COUNTRY CASE STUDY

Pathways out of Plastic Pollution

Plastic Waste Management in Rwanda:

An Ex-post Policy Analysis

PROBLUE

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Abbreviations and Acronyms

ASA	Advisory Services and Analytics
C&C	command-and-control (C&C) measures
EAC	East African Community
EPR	Extended Producer Responsibility
GDP	Gross Domestic Product
MBIs	Market-based instruments
MoE	Ministry of Environment
MoH	Ministry of Health
MINALOC	Ministry of Local Government
MINICOM	Ministry of Commerce
MININFRA	Ministry of Infrastructure
NGO	Non-Governmental Organization
OEC	The Observatory of Economic Complexity
OECD	Organization for Economic Co-operation and Development
PET	Polyethylene Terephthalate
REMA	Rwanda Environment Management Authority
RFDA	Rwanda Food and Drugs Authority
RSB	Rwanda Standards Board
RURA	Rwanda Utilities and Regulatory Authority
RWF	Rwandan Francs (RWF 10,000 = US$ 10)
SWM	Solid Waste Management
SME	Small and Medium sized Enterprises
SWOT	Strengths, Weaknesses, Opportunities and Threats assessment
US$	United States Dollar
WASAC	Water and Sanitation Corporation

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Executive Summary

The implementation of end-of-life solutions for plastics, such as recycling and safe disposal, is not keeping pace with production. Fossil-derived plastics are versatile and shown to be a viable material for the manufacture of many consumer and industrial products. According to a number of recent studies, the global production of plastics was over 438 million tonnes (including resins, fibers and additives) in 2017, and if left unchecked, production is projected to more than double by 2040 (UNEP, 2021; Geyer, 2020; Lebreton & Andrady, 2019). Of the estimated 7 billion tonnes of plastic waste produced globally by the end of 2017, only 10 percent has been recycled, with an estimated 76 percent having been landfilled or leaked into the environment (Geyer, 2020). Global solid waste is expected to increase by 73 percent (from 2.24 billion tonnes in 2020 to 3.88 billion tonnes by 2050). As the living standard in Rwanda is increasing over the years, more plastics consumption and waste generation is expected unless the country adopts rigid and effective policies to manage plastics waste.

Plastic pollution threatens public health, local economies, and ecosystems, especially aquatic environment, and its environmental impacts is growing at an alarming rate. Exposure to chemicals and pathogens associated with plastics, microplastics, and the burning of plastics has direct impacts on human health (Hermabessiere et al., 2017) and economies. Plastic pollution presents a serious threat to aquatic life through entanglement, starvation, and toxicological harm, and is understood to alter the global carbon cycle (UNEP, 2021). Plastic pollution has significant environmental costs (UNEP, 2021). In Rwanda, SWM is still in its early stages and lacks adequate waste collection and disposal services. Litter and open burning of solid waste are common, including e-waste, especially in small cities and rural areas. Because of plastic pollution, the country is facing increasing risks to public health, ecosystems, and sustainable development.

Plastic pollution is a result of market and policy failure in plastics production and consumption, and effective plastics policies are required to address the problem of negative externalities. To control plastic pollution, governments must effectively use a variety of policy instruments to target appropriate points in the plastics lifecycle and influence decision-making by individuals and/or multiple actors across the value chain (EMF, 2021b; UNEP, 2021; Watkins et al., 2019). Many countries, including Rwanda, have begun to implement a range of public policies to manage plastic pollution. For example, more than 60 countries have applied bans, taxes, and levies to curb plastic waste and its impacts (World Bank, 2022). Inventories of the policies used to manage plastic pollution have been developed to assess plastics policies and their effectiveness, as have studies. Most policies currently in operation around the world have a focus on banning plastic bags and foamed plastic products as well as on the prevention and management of plastic waste and reduction of plastics production, or on incorporating renewable or recycled content into plastics. Rwanda's national law banning plastic bags and other single-use plastics items is one of the earliest of its kind in Africa and has been an example to other developing countries.

There are key entry points for policy interventions in the management of solid wastes and the reduction of the impact of plastics across the value chain, including through circular economy and better governance and accountability. As solid waste is expected to increase continuously, the concept of a 'circular economy' becomes critical to solid and plastic waste management. Circular economy is a system-wide approach that considers the entire value chain, focusing on reducing the use of non-renewable materials, increasing recycling and the use of renewable and recycled materials, preventing pollution, and extending the lifespan of products while regenerating natural systems. Circular economy considers the entire plastics life cycle and can be facilitated by governments through the application of policies that minimize waste and pollution, e.g., encouraging better design of products to increase durability, repairability, reusability and recyclability, incorporation of recycled and renewable materials into products, facilitating and encouraging reuse and recycling of products and aligning policies to reduce fraud and corruption.

An analysis of existing regulatory and policy measures and their effectiveness would help assess what is working, identify the challenges, and determine opportunities for future action. A challenge governments face in policy design and implementation for managing plastic pollution is to understand what causes plastic pollution and policy failure, and what types, and combinations of, policy measures should be used to effectively manage plastic pollution. Effective policy responses to manage plastic pollution generally include combinations of measures or a package of policies and regulations. Such packages include regulations and standards restricting the production, consumption and disposal of plastics, targeted investments in SWM infrastructure and plastic waste recycling, financial incentives (taxes, fees, subsidies, etc.) to change the behavior of plastics producers, consumers, and recyclers, and public procurement methods to drive a change in demand for secondary raw materials and recycled products.

An ex-post policy analysis was carried out in Rwanda to understand what plastics policy framework is in place and how effective it has been at achieving a reduction in plastic pollution. Policy evaluation traditionally uses economic and social science research methods, including qualitative and quantitative techniques to examine the effects of policies. A variety of methods were used to identify and select data during the ex-post analysis, including a review of the literature, targeted data collection, and semi-formal interviews. The study required consideration of policies and wider measures both individually and as a 'package'. A suite of evaluation questions and indicators was used to facilitate cross-examination of the policies under consideration.

