe, 2008). Educating the Parliamentarians about CE will make it easier for them to conceptualise and make decisions on the required legislative changes in this case the introduction of CE principles to ensure effective implementation of pronounced policies (see appendix 3).

Motivation: Stakeholders can contribute to the reduction of plastic waste through recycling plastic waste, keeping the environment clean and advocating for plastic CE (Kalmykova et al., 2018). An example of a group of stakeholders that needs to be appreciated are the informal waste collectors (see appendix 4). According to the researcher's observations, the collection of waste by informal waste collectors is assisting to bring about CE principles through plastic recycling within (HMP) (see fig 8). It has been revealed through interview findings (see appendix 3), that informal waste collectors collaborate with plastic recycling companies like Petrecozim. Based on interview findings (see appendix), informal waste collectors started to pick plastics due to poverty, which resulted from hyperinflation and price fluctuations of 2008 which crippled the Zimbabwean economy. Thus, plastic refuse picking had the effect of alleviating poverty, in the period of crisis. The informal waste collectors collect plastic waste from dumpsites and streets and sell to plastic recycling companies in order to make a living, thus recognising material value in plastics. An example of what the recycling companies does with the plastic waste is shown in Figure 8 below:

Figure 8: PETE Bottle Recycling in Zimbabwe (Petrecozim Recycling Company)

Plastic recycling companies in HMP, are already practicing CE, interestingly enough most of them do not know about CE (see appendix 3).

Fig 8, Fieldwork, 16/05/2019

Figure 8 above shows that plastic recycling is a mammoth task but a beneficial one because plastic material value is preserved and recycled plastics sold to countries like India which earns foreign currency. In a CE, plastics from factories would become a valuable input in another process and products could be repaired, re-used or upgraded instead of being thrown away. Policy-makers should focus on accelerating transition to a CE in a timescale consistent with the response to climate change and other global challenges. Collaboration and indeed cooperation of stakeholders is important for the effectiveness of the plastic waste management regulations to be achieved.

 To respond to question 4, on *ethicality and efficiency of the plastic waste management regulations*, the Five E- Approach model is used as mentioned in Chapter 2 and illustrated in Chapter 3.

4.5 Extent of ethicality and efficiency of the plastic waste management regulations.

The Five E-Approach was used for analysing existing and proposed (not yet existing) policies. However, for this study it will be limited to the analysis of existing environmental regulations that manage plastic waste.

a) Effectiveness: According to the Environmental Management Act Chapter 20:27, the goals of the plastic waste management regulations are to: create an enabling legal framework for improved environmental law enforcement to achieve sustainable environmental management; to establish and maintain a liable and easily accessible environmental information system for improved decision making; to attain a clean, safe and healthy environmental and sustainable use of natural resources; to foster environmental stewardship at all levels; to make (EMA) a financially viable and sustaining

organisation. Based on interview responses, implementation of the plastic waste management regulations has not achieved its stated goals as seen by the amount of plastic litter that is still found on the environment in the (HMP). Furthermore, it has been highlighted that implementation is poor because the public who are the target group are not involved during policy formulation making it hard to implement the policies. Interviews also highlighted lack of awareness of the environmental regulations by most people. CE can be beneficial when integrated into the current environmental regulations which would increase recycling of plastics and bring significant environmental and economic benefits (Porter and Kramer, 2019). Increasing levels of recycling requires increased cooperation across the value chain: from industry, plastics manufacturers and converters to public and private waste management companies. Key players should work together to improve design and support innovation to make plastics and plastic products easier to recycle. They can also expand and improve the separate collection of plastic waste, to ensure quality inputs to the recycling industry. Moreover, viable markets for recycled and renewable plastics can be created

b) Efficiency: The plastic waste management regulations require a lot of resources for them to be effectively implemented. The lack of resources seems to make it difficult to adopt CE in Harare, meaning that resources play a critical role in any policy that has to work effectively (see appendix 3). There is so much effort to carry out the policies due to the poor economic situation in Zimbabwe. However, a CE would increase the efficiency of primary resource consumption. By conserving materials embodied in high value products, or returning waste to the economy as high-quality secondary raw materials, Zinc and Geyer (2017), a CE would reduce demand for primary raw materials or returning wastes to the economy as high-quality secondary raw materials.

c) Ethicality: The plastic waste management regulations are ethical on paper. They follow the Constitution of Zimbabwe which is the supreme law. Accordingly, the human rights component of environmental rights has been firmly established by placing environmental rights within the context of fundamental human rights and freedom under Part 2 of Chapter 4 of the constitution. Environmental rights therefore have the same standing and recognition as other fundamental human rights such as the right to life, the right to human dignity, the rights of privacy and other rights listed under the fundamental human rights section. This has led to a fusion of environmental law which seeks to protect nature for the benefit of mankind and human rights law which focuses on developing mechanisms which enable human beings to assert their rights. **P**lastic waste management regulations are not straight forward due to use of ambiguous regulatory language(see appendix 3 and table 9), making it difficult for the public to understand., This leads to unsuccessful implementation as a result of the public not following the regulations. The policy is not honest as it does not address stiff penalties that can really punish polluters, as stated.

d) Evaluation of Alternatives: It has been revealed from the interview findings (see appendix 3), that there are no alternatives given for the plastic waste management regulations. Other approaches for example, CE have not been considered or tried to see how well they could address the issue of plastic waste and its reduction.

e) Establishment of recommendations for positive change: Based on interviews findings (see appendix 3), the policies must not be eradicated but instead, they must be reviewed or amended from regularly creating opportunities to introduce new solutions such as CE to problems of plastic waste on the environment. In terms of effectiveness, it was indicated that CE can be incorporated into the regulations in order to improve them, however the public must be engaged at early stages during formulation of new policies so that implementation has a greater chance of success. It was also highlighted that resources are required to administer a new policy. However, with CE in plastics, Zimbabwean government can promote the development of an economy that can provide substantial

net material savings, mitigate price volatility and supply risks; and improve ecosystem health and long-term resilience of the economy.

Therefore to respond to the 5th research question on '*how to integrate CE into the current plastic waste management regulations*', the Contextual interaction Theory (CIT) is used to assess the factors that affect policy formulators and implementers to choose CE as a new policy or its principles be incorporated into existing regulations. This analysis will be done after the last step of the Five E Approach, which looks at establishment of recommended solutions as mentioned in chapter 2.

4.6 Integration of CE in environmental regulations

Formulation of a new policy, such as CE, or amendment of existing policies, requires the assessment of characteristics of actors involved during policy formulation and implementation stages within the policy cycle and avoidance of excluding important stakeholders during policy design. This is because at this stage proposals for alternative policies are presented by policy designers or implementers. It is therefore important to analyse the characteristics of the policy designers or implementers involved and how these characteristics influence their decisions in choosing CE as a possible new

Fig 9: Plastics and Circular Economy Policy Formulation in Harare Metropolitan Province, Zimbabwe
The motivations, power and cognitions of policy formulators and implementers are shown below as well as their interaction within the plastic waste management network.

Focusing attention: Moderate levels of attention to CE because of available information

Perception of opportunities and threats: With adequate & availability of resources CE principles can be an alternative to existing plastic waste management regulations or be made into a new policy

Motivation:

Positive – to encourage plastic CE and prevent or ban the use of thin plastics

Positive- policy formulators and implementers enthusiastic to adopt CE if resources are made available

Positive- support from NGOs through funds to reduce plastic waste through CE

Relevance of resources for intended action: More resources encourage the formulation of CE policies & assist in their implementation

Availability of resources for intended action: Limited resources due to poor economic situation in Zimbabwe

Interaction process

T1 · T2 · T3

Cognitions-information:

-Policy formulators have information on CE principles policy formulation and implementation

-Policy formulators and implementers know the cost of implementing CE policy

-Policy formulators and implementers know that CE principles reduce plastic waste

-Public and some plastic manufacturing and recycling companies are not aware of CE principles

Strategic value: Info provides them with plans to strategize on CE adoption

Data search & processing capacity: regular data collection & processing

Capacity & Power:

-Power-formulate and implement policies

-Persuading government parastatals and community

-Legislative and judiciary power
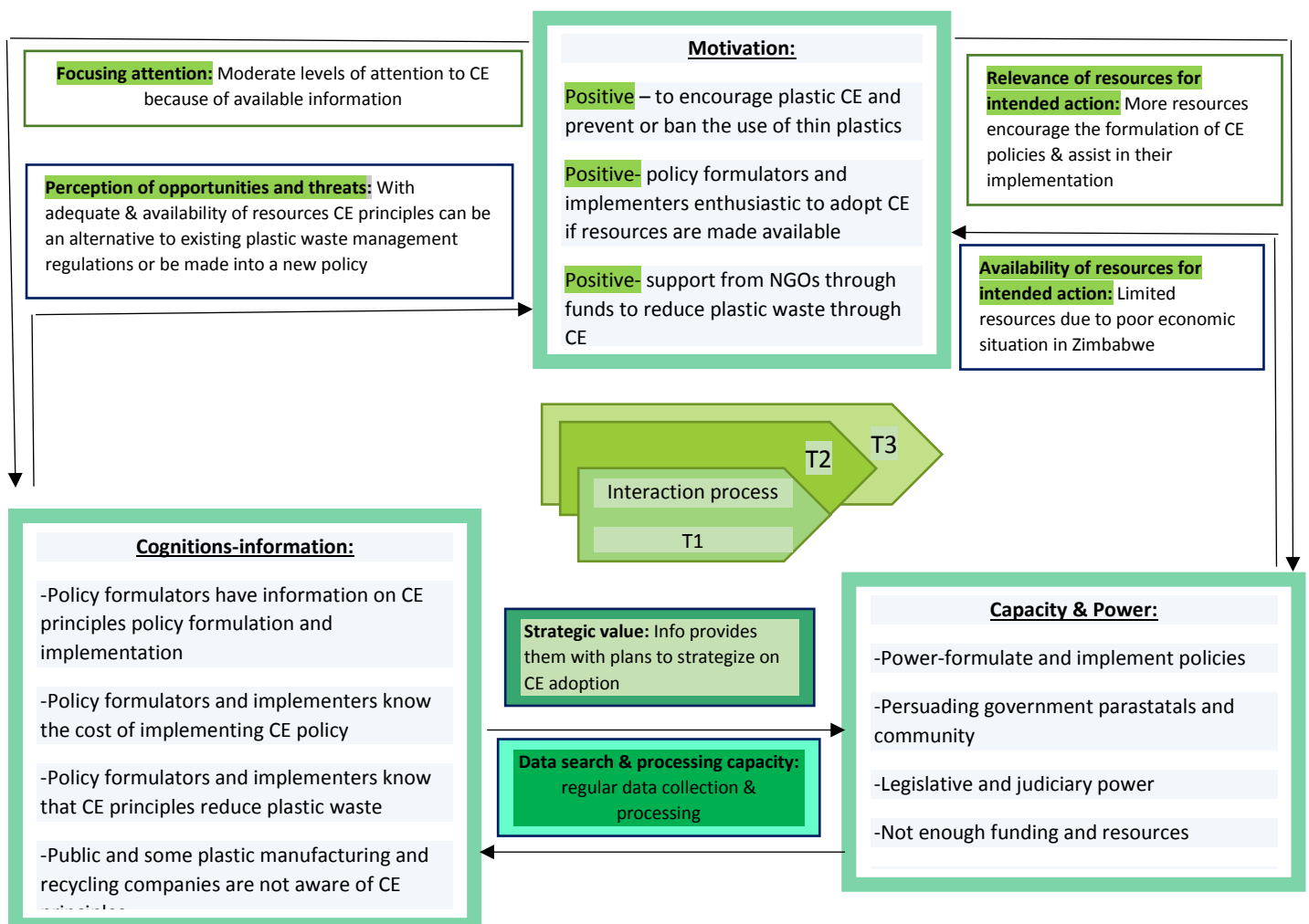
-Not enough funding and resources