Rwanda has an active plastics landscape, from manufacturing to collection and reprocessing, however the scale of operations is relatively small compared to other nations. The plastics production industry in Rwanda comprised nine plastic (and rubber) manufacturers in 2020 (Rwanda Development Board, 2020) of which 100 percent are small and medium sized enterprises (SMEs) (Plastic1.com, n.d.). No data were found to demonstrate the estimated number of people employed in the sector. Rwanda is a net importer of polymer and plastics products. Rwanda's domestic plastics production market was worth US$ 56.3 million in 2019 (National Institute of Statistics of Rwanda, 2020). In 2018, Rwanda imported US$ 41 million worth of plastics and plastic products (UN COMTRADE, 2018) while exports and re-exports of plastics and plastic products were worth US$ 1.5 million (UN COMTRADE). The value of imports increased by 44 percent between 2008 and 2018 (UN COMTRADE, 2018) while exports have remained the same. The data of plastic consumption in Rwanda, however, is largely unreported.

Compositional studies of Rwanda's wastes on a national scale and data on recycling are fragmented and varied. City-specific studies suggest that plastics account for 1.5 to 7 percent of waste in Kigali, where waste generation has increased up to 800 tonnes per day. It is estimated that Rwanda may now generate 75,000 to 100,000 tonnes per year of plastic wastes. However, the precise fate of this waste is difficult to identify. Rwanda is believed to recycle some 2 percent of all wastes (Rwanda Environment Management Authority, 2018). The recycling rate in cities such as Kigali is believed to be as high as 10 percent (Rajashekar et al, 2019) of total municipal solid wastes. The lack of a reliable recycling rate for the nation, as well as the level of uncertainty in the range of Rwanda's recycling rates, has been confirmed through stakeholder input. The country's low recycling rates are in contrast to government targets to recycle 30 percent of non-organic solid waste by 2019/2020 and 40 percent by 2029/2030.

Once plastic wastes are collected in Rwanda, no domestic recycling facility exists for polyethylene terephthalate (PET) bottles. This means that any collected PET bottles in Rwanda are instead crushed and sold to recyclers in Uganda, Kenya, Tanzania and, until recently, China. While in any other nation this would be considered a significant loss of a valuable recycled material, the government has recently, taken action to eradicate the use of PET bottles entirely, according to stakeholder input, through Law No. 17/2019 discussed in this case study.

Mismanaged plastics have created a range of environmental problems in Rwanda. According to stakeholder engagement, the public has been concerned about plastic pollution for years. Plastic pollution has been known to litter water treatment plants, and plastic bags and litter was prevalent across the nation's streets

and fields. Plastic pollution was known to contaminate water, land and air and was believed to create a health risk to human beings, as a result of micro-plastics in soil being ingested by livestock and then humans.

In Rwanda, institutional arrangements exist for the management and monitoring of waste generally, and for the management of plastics specifically. The Ministry of Infrastructure (MININFRA) and the Ministry of Environment (MoE) currently have the overall oversight of SWM and is responsible for planning, strategy preparation, policy and legislation development with contributions from the Ministry of Local Governments (MINALOC), Ministry of Health (MoH), Ministry of Commerce (MINICOM), Rwanda Environment Management Authority (REMA) and Districts (MININFRA 2018; MININFRA 2016). To deliver and enforce the strategy and practices across the country, MININFRA is empowered to introduce regulations with MoE (through its REMA) and MINALOC. The Rwanda Standards Board (RSB) is responsible for developing standards, with inputs from MININFRA, Rwanda Utilities Regulatory Authority (RURA), REMA, and Rwanda Food and Drugs Authority (RFDA). The main national bodies with responsibilities to enforce regulations and standards are REMA, RURA, RSB, and RFDA. MINICOM provides support to waste industry business development including the development of incentives and capacity building such as training for resource efficiency.

International commitments have given the Rwandan government a responsibility to achieve ambitious changes in the use, management, and disposal of plastics in the country. For example, as a signatory of the Convention on Biological Diversity, Rwanda is encouraged to recognize and mediate causes of a significant reduction in biodiversity systems in the country. In addition, as a signatory of the Paris agreement on Climate Change (United Nations Framework Convention on Climate Change), the country seeks to contribute to the ambitious goal of the Paris Agreement.

The management of plastic pollution in Rwanda falls within a wider strategic, regulatory, and policy framework which sets the foundation for the management of wastes. The following national policies and laws concerning general pollution management were identified to provide context, although they were not explored in detail within this case study:

- Vision 2020 (2000).
- The Economic Development and Poverty Reduction Strategy (2008).
- National Policy & Strategy on Water Supply and Sanitation services (2010)
- Rwanda Green Growth and Climate Resilience Strategy (2011)
- Regulations of Solid Waste Recycling (2015).
- The Water and Sanitation Sector Strategic Plan 2018-2024 (2018).
- Law on Environment (48/2018 of 13/08/2018).
- Vision 2050 (2020)

Specific laws or policies that have a direct focus on plastic waste control in Rwanda were identified.

- **Law No. 57/2008 of 10/09/2008 Relating to the Prohibition of Manufacturing, Importation, Use and Sale of Polythene Bags in Rwanda** (2008). The law prohibits the manufacture, use, import and sale of polythene (or polyethylene) bags in Rwanda. Built on a 2004 government instruction on banning importation and manufacture of limited plastic bags, the law also targets the consumers.
- **Law No. 17/2019 Relating to the Prohibition of Manufacturing, Importation, Use and Sale of Plastic Carry Bags and Single-Use Plastic Items** (2019). The law repeals and expands the law No 57/2008 beyond polythene bags by prohibiting the manufacturing, use, importation, and sale of plastic carry bags and single-use plastic items.

In addition, the following two national laws are considered as second tier policy instruments. Although they do not specifically focus on plastics, they play a key role in nurturing the systems, culture, and behaviors towards the management of wastes and plastics. Therefore, these laws are also reviewed and assessed in the study.

- **Organic Law No. 04/2005 of 08/04/2005 Determining the Modalities of Protection, Conservation, and Promotion of the Environment in Rwanda** (2005) which creates the legal framework for all waste management activities in Rwanda.
- **Law No. 53/2007 of 17/11/2007 Establishing Community Works in Rwanda** (2007), which governs Umuganda, a monthly community work including community cleanup, and is the first such national action. The law is later under Prime Ministerial Order Number 58/03, 2009.

Rwanda's plastics policy/law package has generated noticeably positive environmental, institutional, and social impacts with an indication of economic benefits, however, implementation costs to government, citizens and businesses and net economic benefit to the society need to be studied. Each of the policies or laws was assessed individually with the following findings:

- **Organic Law No. 04/2005 has broadly met its objectives.** The policy instigates the "polluter pays" principle as well as a range of financial incentives and disincentives, to promote better management of wastes. According to stakeholder interviews during the study, collection services have been introduced to households and communities, with an estimated 88 percent coverage across the city of Kigali (Rajashekar et al, 2019), leading to a reduction in the government clean-up costs and providing responsible and sustainable methods to manage wastes.
- **Law No. 53/2007 is considered to have met its objectives showing tangible benefits of cleaning up wastes including plastic waste in communities.** This law's objectives were to promote clean-ups of the nation and empower residents by engaging them in developing rules or policies for their communities. Umuganda is believed to have an estimated total economic value of up to US$ 200 million, which has helped build roads and schools and mitigate the impacts of solid and plastic wastes through community participation in litter clean-up exercises. The direct financial contribution of the governments is reported US$ 49.8 million (49.4 billion RWF) and the rest are the in-kind contribution of local residents and businesses of participating communities.
- **Law No. 57/2008 has generally achieved its objectives.** This law was introduced following a 2004 instruction (a measure with less legal weighting and influence in Rwanda) that focused upon banning manufacturers from producing and using polythene plastic bags. The 2008 law extended the focus to residents as well as businesses. Overall, the plastic bag ban has significantly reduced the use of plastic bags across Rwanda. The import of polyethylene sacks, bags, and cones begun to drop sharply in 2004 when Rwanda introduced its public education campaign to prepare banning polyethylene bags, from 1,092 tonnes in 2003 to just 18 tonnes in 2006. Although the import bounced back a bit after, the import level remained low at some 100 tonnes per year in 2009-2011 and reached 323 tonnes in 2016. According to Dsilva (2019), implementation of the law further helped to improve plastics recycling rates with claims that 70-80 percent of plastics were being recycled after use. Stakeholders have highlighted further success, indicating that the law prohibiting plastic bags has delivered significant results, including reduced pollution within water treatment systems and reduced litter clean-up costs. This reduction in plastic pollution is believed to be contributing to a reduction of microplastics in soils with a potential improvement upon the health of Rwanda's cattle and human beings.
- **Law No. 17/2019 repeals and expands Law No. 57/2008. It is relatively recent, so a full analysis is not possible. However, given the successful experience from implementing the preceding law, Rwanda is anticipated on the right track toward achieving the objective of the recent law.** There is a continuous trend of drainage systems no longer blocked, stagnant water being reduced, and fewer related diseases are in evidence. Stakeholder interviews also indicate that inspections of commercial premises, including seizures of all single-use plastic items from shops, hotels and restaurants, has supported the policy's success. In addition, tough penalties are deployed to those violating the ban.

Various government institutions have instilled new behaviors and attitudes within Rwandans through successful awareness-raising campaigns. Awareness raising, marketing and enforcement campaigns generate comprehensive and fully supported policies in Rwanda. These are undertaken by the Districts, RURA, and MoE/REMA, with the latter providing technical support across other Ministries. The nation is generally engaged in good waste management practices, with a particular driver being residents' concerns for local environments. Most of Rwandans are now committed to reducing litter accumulations across communities and are critical of those who do litter, or who do not participate in the Umuganda initiative. Despite impressive success, delivery of waste management services in Rwanda still faces significant challenges if the governments industries and businesses do not invest and develop effective and efficient waste management systems.

Although the regulatory and policy framework discussed in this case study has achieved degrees of success, delivery of waste management services in Rwanda continues to face challenges. The study shows that Rwanda faces a number of barriers and challenges in policies for plastic pollution management, including in waste management infrastructure, data gaps and the impact of policies in neighboring countries, such as:

- Rwanda's SWM service remains very limited, with noticeable challenges in financial limitations and a lack of waste management infrastructure. Current waste management fee mechanisms do not recover full costs, or disincentivize the use, of landfills. Waste management infrastructure is limited, due partially to short-term service contracts which discourage long-term investments by private contractors. Rwanda also has a limited capacity for reprocessing plastic wastes, and it needs a plastics recycling facility for reprocessing and reuse within Rwanda and to provide an opportunity to reprocess plastic waste into materials for use in the construction sector.
- Lack of data and data management systems for waste management make it difficult to understand and design policies for waste management and assess the impact of plastics policies upon plastic waste recycling reduction in Rwanda.
- Although the government is providing financial support to enterprises for developing alternatives to plastic bags, and alternative materials—such as textiles and paper bags— have been used, alternatives remain insufficient to substitute single-use plastic bags. The ban on single-use plastic bags led to single-use bags being smuggled into Rwanda from its neighboring countries. To manage this, Rwanda has stepped up its border control for catching smugglers and disposing of illicit plastics. It needs to coordinate and seek synergy with neighboring countries.
- Despite the existence of a framework for solid waste management in Rwanda, there is no specific policy or strategy focused on integrated solid waste management as of early 2021. The fragmented nature of waste management regulations means that policy goals, regulatory oversight and implementation are not always coherent. This disrupts and confuses national efforts to tackle plastic pollution and leads to either multiple departments or no department taking a response.