Fig 9, Policy formulating and implementing Actors – Government (formulator) Government parastatals & public professionals (implementers)

The information provided in figure 9 above is described and explained as follows:

a) Motivation: As described in Chapter 2 of this study and illustrated briefly in figure 9 above, for CE to be chosen as an alternative to existing plastic waste management regulations or be incorporated into these regulations, it is important for policy formulators and policy implementers to be motivated towards adopting the principles of CE. As has been noted in the findings from the interviews (see appendix 3), the Ministry of Environment, Tourism and Hospitality in Zimbabwe is the one responsible for the formulation of the plastic waste management regulations. The Ministry of Environment believes that, it is possible for CE principles to be incorporated into the existing plastic waste management regulations, however because of the poor economic situation in Zimbabwe, there are no resources to cater for CE (see appendix 3) .Therefore if incorporated into the regulations or be made into a new policy, that means the government has to make sure that there are resources for its implementation (see appendix 3). Furthermore, there is need for new technology and change of design of the current plastic manufacturing companies, of which this might be costly to the companies (see appendix 3). This shows that the Ministry of Environment is motivated towards engaging CE principles but the only hindrance that is there is the lack of resources of which CE does not require resources to be put in place, instead it conserves natural resources.

b) Cognition: As policy formulators, the Ministry of Environment, Hospitality and Tourism and the policy implementers who are the Environmental Management Agency as well as the NGOs together with the Ministry of Health and Child Care in the Harare Metropolitan Province, in Zimbabwe (see appendix 3), all seem to have some knowledge about CE. Therefore the fact that they have the information about CE, might in future lead to them formulating CE as new policy if the economy in the country improves and resources become available. CE has more benefits than the ones stated by the respondents (see table 13), of which if policy formulators and implementers find more information on the benefits of CE, they will realise that the benefits outweigh the negative. As stated in chapter 2, CE can save the existing resources as well as create employment and that way economy in Zimbabwe might improve.

c) Power: The Ministry of Environment has the authority to formulate environmental regulations therefore if the Ministry decides to adopt the CE principles within the plastic waste management regulations, it can do so because they have the power vested upon them by the state or law to formulate policies. The Environmental Management as the arm of the Ministry of Environment advises the Ministry on what policies to formulate, therefore since the Environmental Management Agency supports and recognises CE, there is a possibility of CE principles to be adopted into the existing regulations if resources allow (see appendix 3). The NGOs, advice the Ministry of Environment again on what policies to adopt and most NGOs are the funders or donors of most government projects, therefore NGOs might encourage the Ministry of Environment to adopt CE principles within the regulations. The NGOs themselves support CE, and are practising it in their organisations, for example SNV, is practising CE in agriculture (see appendix 3). The researchers in academia can advocate or promote CE in their research by stating the benefits of CE and indicating the possibility to adopt CE into the existing plastic waste management regulations. Researchers possess the power of conveying information through written reports that can be referred.

<u>Interaction</u>

To proceed with the CIT, interaction between actors is very important (see chapter 2.3.3), for analyses of the selection of CE principles as an alternative solution to reducing plastic waste as compared to the environmental regulations. CE has been revealed in literature and in findings discussed in Chapter 2 and 4 of this study, to promote zero waste production. As mentioned in Chapter 2.3.3 again, there are three types of interaction that is, cooperation, opposition and joint learning.

a) **Cooperation:** Based on interviews (see appendix 3), there is active cooperation between the NGOs, informal waste collectors, plastic recycling companies, environmental academic researchers and the government in HMP because they share a common goal of protecting the environment and reducing plastic waste pollution on the environment (see appendix 3). With regards to CE, they all share the same sentiments that the CE principles are beneficial, however, the wing of the government that deals with policy formulation believe that CE is for developed countries because of availability of resources to implement CE principles within the plastic manufacturing industries. Therefore, the government is of the notion that Zimbabwe might have challenges in terms of resources, for implementing CE principles if ever incorporated into the plastic waste management regulations or be made into a stand-alone policy (see appendix 3). There is passive cooperation between the community members and the plastic manufacturing industries with regards to CE adoption (see appendix 3). This is due to lack of knowledge about CE principles and its benefits, as was discovered in the interview findings of this research.

Forced cooperation was revealed to be weak between government and public professionals. This was probably to the fact that the government who has the role of formulating policies were themselves demotivated towards CE because of lack of resources due to the economic situation in Zimbabwe. Therefore it is impossible for public professionals to adopt CE if their employer (government) believes it is expensive. Forced cooperation was discovered to probably emanate from the NGOs and academic researchers, to advise the government to adopt CE principles into the environmental regulations (see appendix 3). This is so because government mostly depends on donor funds from NGOs for some of its programmes to be implemented. It is believed government is at times forced to adopt certain policies because of pressure from the researchers to alleviate a certain problem, in this case could be the plastic environmental pollution (see appendix 3).

b) **Opposition:** Based on interview findings (see table 13), the majority of the people believe CE will require resources, including monetary ones and would also require change of design of already existing industries, which would be costly. Therefore there is opposition between the academic researchers who believe CE can turn Zimbabwe's poor economy into a flourishing one and the government who believes CE will require more state resources instead of generating revenue, if ever CE is incorporated into the existing plastic waste management regulations.

c) **Joint learning:** The community members, the plastic manufacturing companies as well as some plastic consumers and retailers were observed not to have knowledge about CE (see appendix 3 and table 13), therefore they all need to learn by finding information or liaising with some academic researchers who have knowledge about the benefits of CE. The people working within the government, the NGOs and also plastic recycling companies are aware of how CE regulations can be formulated and implemented (see appendix 3), because the government are the policy formulators and the public professionals (civil servants) are the policy implementers together with some government parastatals. However, the public do not have information on how the channels of policy formulation and implementation proceed and what the regulations require (see appendix 3).

Therefore, joint learning can be done whereby policy implementers conduct awareness campaigns and education programmes to share information.

To summarise question four of this research, it must be noted that it is possible to adopt CE in Zimbabwe, contrary to popular believe that it will require lots of resources as revealed in the interview findings. This can be achieved by bringing in new actors or exclude the existing ones when dealing with circular economy in plastics. New actors' could include academic researchers with the technical know-how about CE and plastics. Also regular interaction with other potentially relevant actors is important even though there are no urgent matters which need their attention. This can assist in providing better network relationships not on government level but at community level. Joint learning can create productive linkages due to group or dual learning. This creates openness of one actor to another, and also builds rapport for effective communication which can later on, create interests to both parties on CE in plastic management. If one or both parties considers the situation purely rivalry this can hinder or separate them from achieving the objectives of integrating the CE principles within the existing regulations.

To conclude this Chapter, it can be noted from interview findings and desk research that most plastic waste management regulations do not address CE principles. They promote disposal of plastic waste and even encourage it through the polluter pays principle and the provision of licenses for disposal of plastic waste. Most of the public and plastic manufacturing industries are not aware of CE, however the government, who are the policy formulators is aware of CE though they are of the opinion that it will be difficult to incorporate CE into the existing plastic waste management regulations because of lack of resources and funding from donors.

CHAPTER 5: DISCUSSION

It is evident that the plastic waste management regulations have not achieved their goals or objectives, as indicated in the findings in Chapter 4. This is owed to various reasons both internally which have to do with the design of the regulations or their formulation and also to do with the external or extrinsic factors such as the public not knowing and following the regulations and the non-inclusion of the community members 'target group' during formulation of these regulations for effective implementation.

5.1 Improving policy making in Zimbabwe

The attempts to improve policy making in Zimbabwe have all suffered from a gap between theory and practice. Effective formulation, implementation and enforcement of environmental regulations is essential to improving and safeguarding a healthy and hospitable environment for all Zimbabweans to enjoy. Without effective environmental regulation of public and private developments many natural ecosystem services, such as fresh water, clean air will be degraded requiring more investment and development to place those services via imperfect human approximations. Creating an efficient and effective system of regulation that endeavours to engage all of the stakeholders in Zimbabwean society from individual citizens to business to the public sector, will help create developments that minimally impact the environment and benefit its intended users, as well as Zimbabwean Society as a whole. For the policies that control plastic waste to be effective, efficient and ethically sound, total remodelling is required, the creation of the model that can be adopted across all actors, in managing relationships amongst stakeholders that deal with plastic, also in managing CE. The model should come back to the public or community, adopted at source, but it needs political will for them to adopt CE. Politicians should appreciate CE by getting training on CE principles. Existing policy must not be eradicated or be removed but other arms such as CE have to be added to support it for it to be effective.