The ex-post analysis of the laws/policies identified the following opportunities which will help Rwanda improve policy development and implementation for better management of plastic pollution.

- *Developing a robust data management system to gather, record and report on plastics data*. Such a system is essential to facilitating policy performance measurement and improvement. It will allow the nation to track waste accumulating, waste movements and end destinations (e.g., tonnages recycled, recovered, or disposed) including public behavioral changes towards plastic waste management practices, and enable the government to identify and assess opportunities for future interventions.
- *Setting clear targets regarding plastics reduction, reuse, and recycling*. Clear targets help develop a path to reduce plastic pollution, assess financial needs, and promote behavioral changes and investments in plastic waste management.
- *Encouraging source separation of plastic waste*. The government needs to step up its support to separate waste at source and to handle separated waste during its collection and transportation with

the right financial incentives. Gradually increasing landfill tipping fees, fines of illegal dumping, deposit refund schemes, and other financial incentives according to society's increasing affluence will help encourage both households and entities to separate recyclable plastics from other wastes, reduce landfill disposal and curb illegal dumping in Rwanda.

- *Promoting a circular economy to increase reuse and recycling of plastic waste by local businesses in Rwanda*. The government needs to develop effective mechanisms and provide financial incentives to support local industries – such as the construction and manufacturing sector – to incorporate recycled materials into their manufacturing processes and products. Existing incentives, such as business rate cuts, can be supplemented through government grants to support the incorporation of secondary materials into manufacturing or introduce cleaner materials to substitute for plastics.
- *Providing financial support packages for businesses to adapt to policy and legal requirements for circular economy and new green markets*. These could include greater accessibility to grants, subsidies, loans, or blended funding streams (partnerships and direct investments from both the private and public sector) for new investments by manufacturers, retailers, and waste management companies that manufactures, separates, and recycles plastics.
- *Supporting local development and use of biobased plastics*. This should be further supported in Rwanda as this is an area where attention is slowly beginning to focus. The government, in the form of a national working group with grants, subsidies, and exemptions, should support industries, research institutes, and academics to research, investigate, and develop locally produced and biodegradable (or recyclable) biobased materials. In particular, environmental impact assessment, development of standards and lab testing methods should be adopted to determine whether the biodegradable qualities are realistic and whether biodegradation can actually happen in the natural environment.

1 Introduction

The global manufacture of plastics continues to increase rapidly, and at a relatively low cost. However, the effort to collect and treat plastic waste is costly, and as a result the implementation of solutions to reduce plastic waste has not kept pace with the amount of waste generated. Globally, plastic pollution is now a major challenge.

Plastic pollution has a wide range of impacts on public health, economies, ecosystems, and biodiversity and can occur during each stage of the plastic lifecycle—from extraction of raw materials, production, and use, through to end-of-life. Exposure to the chemicals and pathogens associated with plastics and microplastics, as well as the burning of plastics, have direct impacts on human health (Hermabessiere et al., 2017). Plastic pollution also presents a serious threat to aquatic life and is understood to alter the global carbon cycle (UNEP, 2021). The environmental costs of plastic pollution are significant (UNEP, 2021).

Plastic pollution is a result of market and/or policy failures in plastic production and consumption and plastics policies and other measures are necessary to address the related problems. The literature shows a clear recognition of the need for governments to develop and implement effective policies to reduce the impact of plastics and plastic waste (Karasik et al, 2022, EMF, 2021; IRP, 2021; UNEP, 2021; Karasik et al, 2020). Governments play a critical role in managing plastics and preventing pollution, and several influential studies have carried out global assessments of national and subnational policies. According to a recent analysis of the plastics policy inventory of Duke University's Nicholas Institute (Karasik et al. 2022), there have been a total of 571 public policies to plastic pollution since 2000, as compared to 291 reported in Karasik et al. 2020. About 60% of these policies are regulatory (e.g., bans), close to a quarter are economic measures (e.g., taxes, fees, or subsidies), and the rest are related to information measures. Among them are the instruments implemented by the Government of Rwanda, which are described and assessed further in this report.

A technical challenge for national governments in designing and implementing policy instruments to effectively address market and policy failures and reduce plastic pollution is to understand what is causing plastic pollution in their country, and what types, and combinations of, policy instruments can be used to prevent it within their unique country context. The Word Bank conducted an ex-post assessment of the regulatory and policy measures that Rwanda applied to reduce plastic pollution—including an analysis of the design, implementation, and enforcement of these policy measures-- to clarify what is working well in Rwanda, identify the gaps, and determine opportunities for future action.

Rwanda is a low-income country located in Central East Africa (see Figure 1.1) with a population of 12.95 million and a GDP that in 2020 was close to US$10.3 billion.[1] Since the mid-1990s, the country has experienced impressive economic development. Over the decade starting in 2010, GDP growth averaged 7.2%, while per capita gross domestic product (GDP) grew at an annual average of 5%. Around 17 percent of Rwanda's population is urban (The World Bank, 2018a) and Kigali is the largest city, with a population of 1.2 million (City of Kigali, 2021). At 26,338 sq. km, Rwanda is the 149th largest country in the world (Encyclopaedia Britannica, 2020). Its key natural resources are gold, metals, coffee, and tin ores (OEC, 2019). The country's main export sectors include precious metals, mineral products, and vegetable products (OEC, 2019).

[1] datacatalog.worldbank.org.

Figure 1.1. Location of Rwanda

Rapid economic growth and poor environmental management have Rwanda facing growing pollution problems, including solid waste and plastic pollution, among others. For years, Rwanda has sought to tackle plastic waste, and the country has been proactive in pursuing environmental management with ambitious policy measures. Since 2000 when the Government of Rwanda introduced its Vision 2020, the nation has progressed in introducing waste management practices that included a structured approach to sustainable waste management. Rwanda's continued efforts include the ambitious adoption of legislative bans on the manufacture, importation, use and sale of polyethylene bags in 2008. The country recently took this effort further, with a ban on the manufacture, importation, use and sale of plastic bags and single-use plastic items. Rwandans embrace these policies through a culture where citizens work together to better their communities through collective actions or Umuganda, a practice (now enshrined in law) that requires residents to support the nation's cleanliness. Combined, these policies have led to the near eradication of polythene bags in Rwanda and an increase in affordable waste collection services for most urban populations, especially in Kigali.

The purpose of this report is to review lessons learned from an ex-post analysis of the policies regarding plastic pollution management in Rwanda and provide evidence-based recommendations for policy improvements in the country. The ex-post analysis is based on an extensive review of relevant literature, identification and assessment of relevant national policies or laws, and consultation and interviews with representatives of key stakeholders in Rwanda. From a literature review, the analysis first presented the global trend of plastics and plastic pollution management. Reviewing international trade and domestic production of plastics in Rwanda further helped discuss the state of play with plastics, including an overview of the country's plastics value chain, plastics production, import/export, and consumption. Based on literature review and stakeholder consultation, the analysis then identified a set of national laws or policies which directly or indirectly affects plastic pollution management. A set of evaluation criteria and questions were developed and employed for the ex-post policy analysis. The effectiveness of main laws or policies intended to control plastic pollution were assessed. Finally, the SWOT method was used to discuss the challenges and opportunities / recommendations for developing and implementing effective plastics policy instruments.

The ex-post policy analysis faced a number of constraints and limitations from the availability of data to the COVID-19 pandemic. The degree of quantitative assessment and evaluation possible was limited due to the availability and quality of data and information. In addition, the COVID-19 pandemic interrupted normal stakeholder interactions and face-to-face interviews. Stakeholder engagement was below expectations, leading

to a limited sample. A further limitation was that consistent, robust data sets were not available, and the ex-post assessment was limited to, or dependent on, secondary data from the literature.

Following this Introduction, Chapter 2 introduces the global context of plastic waste, environmental impacts, and plastics policies. Chapter 3 presents the state of play of plastics and the baseline for ex-post policy analysis in Rwanda. Rwanda's institutional arrangements, particularly national laws and policies regarding plastic pollution control, are reviewed in Chapter 4. Chapter 5 assesses, individually and in a policy package, the implementation effectiveness of main Rwandan national laws related to plastic pollution management. Chapter 6 summarizes conclusions and recommendations.

2 Context and Overview of Plastic Waste Management

This chapter overviews plastic pollution, environmental impacts, and entry points for plastic waste management as well as policy interventions.[2]

2.1 Plastics, plastic pollution, and environmental impacts

Plastics are polymeric materials that can be manufactured from a wide variety of feedstocks (including both fossil fuels and biobased materials such as cellulose, starch, oils, proteins, and sugars), using a range of different processes. Plastics are lightweight, durable, impermeable, and moldable and can resist some chemicals. Their low manufacturing costs have made plastics the preferred material in many consumer and industrial applications and widely used across every sector of the global economy; with 26 percent of the total volume of plastics used in packaging (EMF, 2021b) and most of the remainder used in construction, textiles, consumer goods, transportation, and electronics (UNEP, 2018a). World production of plastics has risen from two million metric tonnes globally in 1950 (EEA, 2019) to over 438 million metric tonnes (MT) in 2017 (Geyer, 2020), and a projected 398 million metric tonnes in 2020 (IEA, 2020). Under the business-as-usual scenario, global production is expected to double within the next 20 years (Lebreton and Andrady, 2019), and triple by 2050 (Geyer, 2020).

The availability of cheap and versatile plastics has encouraged a shift in many sectors from multiple-use products to disposable or short-lifetime plastic alternatives. As a result, the amount of plastic waste generated is increasing globally. An estimated 380 million tonnes of plastic waste were generated globally in 2017 (Geyer, 2020) which is expected to double by 2040 (IRP, 2021). On average, 12 percent of all municipal solid waste (MSW) is comprised of plastics, with variation by income level (Meijers et al, 2021); 6.4 percent of municipal waste generated in low-income countries in 2015 was plastics, compared to 13 percent in high income countries (Kaza et al, 2018).

The management of plastics end-of-life pollution is not effective at the global level. Nearly half of municipal plastic waste is currently discarded into the environment and causing air, water, and land pollution problems. Studies confirm that mismanagement of plastic waste more often arises in low-to-middle income countries, where waste management systems have often failed to keep pace with the rate of plastic waste generated (Meijers et al, 2021; Ritchie and Roser, 2018; Jambeck et al, 2015).

Plastic enters the environment via both land and marine sources, with domestic, industrial, and fishing activities the most important contributors. Although most of the mismanaged plastic waste appears to remain on land, plastic waste is entering in the ocean at an alarming rate and its persistence further poses a specific challenge for pollution management. The best available estimates suggest that 11 million metric tonnes of plastics currently enter the ocean every year from land-based sources (e.g., agriculture, building and construction, transport and unregulated landfill) (UNEP, 2021; Geyer, 2020; Jambeck et al., 2015) and, if without adequate waste management, the annual amount expected to triple by 2040 (IRP, 2021; UNEP, 2021). In addition, between 75 and 199 million metric tonnes are estimated to already be in the oceans (Lau et al, 2020; Pew Charitable Trusts and SYSTEMIQ 2020).