5.2 Plastic waste management regulations in Zimbabwe and their Effectiveness

There is lack of enforcement of the regulations, even though Harare City Council is trying to install waste bins, but people ignore the use of refuse bins on the streets. Furthermore the plastic waste management regulations cannot be compared to other approaches because no alternatives have been tried, for example CE has not been consulted. Policies need to be reviewed from time to time and more effort is required and resources to implement them. The Plastic Bottles and Plastic Packaging S.I 98 of 2010, was put in place to reduce plastic waste and make sure plastic material that is used is durable and can be re-used. The S.I. 98 for plastics was to make sure that thin plastics were not sold in shops or by retailers. These regulations are applied to plastic manufacturing industries and Local authorities, to make sure that plastic industries conform to the regulations and are licensed according to the nature of the waste. Resources in Zimbabwe are distributed in such a way that issues of major concern, or with a bigger problems affecting a large population get required resources first for policy formulation. Policies are just for formality by copying and pasting from other countries. If research is done then it is easier to solve problems based on what Zimbabwe has and based also on the country's capabilities. In terms of the strengths and weaknesses of the plastic waste management regulations, Zimbabwe lacks consistence in whatever is done, different things are done every day.

Monitoring and Evaluation side of policies is not strong, there are no available records of the amount of plastic waste collected and no follow ups are made and policy reviews presentation must be clear. Workers administering the plastic waste management regulations support its effectiveness, however taking environmental protection and conservation to the grassroots is more important, teaching

children (new generation) since primary schools about environmental protection will make it easier to implement the plastic waste management regulations. The public has to understand that they are not allowed to buy and use the single-use plastics and thin plastics and this way plastic waste can be reduced. The target group when it comes to plastic waste management regulations is the public and the public is not changing its bad behaviour of throwing plastic litter everywhere. Majority of the people do not clearly understand the plastic waste management regulations and its implications as revealed in the interview findings (see table 9 and appendix 3). The local authority have not made an effort for awareness to the public about negative effects of plastic waste. There are plastic banning in Zimbabwe but the public lacks details on the regulations or explanations.

5.3 Plastic Recycling Companies in Zimbabwe

Recycling companies in Harare work with various stakeholders such as private, government, NGOs in order to save the environment. Plastic packaging designed with a significantly smaller set of material/additive combination could reduce the costs of buying lots of plastic material and increase profits, thereby improving the economy of a country. Designing out small/ low value plastic packaging such a tear-offs which are likely to leak is said to reduce plastic waste, saves time and material. More standard products, more markets and competitive markets would be the economic benefits of plastic packaging that has common labelling and chemical marking, especially if these were all aligned with standardized separation and sorting systems. The best way to stimulate the market for recycled plastic products would be the production of quality recycled products that almost resemble the original products which are not recycled. There is need to connect plastic manufacturing companies for example Proplastics to recycling companies such as Petrecozim because there is no integration of the companies in the loop. More than 80% of the plastic in Zimbabwe is imported because of the poor economic situation in the country which forces people to use poor quality plastic material. Tear-offs occur in manufacturing industries especially if the material used is poor quality and lack of expertise and poor technology, might lead to plastic waste being produced. The challenge with the market for recycled material is that some countries for example China, have banned the importation of plastic containers and the plastic recycling companies have lost some of their markets. The Environmental Management Agency monitors mostly big companies and ignores small companies which when put together they can outweigh the plastic waste produced by bigger companies.

The following section will look at the general recommendations for improving the design and effectiveness of the plastic waste management regulations as well as the specific recommendations meant to be adopted by certain stakeholders within the network of plastic waste reduction. Fig 12 below shows how CE can improve the plastic waste management regulations.

5.4 General Recommendations

It is deduced, hypothesized and reckoned that the following general recommendations will ameliorate the plastic waste problem in Harare Metropolitan Province, Zimbabwe and will revamp the plastic waste management regulations within the country.

Fig 10: Improving Plastic Waste Management Regulations with CE

The negative factors affecting the effectiveness of the plastic waste management regulations can be eradicated by adopting CE principles as shown below. CE must be included within regulations

Factors Affecting Effectiveness of plastic waste management regulations	Benefits of CE
Lack of incentives Lack of awareness Non-engagement of the public during policy formulation Demotivated public professionals Lack of knowledge of the regulations, by the public Weak penalties Not strict regulations Lack of cooperation of all stakeholders Lack of resources Lack of plastic waste bins on streets No alternatives to regulations Poor enforcement of regulations Plastic waste disposal in dumpsites	Re-use of goods Product Refurbishment Content remanufacturing Cascading of components and materials Material Recycling Energy recovery Designing of quality products Zero waste CIRCULAR ECONOMY

As shown in Figure 10, making plastics more circular will reduce plastic pollution and move towards elimination of plastic waste management. The CE represents an alternative, more sustainable model to the traditional linear economy. A linear model encourages disposal of plastic waste, which is what is currently practiced in the (HMP). In contrast in a CE, resources are kept in use for as long as possible, and extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of their service life. The re-use of material in terms of CE is also important, because in most cases it is difficult to take back material. To improve circularity of plastics, it is essential to make sure that more and more plastic waste is recovered and does not end in the dumpsites of (HMP) such as Pomona.

Other ways of improving regulations and reducing plastic waste in (HMP)

a) **Enforcement and implementation of environmental rights:** Environmental stakeholders should develop a policy framework document that can guide the "progressive realization" of environmental rights. The courts should adopt a narrower interpretation of the progressive realization of rights against any claims of lack of resources by government

b) **Adequate deterrent penalties provision:** Penalties must be put in place that thoroughly punish those who violate environmental rights and laws. The cost of non-compliance must far outweigh compliance.

c) **Use of knowledge utilisation approach**: leverage existing knowledge from several research organisations undertaken over several years to inform the policy process.

d) **Working groups or committees:** can be installed so that they can teach or disseminate information to the public and the plastic recycling companies, so as to appreciate the benefits of CE.

e) **Strengthening of inter-ministerial committees:** is important for example ZIMRA should cooperate and all government ministries must be on the same level, that way these regulations can achieve their goals

f) **New cognitions can be created:** by introducing and sharing new information for example on CE, creatively to attract those actors who have no knowledge about CE, in order to generate interest on CE. The media can be involved to advertise and promote CE.

g) **New motivations can be created:** by the provision of resources to the government, specifically the Ministry of Environment and Tourism who formulates the environmental policies. CE can be promoted with positive intermediate results, for example, in a selected municipality, to see how it can reduce plastic waste.

h) **New resources can be added:** for example donors can fund the government as well as the plastic manufacturing and recycling companies with resources such as money and equipment to formulate the CE policies, which can later on be implemented effectively.

i) **Power bases can be identified:** for instance by exchanging relatively flexible ones (like money) in advance for relatively fixed or scarce ones such as advanced technology and equipment which is found in developed countries.

Table 14 below indicates the recommendations, specific to different stakeholders concerned with the environmental protection. It is important to recognise and frame the connection of the lesson learnt to individual stakeholders' duties, so that they improve the implementation of the plastic waste management regulations.

Table 14: Specific Recommendations

The recommendations to different stakeholders in plastic waste management is important to assist the regulations to be effective.

Entrepreneurs	Entrepreneurs are encouraged to develop and implement environmental management plans and policies for their organisations. These guide them in management and protection of the environment. Entrepreneurs should be guided by the environmental principles as they carry out activities. Development must be sustainable, that is socially acceptable, economically viable and environmentally friendly. They should prevent or minimise negative impacts of their activities on the environment and further safeguard people's environmental rights. Any person including an entrepreneur who causes pollution or environmental degradation shall meet the cost of remedying such pollution or environmental degradation and any resultant adverse health effects. Entrepreneurs should see the need for more resolute action on plastic waste prevention as a business opportunity. Increasingly, new companies will emerge that provide circular solutions, such as reverse logistics for packaging or alternatives to disposable plastics, and they benefit from the development of digitisation.
NGOs	The involvement of NGOs has assisted the development of international policy in a number of ways. A great deal of environmental policy has been influenced by research collected by these organisations. They also act as whistle-blowers, updating the regulators of progress and compliance. NGOs can provide funding for plastic recycling companies and can act as advocates and provide funds.
Local Authority (Municipality)	City Health Council in Harare can create awareness to the public in such a way that people are interested in reducing plastic waste.
Academic researchers	Academic researchers can find solutions or alternatives of introducing CE through research, cheaper means which are affordable in developing countries.
Government	Develop a new funding plan for Environmental Management Agency (EMA) that supplies it with adequate resources to fulfil its mandate and removes it from fee competition with other government agencies. Ensure that both

	National plans and local level plans are well funded and staffed by competent bureaucrats and judges. Support community groups and government agencies to increase awareness of environmental rights and benefits of sustainable environment. Subsidize legal advice and representation for those who lack the means for legal counsel but whose environmental rights have been harmed. Government can implement effectively the CE through support from its employees. To recognise new goals for CE as matching existing motivations or the values behind them and to recognize the opportunities of new resources or combinations with existing resources brought by CE to optimise their capacity and power.
Public and the Consumers	The general public is encouraged to practice a culture of avoiding environmental pollution and develop an interest in protecting their health and well-being by avoiding littering the environment with plastic. Consumers must avoid purchasing food that requires lots of plastic wrapping and should learn to re-use plastic carrier bags.

Briefly from table 14, above, government can source resources, enforce regulations, support community groups and subsidize legal advice. Furthermore academic researchers are the pillars of all policy making decisions, as they have a role to advice government on what policies need to be addressed quickly and be formulated into policies. NGOs on the other hand can fund government programmes like CE that seek to reduce plastic waste whilst the local authority have the mandate to educate the public, who happens to be also the consumers, about the requirements of the plastic waste management regulations.

To summarise this chapter CE will allow plastics and products containing plastics to be designed for greater durability, re-use and high-quality recycling. Changes in production and design enable higher plastics recycling rates for all key applications. Plastic waste generation is decoupled from growth. Effective waste collection systems, combined with a drop in plastic waste generation and with increased consumer awareness, avoid litter and ensure that waste is handled appropriately.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

This chapter is the last place which wraps up and reconnects the important points in this study. It contains the summary of findings and also the recommendations for future researches.

6.1 Conclusions

Based on the research questions and overall findings which was presented in previous chapters, here the following deductions were made:

a) The plastic waste management regulations have not achieved their stated objectives and they do not address CE principles.

b) This is because public is not involved during policy formulation and lacks knowledge on the requirements of the regulations therefore leading to the ineffectiveness of the plastic waste management regulations.

c) Lack of strict penalties stipulated within the regulations, encourages people not to follow the regulations

d) Furthermore the inadequate application of awareness programmes to the public, use of dumpsites as disposal sites for plastic waste and lack of resources affects the implementation of the plastic waste management regulations.

e) Successful implementation of environmental legislation is determined by various factors such consistency in implementing environmental legislation, coordination of all stakeholders, clear roles and responsibilities, strong enforcement, willingness of communities to cooperate and political will by political office bearers as well as improved product quality design by plastic manufacturing companies.

f) Moreover the gaps in the existing plastic waste management regulations can be closed by CE. CE plays a major role in reducing plastic waste and can generate new employment opportunities in Zimbabwe and also offer important cost savings from various plastic related industries.

g) Recycling pays economically and ambitious waste management strategies and strong environmental awareness particularly bring forth technological innovations for separation and recycling.

h) CE improves resource security and reduce import dependency through improving efficiency of primary raw materials in Zimbabwe.

Finally, to proceed, though this study is limited to the environmental management regulations for plastic waste and practices of circular economy in plastics within two municipalities of the Harare Metropolitan Province in Zimbabwe, nevertheless, it has been able to provide significant contribution, including how CE principles can improve the management of plastics and reduce plastic waste. It also succeeded in identifying the negative factors to the successful implementation of the plastic waste management regulations as well as requirements necessary to assist transitioning to CE in Zimbabwe. The study also identified that most community members and plastic manufacturing as well as recycling companies do not know the plastic waste management regulations neither did they know about CE, however the government and its parastatals were keen to adopt CE principles into a policy if resources were made available.

6.2 Recommendations for further research

a) Research can further be carried out on ways of getting resources and improving the economic situation in Zimbabwe so that CE principles can be incorporated into the existing plastic waste management regulations.

b) Most plastic manufacturing and recycling companies as well the community members are not aware of CE, therefore further research can be carried out to try and cascade information to everyone on CE principles and their benefits.

c) Enforcement of the regulations is still poor as well as implementation, therefore it is important to find ways to improve enforcement and implementation.

d) Sustainable development is very important therefore further research can be done to find out ways of encouraging sustainable development in Zimbabwe

e) Factors such as environmental education, environmental awareness programmes, coordination of all stakeholders, willingness of communities to co-operate and the political will by political office bearers are important for successful implementation of environmental legislation. However all these factors are difficult to be put in place in Zimbabwe, therefore further research can be done to find out ways of achieving all these factors in one go.

f) It is important to find out ways or innovations fit for developing countries like Zimbabwe for example simple and cheap technology that can be afforded by poor countries, but which can effectively encourage the adoption of CE principles.

g) Moreover it would be advantageous to find out strategies of consolidating CE into the education curriculum in Zimbabwe.

h) A packaging approach fit for Zimbabwean economy is required and needs to be formulated and implemented well. Therefore a research which can identify and encourage the adoption of a packaging approach would be ideal.

In conclusion to this chapter, CE seems to standout when it comes to improving the plastic waste management regulations. Circular Economy in plastics, is the only method that can at least stop the production of plastic waste in Harare and Epworth, Zimbabwe so far. The avoidance in production of plastic waste will also in the long run get rid of other factors that branch out and cause ineffectiveness of the plastic waste management regulations. Therefore CE must be integrated into the current environmental protection regulations as has been revealed in the findings.

References

Aggeri, F. (1999). Environmental policies and innovation: a knowledge-based perspective on cooperative approaches. *Research Policy*, *28*(7), 699–717.

Agranoff, R., & McGuire, M. (2004). *Collaborative public management: New strategies for local governments*. Georgetown University Press.

Andersen, S. S., & Sitter, N. (2006). Differentiated integration: what is it and how much can the EU accommodate? *European Integration*, *28*(4), 313–330.

Andrady, A. L. (2003). *Plastics and the Environment*. John Wiley & Sons.

Auel, K. (2007). Democratic accountability and national parliaments: Redefining the impact of parliamentary scrutiny in EU affairs. *European Law Journal*, *13*(4), 487–504.

Baker, D., Fear, J., & Denniss, R. (2009). *What a waste: an analysis of household expenditure on food, Policy brief 6* (null, Ed.).

Basnayake, B. F. A., & Visvanathan, C. (2014). Solid waste management in Sri Lanka. In *Municipal Solid Waste Management in Asia and the Pacific Islands* (pp. 299–316). Springer.

Berry, M. A., & Rondinelli, D. A. (1998). Proactive corporate environmental management: A new industrial revolution. *Academy of Management Perspectives*, *12*(2), 38–50.

Biernacki, P., & Waldorf, D. (1981). Snowball sampling: Problems and techniques of chain referral sampling. *Sociological Methods & Research*, *10*(2), 141–163.

Birkland, T. A. (2015). *An introduction to the policy process: Theories, concepts, and models of public policy making*. Routledge.

Blomsma, F., & Brennan, G. (2017). The emergence of circular economy: A new framing around prolonging resource productivity. *Journal of Industrial Ecology*, *21*(3), 603–614.

Bocken, N. M. P., de Pauw, I., Bakker, C., & van der Grinten, B. (2016). Product design and business model strategies for a circular economy. *Journal of Industrial and Production Engineering*, *33*(5), 308–320.

Bressers, H. (2007). Contextual Interaction Theory and the issue of boundary definition: Governance and the motivation, cognitions and resources of actors. *External Report ISBP EU-Project, ISSN 1381*, *6357*.

Bressers, H. (2009). From public administration to policy networks: Contextual interaction analysis. *Rediscovering Public Law and Public Administration in Comparative Policy Analysis: Tribute to Peter Knoepfel*, 123–142.

Bressers, H., Fuchs, D., & Kuks, S. (2004). Institutional resource regimes and sustainability. In *Integrated Governance and Water Basin Management* (pp. 23–58). Springer.

Camilleri, M. A. (2018). Closing the loop for resource efficiency, sustainable consumption and production: A critical review of the circular economy. *Sustainable Consumption and Production: A Critical Review of the Circular Economy*.

Chikobvu, D., & Makarati, F. (2011). The challenges of solid waste disposal in rapidly urbanizing cities: a case of highfield suburb in Harare, Zimbabwe. *Journal of Sustainable Development in Africa*, *13*(7).

Chitotombe, J. W., & Gukurume, S. (2014). The plastic bag 'ban'controversy in Zimbabwe: An analysis of policy issues and local responses. *International Journal of Development and Sustainability*, *3*(5), 1000–1012.

Clapp, J., & Swanston, L. (2009). Doing away with plastic shopping bags: international patterns of norm emergence and policy implementation. *Environmental Politics*, *18*(3), 315–332.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Davies, J. C., & Mazurek, J. (2014). *Pollution control in United States: Evaluating the system*. Routledge.

Doranova, A., Roman, L., Bahn-Walkowiak, B., Wilts, H., O'Brien, M., Giljum, S., … Hestin, M. (2016). Policies and practices for eco-innovation up-take and circular economy transition. *European Commission & Eco-Innovation Observatory (EC&EIO): Brussels, Belgium*.

Drackner, M. (2005). What is waste? To whom?-An anthropological perspective on garbage. *Waste Management & Research*, *23*(3), 175–181.

Dunn, W. N. (2015). *Public policy analysis*. Routledge.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, *14*(4), 532–550.

EMA Newsletter (2011), EMA Bulletin:An Environmental Newsletter, Vol.1, No.2.

EMA/The Herald June 11, 2018, Only 11pc of plastic waste recycled, Vol.3, No 1.

Environmental Management Act (Chapter 20:27), GOZ, Harare, Zimbabwe

Environmental Mangement (Importation and Transit of Hazardous Substances and Waste) Regulations, 2009 (S.I.No. 77 of 2009.

Environmental Management (Effluents and Solid Waste Disposal) Regulations 2007. S.I.No.6 of 2007

Environmental Management (Hazardous Waste Management) Regulations, 2007 S.I.No.10 of 2007

Environmental Management (Environmental Impact Assessment and Ecosystems Protection) Regulations 2007, S.I.No.7 of 2007

Fang, Y., & Zeng, Y. (2007). Balancing energy and environment: the effect and perspective of management instruments in China. *Energy*, *32*(12), 2247–2261.

Fischer, J., & Lindenmayer, D. B. (2007). Landscape modification and habitat fragmentation: a synthesis. *Global Ecology and Biogeography*, *16*(3), 265–280.

Franco-García, M.-L., Carpio-Aguilar, J. C., & Bressers, H. (2019). Towards Zero Waste, Circular Economy Boost: Waste to Resources. In *Towards Zero Waste* (pp. 1–8). Springer.

Geels, F. W. (2005). *Technological transitions and system innovations: a co-evolutionary and socio-technical analysis*. Edward Elgar Publishing.

Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2017). The Circular Economy – A new sustainability paradigm? *Journal of Cleaner Production*, *143*, 757–768. https://doi.org/https://doi.org/10.1016/j.jclepro.2016.12.048

Ghisellini, P., Cialani, C., & Ulgiati, S. (2016). A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. *Journal of Cleaner Production*, *114*, 11–32.