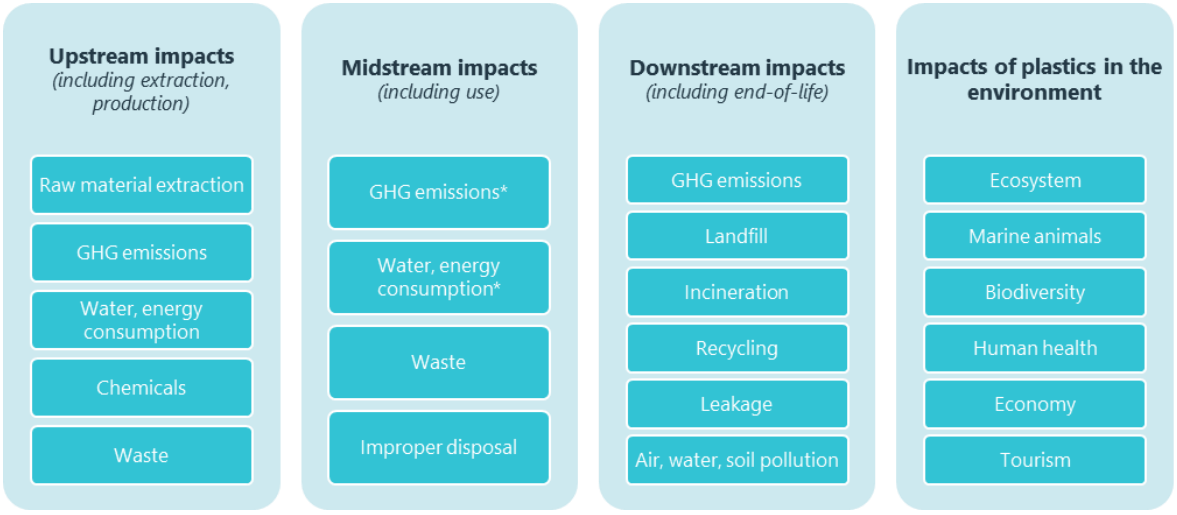
Plastic pollution threatens public health, local economies, and ecosystems including marine environment, and its environmental impacts is growing at an alarming rate. Exposure to chemicals and pathogens associated with plastics, microplastics, and the burning of plastics, has direct impacts on human health (Hermabessiere et al., 2017). Plastic pollution also presents a serious threat to aquatic life through entanglement, starvation, and

[2] This chapter is largely adopted from the publication of the World Bank (2022) which the authors helped prepare.

toxicological harm, and is understood to alter the global carbon cycle (UNEP, 2021). Economic activities such as aquaculture, tourism, and waterway transport are affected by plastic litter and debris. The environmental costs of plastic pollution are significant (UNEP, 2021).

Environmental impacts are evident across the plastics lifecycle, from the extraction of raw materials, production and use through the end-of-life phase**.** Understanding the specific impacts of each stage of the plastic lifecycle provides context for policies that may target various stages which are described briefly in this section and summarized in Table *2-1*.

Table 2-1. Summary of lifecycle impacts of plastics



Source: World Bank, 2022.

GHG emissions are released across most stages of the plastic lifecycle, with the highest carbon impacts seen in the production phase and end-of-life incineration phase (UNEP, 2021; CIEL, 2019; WEF, 2016). Left unchanged, GHGs from the production, recycling and incineration of plastics is anticipated to account for 19 per cent of the remaining global carbon budget by 2040 (Pew Charitable Trusts and SYSTEMIQ 2020, UNEP, 2021).

2.2 Entry points for plastic waste management interventions

Plastic waste management should consider moving upstream from the end-of-life waste disposal to a circular economy, with an effective after-use plastics economy and increasing demand for renewable and recycled plastics feedstocks. It requires to improve the management of solid wastes and consider institutional and financial arrangement and governance issues related to plastic waste management.

Promoting circular economy. "Circularity" is increasingly recognized by governments as an effective way to rethink the concept of waste and reduce the consumption of non-renewable raw materials. A 'circular economy' aims to reduce the use of natural resources and energy, and to minimize waste by keeping resources in use for as long as possible. The approach involves extracting the maximum value from materials while in use, then recovering and regenerating products and materials at the end of their service life. The overall intent is to reduce the consumption of non-renewable materials, reduce waste, and extend the lifespan of products, while regenerating natural systems. There are following key entry points for policy intervention which can increase plastics circularity in full lifecycle:

- *Upstream (including extraction and production)* – Policy instruments can be used to prevent waste and pollution related to the manufacture of plastics products. Policies or laws can incentivize

manufacturers to design durability, repairability, reusability and recyclability into products and alternative materials.

- *Midstream activities (including use)* – Policy instruments can be used to facilitate product repair and reuse; to develop infrastructure, systems and communications needed to keep existing products and materials in use for as long as possible; and to encourage waste prevention and recycling behaviors.
- *Downstream activities (including end-of-life)* – Policy instruments can be used to link consumers (e.g., sorting and disposing of waste) and waste management services (e.g., collecting, bulking and distributing used plastics) with the recycling and reprocessing of products and materials.

Driving up the demand for alternatives. A solution to reducing the impact of plastic pollution is to phase out unnecessary, avoidable, and particularly problematic plastic items and replacing these with alternative materials, products, and services (UNEP, 2021). Brands and product designers make choices (including incorporation of recycled or biobased feedstock) based on various factors. These factors include consumer demand, regulation, technologies, industry initiatives and prices (PlasticsEurope, 2019). Policy interventions can be used to drive up the demand for alternative feedstocks and reusable plastic products.