Gurko, D. (2017). *The Importance of Circular Economy for Businesses in Russia*.

Hajer, M. A., Hoppe, R., & Jennings, B. (1993). *The argumentative turn in policy analysis and planning*. Duke University Press.

Hester, R. E., & Harrison, R. M. (2011). *Marine pollution and human health* (Vol. 33). Royal Society of Chemistry.

Hill, M. J., & Hupe, P. L. (2002). *Implementing public policy: An introduction to the study of operational governance*. Sage.

Hopewell, J., Dvorak, R., & Kosior, E. (2009). Plastics recycling: challenges and opportunities. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *364*(1526), 2115–2126.

Hove, M., Ngwerume, E. T., & Muchemwa, C. (2013). *The urban crisis in Sub-Saharan Africa: A threat to human security and sustainable development*.

Jerie, S. (2006). Analysis of institutional solid waste management in Gweru, Zimbabwe. *Eastern Africa Social Science Research Review*, *22*(1), 103–125.

Jerie, Steven, & Tevera, D. (2014). Solid waste management practices in the informal sector of Gweru, Zimbabwe. *Journal of Waste Management*, *2014*.

Kalmykova, Y., Sadagopan, M., & Rosado, L. (2018). Circular economy – From review of theories and practices to development of implementation tools. *Resources, Conservation and Recycling*, *135*, 190–201. https://doi.org/https://doi.org/10.1016/j.resconrec.2017.10.034

Kao, A. S. (1994). Formation and removal reactions of hazardous air pollutants. *Air & Waste*, *44*(5), 683–696.

Karuuombe, B. (2008). The role of parliament in regional integration–the missing link. *Monitoring Regional Integration in Southern Africa Yearbook*, *8*, 222–248.

Kershaw, P. (2018). *Exploring the potential for adopting alternative materials to reduce marine plastic litter*.

Kerwin, C. M., & Furlong, S. R. (2018). *Rulemaking: How government agencies write law and make policy*. CQ Press.

Kirst-Ashman, K. K. (2015). *Empowerment Series: Introduction to Social Work & Social Welfare: Critical Thinking Perspectives*. Nelson Education.

Kraaijenhagen, C., Van Oppen, C., & Bocken, N. (2016). *Circular business: collaborate and circulate*. Chris Bernasco en Lucy Goodchild-van Hilten.

MacArthur, D. E., Waughray, D., & Stuchtey, M. R. (2016). The New Plastics Economy, Rethinking the Future of Plastics. *World Economic Forum*.

Macarthur, E. (2013). *2 2013*.

MacArthur, E. (2017). Beyond plastic waste. *Science (New York, N.Y.) TA - TT -*, *358*(6365), 843. https://doi.org/10.1126/science.aao6749 LK - https://ut.on.worldcat.org/oclc/7214164342

Maddex, R. L. (2014). *Constitutions of the World*. Routledge.

Mahamba, C. (2015). *Characterisation and management of non-formal solid waste management disposal sites in Harare, Zimbabwe*.

Maignan, I., Ferrell, O. C., & Ferrell, L. (2005). A stakeholder model for implementing social responsibility in marketing. *European Journal of Marketing*, *39*(9/10), 956–977.

Makwara, E. C., & Snodia, S. (2013). Confronting the reckless gambling with people's health and lives: Urban Solid Waste Management in Zimbabwe. *European Journal of Sustainable Development*, *2*(1), 67–98.

Mandevere, B. (2015). *An investigation into the effectiveness of household solid waste management strategies in Harare, Zimbabwe*. University of South Africa.

Matland, R. E. (1995). Synthesizing the implementation literature: The ambiguity-conflict model of policy implementation. *Journal of Public Administration Research and Theory*, *5*(2), 145–174.

Matthews, J. A., & Tan, H. (2011). Progress Toward a circular economy in China: The drivers (and inhibitors) of eco-industrial initiative. *Journal of Industrial Ecology*, *15*(3), 435–457.

Mayring, P. (2004). Qualitative content analysis. *A Companion to Qualitative Research*, *1*, 159–176.

Mudzengerere, F. H., & Chigwenya, A. (2012). Waste Management in Bulawayo city council in Zimbabwe: in search of Sustainable waste Management in the city. *Journal of Sustainable Development in Africa*, *14*(1), 1520–5509.

Mukandavire, Z., Liao, S., Wang, J., Gaff, H., Smith, D. L., & Morris, J. G. (2011). Estimating the reproductive numbers for the 2008–2009 cholera outbreaks in Zimbabwe. *Proceedings of the National Academy of Sciences*, *108*(21), 8767–8772.

Naustdalslid, J. (2014). Circular economy in China–the environmental dimension of the harmonious society. *International Journal of Sustainable Development & World Ecology*, *21*(4), 303–313.

Nickerson, B. J. (1994). The Environmental Laws of Zimbabwe: A unique approach to management of the environment. *BC Third World LJ*, *14*, 189.

Njeru, J. (2006). The urban political ecology of plastic bag waste problem in Nairobi, Kenya. *Geoforum TA - TT -*, *37*(6), 1046–1058. https://doi.org/10.1016/j.geoforum.2006.03.003 LK - https://ut.on.worldcat.org/oclc/5900383656

OECD, O. (2004). The OECD principles of corporate governance. *Contaduría y Administración*, (216).

Park, J., Sarkis, J., & Wu, Z. (2010). Creating integrated business and environmental value within the context of China's circular economy and ecological modernization. *Journal of Cleaner Production*, *18*(15), 1494–1501.

Pawson, R., & Tilley, N. (1997). An introduction to scientific realist evaluation. *Evaluation for the 21st Century: A Handbook*, 405–418.

Perugini, F., Mastellone, M. L., & Arena, U. (2005). A life cycle assessment of mechanical and feedstock recycling options for management of plastic packaging wastes. *Environmental Progress*, *24*(2), 137–154.

Peters, B. G., & Pierre, J. (1998). Governance without government? Rethinking public administration. *Journal of Public Administration Research and Theory*, *8*(2), 223–243.

Preston, F. (2012). *A global redesign?: Shaping the circular economy*. Chatham House London.

Remigios, M. V. (2010). An overview of the management practices at solid waste disposal sites in African cities and towns. *Journal of Sustainable Development in Africa*, *12*(7), 233–239.

Review, world population. (2019). Zimbabwe Population. Retrieved April 7, 2019, from World population review website: http://worldpopulationreview.com/countries/Zimbabwe/

Rhodes, C. J. (2016). The 2015 Paris climate change conference: COP21. *Science Progress*, *99*(1), 97–104.

Roman, M., Saniuta, A., & Pop, N. Al. (2013). When does Loyalty Transform into Addiction? Desk research in Telecommunication Services. *International Journal of Education and Research*, *1*(8).

Rosdiana, H. (2010). Reformulating Policy on Frequency Usage Fees as Non-Tax State Revenue: Urgency and Its Implications. *Journal of Indonesian Economy and Business*, *25*(2), 222–238.

Ross, S., & Evans, D. (2003). The environmental effect of reusing and recycling a plastic-based packaging system. *Journal of Cleaner Production*, *11*(5), 561–571.

Sheldon, R. A. (2012). Fundamentals of green chemistry: efficiency in reaction design. *Chemical Society Reviews*, *41*(4), 1437–1451.

Singh, J., & Ordoñez, I. (2016). Resource recovery from post-consumer waste: important lessons for the upcoming circular economy. *Journal of Cleaner Production*, *134*, 342–353. https://doi.org/https://doi.org/10.1016/j.jclepro.2015.12.020

Stern, N. (2008). *Key elements of a global deal on climate change*.

Su, B., Heshmati, A., Geng, Y., & Yu, X. (2013). A review of the circular economy in China: moving from rhetoric to implementation. *Journal of Cleaner Production*, *42*, 215–227. https://doi.org/https://doi.org/10.1016/j.jclepro.2012.11.020

Statutory Instrument 98 of 2010 (CAP: 20:27 Environmental Management (Plastic Packaging and Plastic Bottles) Regulations, 2010)

Touitou, Y., Portaluppi, F., Smolensky, M. H., & Rensing#, L. (2004). Ethical principles and standards for the conduct of human and animal biological rhythm research. *Chronobiology International*, *21*(1), 161–170.

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, *14*(3), 207–222.

Tsiko, R. G., & Togarepi, S. (2012). A situational analysis of waste management in Harare, Zimbabwe. *Journal of American Science*, *8*(4), 692–706.

Van Eygen, E., Laner, D., & Fellner, J. (2018). Circular economy of plastic packaging: Current practice and perspectives in Austria. *Waste Management*, *72*, 55–64. https://doi.org/https://doi.org/10.1016/j.wasman.2017.11.040

Van Wyk, M. M., & Toale, M. (2015). Research design. *Educafional Research: An African Approach, Oxford University Press, Cape Town*.

Verran, G. B. (2010). *The application of value co-creation in advancing solutions to sustainable consumption*. University of Pretoria.

Verschuren, P., Doorewaard, H., & Mellion, M. (2010). *Designing a research project* (Vol. 2). Eleven International Publishing The Hague.

Webb, H., Arnott, J., Crawford, R., & Ivanova, E. (2013). Plastic degradation and its environmental implications with special reference to poly (ethylene terephthalate). *Polymers*, *5*(1), 1–18.

Xanthos, D., & Walker, T. R. (2017). International policies to reduce plastic marine pollution from single-use plastics (plastic bags and microbeads): A review. *Marine Pollution Bulletin*, *118*(1), 17–26. https://doi.org/https://doi.org/10.1016/j.marpolbul.2017.02.048

Young, I. M. (2002). *Inclusion and democracy*. Oxford University press on demand.

Yuan, Z., Bi, J., & Moriguichi, Y. (2006). The circular economy: A new development strategy in China. *Journal of Industrial Ecology*, *10*(1-2), 4–8.

Zhang, C., & Casciato, B. (2006, April 4). *Composite plastic materials produced from waste materials and method of producing same*. Google Patents.

Zhijun, F., & Nailing, Y. (2007). Putting a circular economy into practice in China. *Sustainability Science*, *2*(1), 95–101.

Ziraba, A. K., Haregu, T. N., & Mberu, B. (2016). A review and framework for understanding the potential impact of poor solid waste management on health in developing countries. *Archives of Public Health*, *74*(1), 55.

Appendixes

Appendix 1: Inquiries

1. Community members

1. Is there plastic litter in Harare, if yes why is it difficult to control it?

2. Do you know about plastic waste management regulations?

3. Do people follow the regulations? Give a reason for your answer?

4. How can informal waste collectors and community members assist or be involved in reducing plastic waste and initiate CE principles?

5. Why do you think people throw away plastic litter all over?

6. How is the interaction and relations amongst the stakeholders involved in plastic waste management? Is there cooperation, team learning or there is opposition for example the Municipality and community members or NGOs and government or Harare City Council and Environmental Management Agency or informal waste collectors and Harare City Council?

7. How can collaboration be improved amongst stakeholders or actors concerned with reduction of plastic waste?

8. Do you know about Circular Economy and its benefits?

9. How can the plastic waste management regulations be improved?

10. Kindly give recommendations of how existing plastic waste management regulations can be improved and how plastic waste can be reduced?

2. Plastic manufacturing, retailers and recycling companies

SECTION 1

Q1.1 Do you know the plastic waste management regulations in Zimbabwe and what they entail?
If "Yes"

   a) What are the outcomes of the policy, in achieving their goals of plastic waste management?

Q1.2 who are the actors involved in policy formulation and implementation and how are the actors involved in plastic waste management in Harare Metropolitan Province

Q1.3 How are the resources distributed in policy formulation and what criteria is used for a policy to be formulated?

Q1.4 How well does the plastic waste management regulations' formulation and implementation achieve its stated goals?

Q1.5 What are the plastic waste management regulations' strengths and weaknesses?

Q1.6 Who are the 'target group' and what do they say about the policy and program implementation?

Q1.7 Do workers administering the plastic waste management regulations support its effectiveness?

Q1.8 How is the interaction and relationships amongst the stakeholders involved in plastic waste management? Is there cooperation, team learning or there is opposition

SECTION 2

Q2.1 To what extent do the plastic waste management regulations address the problem or issue it intends to, with the least expenditure of time, effort and money?

Q2.2 What do you think should be done or should have been done to improve the plastic waste management regulations.

Q2.3 How good are plastic waste management regulation compared to other approaches?

Q2.4 Have all the relevant other approaches been consulted for example circular economy?

Q2.5 To what extent do the plastic waste management regulations, respects peoples' rights to dignity, confidentiality, and self-determination?

Q2.6 Do people who might be affected by the policy clearly understand it and its implications?

Q2.7 Does it concur with current legal requirements?

SECTION 3

Q3.1 What do you understand by the term circular economy (CE) and plastic waste management

Q3.2 What are the benefits of circular economy in plastic management and to what extent do you think CE can assist in reducing plastic waste.

Q3.3 What are the major differences between CE and plastic waste management.

Q3.4 What are the possibilities of CE principles to be incorporated into existing plastic regulations or be a stand-alone policy.

Q3.5 What if after-use systems, currently shaped by fragmented decisions at municipal or provincial level, were re-thought and redesigned to achieve optimal scale and economics.

Q3.6 What do you understand by a CE model and cycle?

Q3.7 What are the benefits of CE models?

Q3.8 How can business model innovation for plastic CE be achieved or done?

SECTION 4

Q4.1 How can the policy be amended so that it becomes effective, efficient and ethically sound?

Q4.2 Should this policy be eradicated and a new one developed to take its place? If "yes" Why?

Q4.3 Do you have any recommendations for reducing plastic waste or improving the existing plastic waste management regulations.

3. <u>Government, NGOs, Researchers</u>

SECTION 1

Q1.1 Do you know the plastic waste management regulations in Zimbabwe and what they entail? If "Yes"

   a) What are the outcomes of the policy, in achieving their goals of plastic waste management?

Q1.2 How well does the plastic waste management regulations' formulation and implementation achieve its stated goals?

Q1.3 What are the plastic waste management regulations' strengths and weaknesses?

Q1.4 Who are the 'target group' and what do they say about the policy and program implementation?

Q1.5 Do workers administering the plastic waste management regulations support its effectiveness?

SECTION 2

Q2.1 To what extent do the plastic waste management regulations address the problem or issue it intends to, with the least expenditure of time, effort and money?

To a lesser extent because plastic waste is still all over

Q2.2 What do you think should be done or should have been done to improve the plastic waste management regulations.

SECTION 3:

Q3.1 How good are plastic waste management regulation compared to other approaches?

 Q3.2 Have all the relevant other approaches been consulted for example circular economy?

SECTION 4

Q4.1 To what extent do the plastic waste management regulations, respects peoples' rights to dignity, confidentiality, and self-determination?

Q4.2 Do people who might be affected by the policy clearly understand it and its implications?

Q4.3 Does it concur with current legal requirements?

SECTION 5

Q5.1 What do you understand by a CE model and cycle?

Q5.2 What are the benefits of CE models?

Q5.3 How can business model innovation for plastic CE be achieved or done?

SECTION 6

Q6.1 Who are the actors involved in policy formulation and implementation and how are the actors involved in plastic waste management in Harare Metropolitan Province

Q6.2 How are the resources distributed in policy formulation and what criteria is used for a policy to be formulated

Q6.3 What do you understand by the term circular economy (CE) and plastic waste management

Q6.4 What are the benefits of circular economy in plastic management and to what extent do you think CE can assist in reducing plastic waste.

Q6.5 What are the possibilities of CE principles to be incorporated into existing plastic regulations or be a stand-alone policy.

Q6.7 What if after-use systems, currently shaped by fragmented decisions at municipal or provincial level, were re-thought and redesigned to achieve optimal scale and economics.

Q6.8 How is the interaction and relationships amongst the stakeholders involved in plastic waste management? Is there cooperation, team learning or there is opposition

SECTION 7

Q7.1 How can the policy be amended so that it becomes effective, efficient and ethically sound?

Q7.2 Should this policy be eradicated and a new one developed to take its place? If "yes" Why?

Q7.3 Do you have any recommendations for reducing plastic waste or improving the existing plastic waste management regulations.

4. Informal waste collectors

1.What made you to start to pick plastic waste

2.How are the sales of plastics compared to expenses

3.How are the relations, collaboration and relations amongst stakeholders at Pomona Dumpsite

4. Are you getting any help from Harare City Council

5. What kind of waste do you collect

6.Who are your market access

7.Do you know about plastic waste management regulations

8.How many quantities of plastic waste do you collect per day

9.How long have you been in operation

10.How can informal waste collectors assist or be involved in reducing plastic waste and initiate CE principles.

Appendix 2: Key Policy Features of the plastic waste management regulations

Name of Environmental Regulations	Key Policy Features
Plastic Packaging and Plastic Bottles Regulation S.I 98, 2010	In terms of plastic waste prevention targets section 4(1) states that the agency shall require from time to time, every responsible person to set plastic waste prevention targets and to notify the Agency to such targets. The plastic waste prevention targets shall provide for any of the following as may be appropriate. The disposal of plastic waste by the responsible person is designated receptacles or sites or the design of plastics containing few pollutants are recyclable and durable when put to their intended use, or the use of biodegradable plastic or the creation of the mode of distribution and return systems that reduce residual plastic waste to a minimum. The purpose of compulsory specification according to section 2 and 3, is to assist the implementation of the Plastic Packaging and Plastic Bottles Regulations in order to protect the environment. These specifications cover requirements for packing that is made from thermos-plastics material and covers plastic and carrier packaging both domestically produced and imported for use within Zimbabwe. It also covers the thickness and printing requirements for these packaging.
Importation and Transit of Hazardous Substances and Waste Regulations S.I 77, 2009	Waste management regulations are meant to streamline the handling, transportation and disposal of various types of wastes including plastic waste. The aim of the Waste Management Regulations is to protect human health and the environment. The regulations place emphasis on waste minimisation, clean production and segregation of waste at source. The regulations have classified various types of waste and recommended appropriate disposal methods for each waste type. Under the waste management regulations, EMA licenses transporters, incinerators, landfills, composters, recyclers and transfer stations. Facilities to be licensed include local authorities, transporters, and handlers of various types of waste. The licensing employs a risk-based approach by concentrating on facilities considered to pose a high risk to the environment. The waste management regulations also provide an opportunity for investments in various aspects of waste management. A prohibitive approach to plastic bags acts as a driving force for people to adopt environmentally friendly alternatives such as reusable bags.
Hazardous Substances, Pesticides and Toxic Substances Regulations S.I 12, 2007 & Hazardous Waste Management Regulations S.I 10, 2007	Environmental and Natural resources management (Hazardous Substance, Pesticides and Others Toxic Substances) (Amendment) Regulations, 2011 (CAP.20:27). It is hereby notified that the Minister of Environment and natural resources Management has, in terms of section 140 of the environmental Management Act (Chapter 20:27), made the following regulations: these regulations may be cited as the Environmental and Natural Resources Management (hazardous Substances, Pesticides and other toxic Substances) (Amendment) Regulation, 2011. Section 13 (10) of the Environmental Management (Hazardous Substance, pesticides and Other Toxic Substances) Regulations, 2007, published in Statutory Instrument 12 of 2007. The statutory Instrument provides for the licensing for generation, storage, use, recycling, treatment, transportation or disposal of hazardous waste. Generators of hazardous waste are also required to prepare waste management plans and targets. The Statutory Instrument also regulates waste collection and management by local authorities.