Strengthening solid waste management. Municipal solid waste is expected to increase globally and in Rwanda, with about an average of 6.4 percent of the solid waste being plastic in low-income countries (Kaza et al, 2018). Effective SWM is a key element of stopping plastic waste entering environment. The waste hierarchy shown in Figure 2.1 has been a useful conceptual framework to move up SWM from disposal, recycling to prevention and enhance circularity of plastics. Policy instruments are critical to both financing SWM infrastructure and improving SWM services.

Figure 2.1. The waste hierarchy diagram

Source: EC, 2008

Unpacking the challenges of recycling. Recycling is an essential part of circular economy. It can be facilitated through interventions that provide the market with both economic incentives and regulatory controls to encourage plastic waste to be put to productive use through recycling and reuse. Policy interventions are often required to drive innovation, improve financial sustainability, enhance feedstock quality, generate opportunities in trade, and recognize the socio-economic benefits of recycling

2.3 Overview of plastics policies

Plastics pollution is a result of market and policy failures in plastics production and consumption. Effective plastics policies and other measures are necessary to address the problem of negative externalities. To control plastic pollution, governments must effectively use a variety of policy instruments to target appropriate points in the plastics lifecycle and influence decision-making by individuals or multiple actors across the plastics value chains This section provides an overview of plastics policies to tackle the impact of plastics and plastic pollution. It starts with a review of the types of policies and their combination and timing and then a brief history of policies to manage plastic pollution.

Types of policies for plastic pollution management

Government policy to manage plastic pollution can be generally categorized into command-and-control (C&C) measures, market-based instruments (MBIs), and a variety of other instruments designed to improve governance, drive behavioral change and stimulate investment.

Command and Control (C&C) or regulatory measures can be used by public authorities to mandate the level of performance required or the technologies to be used and to restrict the production or consumption of particular materials or products. They include bans, emissions standards, and discharge or input thresholds or limits as well as product design standards or requirements which can be applied at different (or multiple) points across the plastics value chain.

Market-based Instruments (MBIs), also referred to as economic or price-based instruments, seek to incentivize producers and consumers to change behavior, use resources more efficiently, and reduce the negative impacts of resources. MBIs include a variety of instruments such as taxes and fees that recognize the social and/or environmental costs of production or consumption activities in the cost of a product or material; use of deposit-refund schemes to apply a surcharge on a product when purchased and a rebate when the packaging is returned; provision of subsidies to encourage the manufacture or uptake of a "better" product (e.g. a reusable product over a single use one); or implementation of mandatory labelling or design requirements for particular products.

In addition to the regulatory and economic instruments, **other types of instruments** are used to manage plastics and reduce plastic pollution including ones that:

- **Improve governance:** policies can improve governance through the incorporation of measures that create accountability and encourage public support for policies to manage plastic pollution, e.g., by setting targets, improving transparency in reporting and enforcement, and mandating public data collection reporting (Watkins et al., 2019).
- **Drive behavioral change:** measures that require or facilitate the provision of coherent and accurate information (e.g., on composition, chemical makeup, end of life treatment) provide a means to educate the public and drive behavioral change (Watkins et al., 2019). Other measures can introduce and scale-up outreach programs (e.g., authorities cooperating with informal waste pickers) and locally alleviate plastic pollution (e.g., investing in beach clean-ups) in a relatively low-cost way. Such policies may also apply disincentives such as anti-littering and anti-dumping penalty notices or fines, to tackle hotspots.
- **Drive financing & investment:** *Subsidies* can be used to de-risk investment, however policies can also be designed to directly *finance interventions* (and regulations designed to enforce and maintain them), to stimulate *investment in infrastructure,* and to *stimulate research and development* (Watkins et al., 2019). Infrastructure investment could be facilitated through the introduction of blended financing instruments (e.g., use of public, private, or philanthropic capital, to spur investment in projects aimed at improving waste management) and tradeable credit systems (e.g., where producers meet their obligations by purchasing recycling certificates issued by accredited re-processors or

recyclers based on the amount of plastic waste recycled). Also included in this category is the use of public-private partnerships to drive investment in more sustainable products.

- **Support voluntary industry action**: there are many examples around the world of brands, manufacturers, retailers, etc. working to reduce social and environmental impacts of their products under a voluntary agreement. The plastics sector is no exception, e.g., the Plastics Pact (EMF, 2021b), VinylPlus (Defra, 2018), and design for recyclability standards (Watkins et al, 2020). Government policies and initiatives, e.g., EU Ecodesign Directive and EU circular economy action plan, can be used to encourage sustainability improvements in products on a voluntary as well as mandatory basis (EU, 2020).

A global trend of national laws and policies to manage plastic pollution

International initiatives and treaties have helped pave the way for policy actions and reforms on policies to manage plastic pollution (UNEP, 2021). The first Honolulu Conference on Marine Debris in 1984[3] explored research which attempted to quantify and understand the impacts and fate of marine debris (including plastics). More recently, the Ocean Plastics Charter, a voluntary international framework to reduce plastic waste, was signed in 2018 as an outcome of the G7 summit in Charlevoix (Government of Canada, 2018).

As introduced in Chapter 1, governments have introduced a variety of policies to address the negative impacts of plastics and plastic waste. More than 60 countries, including Rwanda, use bans, taxes, and levies to restrict unwanted plastic products at the source and curb plastic waste (Karasik, 2022; UNEP, 2021; Ocean Conservancy, 2019; WEF, 2016). Many of these are aimed specifically at plastic packaging and packaging waste; around the world, several countries (e.g., Germany, UK, USA) successfully operate deposit-refund schemes which incentivize the return of plastic containers into reuse and recycling systems.

Many plastics laws or policies focus directly on specific product types (e.g., banning or restricting lightweight plastic bags). In other cases, policies have applied restrictions and conditions on individual combinations of polymer and product types e.g., Polypropylene (PP) carrier bags, PET bottles or PS food and drink containers (Pew Charitable Trusts and Systemiq, 2020; Ocean Conservancy, 2019; UN, 2018).