Effluent and Solid Waste Disposal Regulations S.I 6, 2007	Regulates the disposal of waste (solid waste and effluent() Uses polluter pays principle through licensing which is according to the following Four Classes: Blue-in respect of disposal which is considered to be environmentally safe, Green- in respect of disposal that is considered to present a low environmental hazard, Yellow-in respect of a disposal which is considered to present a medium environmental hazard and Red- in respect of a disposal that is considered to present a high environmental hazard. Provides the water quality standards in which the effluent should be discharged into the environment
Environmental Management Act (EMA) (Chapter 20:27)	An Act to provide for the sustainable management of natural resources and protection of the environment, the prevention of pollution and environmental degradation; the preparation of a National Environmental Plan and other plans for the management and protection of the environment, the establishment of an Environmental Management Agency and an Environment Fund; to amend references to intensive conservation areas and committees and associated matters in various Act; to repeal the Natural Resources Act (Chapter 20:13); the Atmospheric Pollution Prevention Act (Chapter 20:03), the Hazardous Substances and Articles Act (Chapter 15:05) and the Noxious weeds Act (Chapter 19:07), and to provide for matters connected with or incidental to the foregoing. In terms of air pollution, any industrialist, company, developer and person is not allowed to emit any substances which cause substantial air pollution (that is, by the emission of substances in excess of prescribed amount for a particular source) in contradiction of emission standards established under the EMA. Industrialists are encouraged to practice cleaner production mechanisms which reduce pollution. The air polluter will be liable to imprisonment for a period of not more than five years or to a fine to exceeding level fourteen or to both such fine and such imprisonment. The air polluter will in addition to any sentence or fine imposed on him/her pay the cost of the removal of pollution, including any cost which may be incurred by any government agency in the restoration of the environment damaged destroyed as a result of the emission. It is prohibited to discharge or dispose-off any waste, whether generated within or outside Zimbabwe, in such a manner as to cause pollution to the environment or ill-health to any person. If you discharge or dispose- off any waste in contravention of any measure or prescribed standard or transport any waste otherwise that in accordance with a valid license issued you shall be liable to imprisonment for a period of not more than five years or attract a fine which does not exceed level fourteen or both such fine and such imprisonment. You are required to apply for a waste license if you intend to transport wastes within Zimbabwe, or to operate a waste disposal site or plant or to generate hazardous waste of a prescribed type or quantity from the Environmental Management Board. Minimising waste production, recycle and reuse your waste.
The Zimbabwean Constitution, Environmental Rights and Human Rights	The Constitution of Zimbabwe is the law which overrides any other law in the country. The advent of the new constitution of Zimbabwe which specifically recognises environmental rights as a fundamental human rights issue, the expectation created especially amongst environmental rights activists is that environmental rights will now enjoy greater protection. Accordingly, the human rights component of environmental rights has been firmly established by placing environmental rights within the context of fundamental human rights and freedom under Part 2 of Chapter 4 of the constitution. Environmental rights therefore have the same standing and recognition as other fundamental human rights such as the right to life, the right to human dignity, the rights of privacy and other rights listed under the fundamental human rights section. This has led to a fusion of environmental law which seeks to protect nature for the benefit of mankind and human rights law which focuses on developing mechanisms which enable human beings to assert their rights. The environmental rights clause as found under section 73 of the constitution of Zimbabwe reads as follows;(1) Every person has the right: to an environment that is not harmful to their health or well-being and, to have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures that; prevent pollution and ecological degradation; promote conservation and secure ecologically sustainable development and use of natural resources while promoting economic and social development.

Appendix 3: Interview Findings

Respondents	MAIN RESEARCH QUESTION: How are environmental regulations managing plastic waste in Zimbabwe and how can circular economy principles (CE) be incorporated in these regulations.
Researchers	The regulations are not really achieving the intended purpose because there is still plastic waste everywhere. Implementation is on the poor side. The plastic waste management regulations may be improved by the provision of other alternatives and include probably CE. Circular economy will allow the re-use, refurbishment, remanufacture of the plastic containers and re-thinking about the design of these plastic containers, because currently Harare is recovering most plastic waste from landfills and dumpsites which somehow promotes the use of landfills instead of moving away from landfills
Government	The regulations have not achieved their goals as seen by the amount of plastic waste in Harare Metropolitan Province. Regulations are very good content-wise but implementation is poor. Implementers are trying their best but the public do not clearly understand the regulations. It is not easy to teach old people regulations on plastic waste management, it is something that must be in their culture for them to adapt easily. Policies need to be reviewed from time to time but at the moment the ones that are there are good. Zimbabwe does not have the resources to carry out CE. CE model, cycle and some of these developments are for developed countries. Zimbabwe does not have the capacity to do CE , and once put in the regulations, it means it has to be followed
Government Parastatals (EMA)	The regulations for plastic waste management are very clear and addresses plastic pollution reduction. The thin plastics are in the informal market and that's the gap that has to be closed. There is a big reduction of plastic waste produced as EMA does frequent raids to those who sell thin plastics. The regulations do concur with the legal requirements and EMA is aware of CE and they have started sensitizing people and believe are better when moving towards CE. CE calls for technological advancements' and it also calls a lot to do with changing design of plastic manufacturing industries Plastic CE models can reduce plastic waste production according to EMA and the regulations should be amended with time.
NGOs	In terms of outcomes of the policy in achieving their goals of plastic waste management, no existing policies are excellent. Enforcement mechanisms are weak, no punitive mechanisms are put in place and there are no incentives to motivate people to reduce plastic waste. The possibilities for CE principles to be incorporated into existing plastic regulations or be a stand-alone policy are there, however for any policy to be effective the public needs to be consulted during formulation
Community members	The public do not know about the plastic waste management regulations, neither do they know about CE and its principles.
Plastic Recycling Companies	The plastic waste management regulations have not achieved their goal of reducing plastic waste because plastic is still all over in Harare Metropolitan Province. The regulations require resources and funding for them to be effectively implemented. In order to improve the plastic waste management regulations it is important to gather resources together for the policies before formulating them so that implementation is easy. Academic researchers can find solutions or alternatives of introducing CE through research and identify cheaper means which are affordable in developing countries
Plastic Manufacturing Companies	These policies have tried to achieve their goals of reducing plastic waste, however there is still lots of work to be done. The company is not aware CE, CE model and cycle and is also not aware of the benefits of CE models and how other stakeholder for example the government can assist in introducing CE principles

Respondents answering sub question one

SQ1. How successful are the plastic waste management regulations' formulation and implementation in achieving its stated goals (effectiveness)? What are the factors affecting their enforcement and implementation.	
Researchers	The formulation of the policies was not made with consultation of the end users. The formulation of the policy was made just for formality so as to have regulations, without doing any research. The policy formulators did not look at the economic situation of the country or consult with the public. Furthermore there are no alternatives when looking at the plastic waste management regulations, the use of plastics cannot be banned without putting an alternative. The regulations for plastic waste management are more on the banning side but no alternatives are put in place. If properly done or implemented, the regulations can have benefits, but weaknesses are that there are no alternatives, therefore it leaves people with no option but to illegally dump plastics. In terms of the public, they should be alternatives that are cost effective. The policy implementers are part of the people buying thin plastics and they are doing it for work purposes, there is no effective implementation of the plastic waste management regulations.
Government	As far as environment is concerned, it is only those who formulate and implement regulations who understand the regulatory instruments and are able to interpret what is written within these regulations, however the majority of the public does not understand the regulations. The public knows that there is the Environmental Management Act, but what it entails they do not know. Penalties and inter-ministerial committees are weak.
Government Parastatals	The plastic waste management regulations are achieving their goals according to EMA, as there is significant reduction of plastic waste on the streets. EMA states that the big companies are no longer producing thin plastics and the recycling industry has grown in Zimbabwe for example Waverly and Petrecozim which are companies which recycle plastic waste. The thin plastics are in the informal market according to EMA and that's the gap that has to be closed. There is a big reduction of plastic waste produced as EMA does frequent raids to those who sell thin plastics.
NGOs	In terms of outcomes of the policy in achieving their goals of plastic waste management, the organisation stated that no existing policies are excellent. Enforcement mechanisms are weak, no punitive mechanisms are put in place and there are no incentives to motivate people to reduce plastic waste
Community members	Majority of community members are not well informed about the plastic waste management regulations and that is affecting the implementation, meaning that they are not massively consulted during the formulation stage
Plastic Recycling Companies	The regulations require resources, money and for them to be effectively implemented. Fines are not stringent and no punitive measures to those who pollute the environment with plastic waste
Plastic Manufacturing Companies	These policies have tried to achieve their goals of reducing plastic waste, however there is still lots of work to be done according to plastic manufacturing companies. Plastic waste management policies require resources for them to be effectively implemented. Most policies are made without looking at the availability of resources for the policy implementation hence they are not effective

Respondents answering sub question two and four

SQ2. How can the existing regulations be improved in terms of effectiveness and gaps closed in the formulation, implementation and enforcement of urban plastic waste management regulations? SQ4. To what extent are the plastic waste management regulations ethical and efficient?	
Researchers	For the policies that control plastic waste to be effective, efficient and ethically sound, total remodelling is required, the creation of the model that can be adopted across all actors, in managing relationships amongst stakeholders that deal with plastic, also in managing CE, the model should come back to the public or community, adopted at source, but it needs political will for them to adopt CE. Politicians should appreciate CE by getting training on CE principles. Policy must not be eradicated or be removed but other arms have to be added to support it for it to be effective. The policies can be improved by making sure that policies are formulated by researchers instead of politicians, that way the policies will work. If policies are formulated or implemented by politicians some people will not abide because of different opinions about the political party in which the politician belongs to. Policies need to be amended by doing away with polluter pays principle. The plastic waste management regulations are trying to enshrine the rights of the people if done properly
Government	According to the Ministry of Environment, the new education curriculum in Zimbabwe should include more environmental studies and waste management subjects. Environmental campaigns must be done in churches, schools, bars and also educating the police officers, court judges so that they appreciate the importance of environmental protection. The advent of the new constitution of Zimbabwe which specifically recognises environmental rights as a fundamental human rights issue, the expectation created especially amongst environmental rights activists is that environmental rights will now enjoy greater protection.
Government Parastatals	The thin plastics are in the informal market according to EMA and that's the gap that has to be closed. There is a big reduction of plastic waste produced as EMA does frequent raids to those who sell thin plastics. The issue of plastic of plastic waste according to EMA is of concern but it is not significant, the informal sector is struggling plastics into the country. In terms of strengths and weaknesses of the plastic waste management regulations, there is need for the informal market to be organised and they have to move from being informal to being formal by meeting the required standard. The target group when it comes to plastic waste management regulations is the public and the public is not changing its bad behaviour of throwing plastic litter everywhere.
NGOs	Plastic waste management regulations should have stiff penalties that are similar to the ones for public drinking because if penalties are less costly or weak then people tend to be reluctant. Companies must recycle back their plastic waste and make awareness programmes as well as concertizing the public. The plastic waste management regulations can be amended for improved effectiveness, ethicality and efficiency by reviewing the policies to close gaps
Community members	Community members must be included during the policy formulation period, and must be engaged all the time
Plastic Recycling Companies	Implementation of the plastic waste management regulations is poor because of lack of resources due to poor economic situation in the country. There has been a paradigm shift, stakeholder participation has improved in harnessing plastic and carry it for recycling
Plastic Manufacturing Companies	There is need for resources for regulations in order to achieve their goals. Resources can improve the implementation of the policies and resources must be sourced before the formulation of policies. Municipalities and NGOs can assist in improving the existing plastic waste management regulations by promoting the plastic recycling companies through funding, so as to absorb large volumes of plastic waste.

Respondents answering sub question three

SQ3. What are the roles of stakeholders in the formulation, implementation and enforcement of the plastic waste management regulations?	
Researchers	The problem with plastic waste management is that not all players are coming on board, some retailers are not cooperating as they export the plastics from other countries. Some companies are after profits and are not willing to put a certain percentage of tax for plastics to Petrecozim yet they are the producers of large volumes of plastic waste. If CE was introduced then plastic waste would be reduced and plastic management would improve. The public is not appreciating these regulations since they do not understand them. Zimbabwe does not have devolution for policy formulation to be done at provincial level, it is only at National level.
Government	The stakeholders are the Environmental Management Agency, Allied Timbers, Zimbabwe Tourism, NGOs such as the Ministry of Agriculture and Ministry of Health and Child Care, community members, Local City Council, Plastic manufacturing companies. Some of the regulations are ambiguous but people at times are given simpler booklets during campaigns by EMA but they do not read them even though, the booklets are easy to understand. Single use plastics reduction must involve all stakeholders including community members and ZIMRA so as to control the entrance of single-use plastics at the boarders and airports. The public has to understand that they are not allowed to buy and use the single-use plastics and thin plastics. This way plastic waste can be reduced.
Government Parastatals	There are so many actors involved in plastic waste policy management formulation and implementation for example the government, government parastatals, NGOs, Harare City Council (Municipality), Private Companies and the Community members. Environmental Management Agency is responsible for enforcing the Environmental Management Act. EMA believes the regulations for plastic waste management are very clear and addresses plastic pollution reduction. Awareness campaigns can be done to the public and incentivise people.
NGOs	The Environmental Management Agency (EMA), EMA is involved in policy formulation since it is a part of the Ministry of Environment. NGOs usually gives ideas to the government on issues that can be made into policies. NGOs usually gives ideas to the government on issues that can be made into policies. The organisation at times pushes the government to make some issues that they feel are important or urgent into policies.
Informal Waste Collectors	They informal waste collectors pick up plastic waste from the streets and dumpsites in order to take them for recycling
Community members	Community members can reduce plastic waste by throwing plastic litter in appropriate bins and separating plastic waste at source for easy recycling
Plastic Recycling Companies	These companies can recycle as much plastic waste as possible hence reducing plastic waste on the environment and they can liaise with plastic manufacturing companies who can give them plastic for recycling.
Plastic Manufacturing Companies	Plastic manufacturing companies can adopt CE through designing of quality plastic products and avoid production of waste.

Respondents answering sub question five

SQ5 .How can circular economy concepts be expected to be integrated in the current environmental regulations in Zimbabwe	
Researchers	The plastic waste management regulations may be improved by the provision of other alternatives and include probably CE. Circular economy will allow the re-use, refurbishment, remanufacture of the plastic containers and re-thinking about the design of these containers, because currently Harare is recovering most plastic waste from landfills and dumpsites which somehow promotes the use of landfills instead of moving away from landfills. Not all relevant approaches have been consulted, actually no alternatives were put in place during the formulation of the plastic waste management regulations.
Government	According to Ministry of Environment, CE model, cycle and some of these developments are for developed countries. Zimbabwe does not have the capacity to do CE, and once put in the regulations, it means it has to be followed. This can also be applied to plastics, if we ban plastics completely, Zimbabwe does not have other alternatives for packaging that can be used. Resources during policy formulation are distributed according to the involved stakeholder's capabilities and policies are formulated according to the availability of resources to fulfil them. CE is better than recycling according to the Ministry. CE can reduce plastic waste to a large extent but Zimbabwe does not have the resources to adopt CE. CE in Zimbabwe can only be incorporated into the existing regulations if resources were available but because of the poor economic situation it will be difficult to implement if incorporated.
Government Parastatals	Circular Economy is another way of managing plastic waste by promoting the non-production of plastic waste according to EMA. CE is also an efficient way of managing plastic waste, however somehow at the end, plastic waste is still produced because some people do not see value in material. EMA mentioned that it is possible to incorporate CE within the plastic waste management regulations but CE came recently. According to EMA it is true that CE for one to comply they have to put mechanisms that come cheap and are affordable, since everyone knows the poor economic situation in Zimbabwe.
NGOs	According to NGOs, CE means everything has to go back to the cycle for example PETE, there should be a way of taking things to the loop. NGOs promoted CE in agriculture. There is a gap within regulations in the form of CE, if plastic waste is not collected and no separation of plastic at source, then Harare Metropolitan Province is still lagging behind. There is no infrastructure for CE. The possibilities for CE principles to be incorporated into existing plastic regulations or be a stand-alone policy are there, however for any policy to be effective the public needs to be consulted during formulation
Community members	Any adopted or formulated policy has to involve the community members for its effective implementation because they are the target group.
Plastic Recycling Companies	CE has to do with recycling according to the company and can reduce plastic waste. Plastic waste management is about the 3Rs, recycle, reduce, reuse. There are possibilities of CE principles to be incorporated into the existing regulations if resources allow and have more benefits
Plastic Manufacturing Companies	The company is not aware CE, CE model and cycle and was also not aware of the benefits of CE models and how other stakeholder for example the government can assist in introducing CE principles. The designing of plastic packaging with a significantly smaller set of material additive combinations may reduce costs for companies and increase profits. Less plastic waste would be produced, more business opportunities, more products of quality standards would be produced if all plastic packaging had common labelling and chemical marking and if they were aligned with standardized separation and sorting systems. Joining with recycling companies like Petrecozim can assist in recycling plastic waste of which the products can be used for other purposes other than food packaging.

Interview responses from Community members

Reasons for plastic litter	Knowledge on plastic waste management	Reasons for not following the regulations	How Informal plastic waste collectors & public can reduce plastic waste	Cooperation amongst stakeholders	Collaboration improvement	Knowledge on CE	Ways of improving plastic waste management regulations
-high population therefore any campaign against litter is not effective -Public ignores rules -Public is careless -Too many homeless people -Shortage of litter bins and waste collection trucks, designated areas for plastic waste is scarce -public do not appreciate a litter free environment -Public is unaware of proper disposal of plastic litter -High population of people buying food covered in plastics -Public not educated about how to control litter	-Public have no idea about the plastic waste management regulations -Community members assume plastic waste management regulations to be the recycling plastic waste paper so that waste is reduced.	-The public **do** not care about their health. -The regulations are not strict -The public lacks discipline -The community members are ignorant	-by placing plastic litter in the waste bin Participating in workshops about plastic litter -Participating in clean-up campaigns -Regular routine to collect refuse -Be involved at policy formulation stage -Separate waste at source -Recycling plastic waste	-There is cooperation amongst stakeholders but shortage of resources makes it difficult to implement regulations -Cooperation should improve because the stakeholders are independent of each other	-By awarding those who collect more plastic litter and giving hem incentives -Providing online programs to educate the society about plastic litter -Constant engagement is needed -Stakeholder meetings must be held -Programmes to educate people about plastic waste picking must be held -plastic manufacturing companies should pay community -Supporting the idea of plastic waste reduction	-Most community members do not know about CE -Some respondents in the community assume it is the reuse and recycle of plastic	-Consider/set jail penalties for those who throw litter -Enforcement of regulations must be strong -By engaging the public during policy formulation -imposing strict laws that guard against plastic disposal

79

Responses from Informal Waste Collectors

Views from Informal waste collectors/pickers
Most informal waste collectors stated that they are against the entry of Harare City Council workers in the recycling business, because council workers had started participating in the economy of recyclables before 2014. They stated that they did not want the Harare City Council workers in the plastic waste collections business because the informal waste collectors themselves survived on selling those plastic waste containers to recycling companies.
Informal waste collectors do not get pay on month ends as compared to Council workers, according to one informal waste collector. The informal waste collectors complained that the City Council people wanted money from the plastic informal waste collectors who worked at the waste dumpsites.
There were complaints amongst the informal waste collectors that City workers exploited people who were picking waste in the dumpsites.
They stated that City Council must collect its own money themselves. It was said by the informal waste collectors that some City Council workers were abusing the privilege of being Council workers to select vehicles ferrying recyclables which they sell themselves and cash in personal gains.
City council workers were not expected to be competing with the pickers since they had jobs with expected pay on month ends, while the plastic waste collectors did not have either real jobs or expected pay on month ends.
The informal waste collectors were complaining of being paid very little money by recycling companies and stated that they needed protective clothing, for use when picking plastic waste at dumpsites and shelter for protection against harsh weather patterns since they spent close to 8 hours a day in the dumpsites. They require assistance in the form of blankets and clothing.
Most informal waste collectors collect PETE (polyethylene terephthalate), HDPE (high-density polyethylene), PVC (Polyvinylchloride), LDPE (low-density-polyethylene), PPC (polypropylene), and PS (Polystyrene), other plastics.