A progression toward policies focusing on upstream interventions earlier in the plastic lifecycle (e.g., waste prevention at the design and production stages) is evident. Instruments such as Extended Producer Responsibility (EPR) are becoming widely implemented. EPR provides a mechanism to target the environmental, economic, and social costs of the disposing of plastics products, while mandating waste collection and prevention, and raising awareness (UNEP, 2021; Ocean Conservancy, 2019). Other policies focus on reducing the use of hazardous chemicals in plastics products (EEA, 2019).

There is a growing understanding that policies addressing individual aspects of plastics management are not effective in isolation. Multiple system interventions are required, applied in combination at different levels of government, to adequately reduce the impact of plastic production, improve the management of waste plastics, reduce the leakage of plastic into the environment and tackle plastic pollution. The development of an overarching strategy or umbrella framework which considers the entire plastic lifecycle, including production, consumption, and end-of-life disposal can be an effective way to create coherency, while tailoring the precise interventions to the meet specific national or regional requirements (UNEP, 2021; EMF, 2021a; Watkins et al., 2019).

More recently, governments have started to adopt a circular economy approach as the framework to manage plastics. In 2016, the European Union adopted a circular economy framework[4] which includes a strategy on plastics, a target to increase plastic packaging recycling to 55 percent, a binding target to reduce landfill, and

[3] Proceedings available online: https://pame.is/document-library/desktop-study-on-marine-litter-library/impact-of-marine-litter/616-day-1985-ingestion-of-plastic-pollutants-by-ma/file

[4] A European Strategy for Plastics in a Circular Economy (COM/2018/028 final)

a total ban on landfilling the waste, which has already been separated at source and separately collected (UNEP, 2021; EU, 2020). Other countries, such as the United Kingdom (Defra, 2020) have released Circular Economy strategies or statements, that include plastics in their scope.

Although quite a number of countries, including Rwanda and other developing countries, have begun to implement a range of public policies or laws to manage plastic pollution, as yet little is known about the effectiveness of many of the plastics policies implemented by developing countries. The remainder of the report introduces the evolution of plastics policy or laws in Rwanda and conducts the ex-post policy analysis to assess the policy effectiveness in the country.

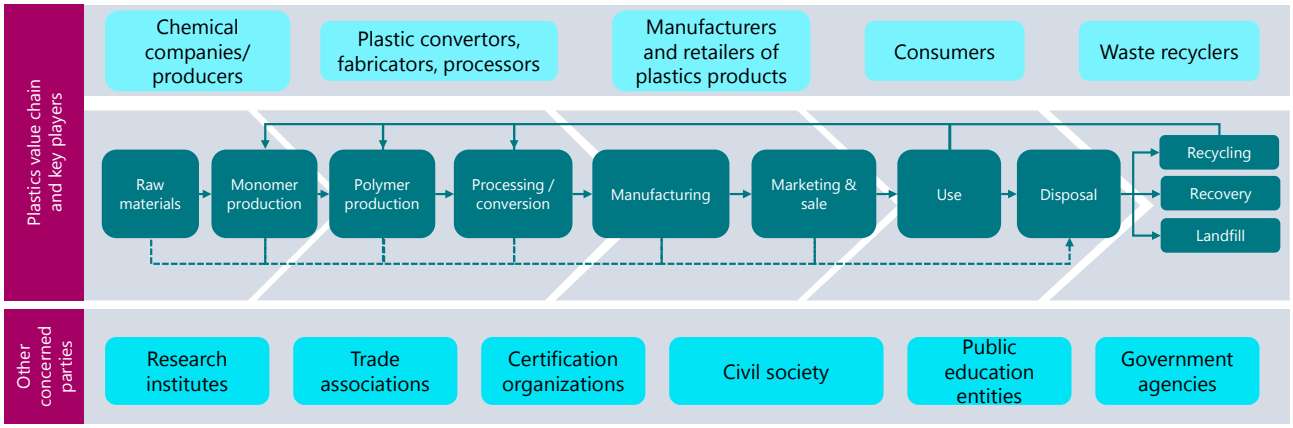
3 The State of Play with Plastics, and Baseline for Ex-post Policy Analysis in Rwanda

This section presents the state of play of plastics, including an overview of the plastics value chain in Rwanda, plastics production, import/export, and consumption, and Rwanda's plastics end-of-life management.

3.1 Plastics value chain and stakeholders in Rwanda

Figure 3.1 illustrates the full plastics value chain (middle row) and stakeholders. The categories along the top provide a list of the main groups involved and where on the value chain they tend to operate. Rwanda has an active plastics value chain, from manufacturing to collection and reprocessing. The elements listed in colored boxes in Figure 3.1 represent parts of the value chain currently operating in Rwanda. It makes clear that Rwanda does not produce any raw materials and its plastics manufacturing and consumption rely on imports.

Figure 3.1. Plastics value chain and players in Rwanda



Source: developed by authors according to a generic figure in UNEP 2019

3.2 Plastics production

Rwanda is a net importer of polymer and plastics products. It has very limited plastic industries for the manufacturing or reprocessing of plastics. By 2007, and prior to the introduction of plastics policies, chemicals, rubber, and plastics production accounted for less than 1 percent of GDP in Rwanda, despite an annual average growth at 4.5 percent of plastics production between 2004-07 (The Observatory of Economic Complexity, 2018).

According to both Rwanda Ministry of Trade and the Industry Government of Rwanda (2011), Rwanda didn't have plastics packaging production facilities until 2011. By 2019, the number of plastic (and rubber) product manufacturers has since increased to nine (Rwanda Development Board, 2020). They are all small and medium sized enterprises SMEs (Plastic1.com, n.d.). The domestic plastics production market in Rwanda was worth US$ 56.3 million in 2019 (National Institute of Statistics of Rwanda, 2020). But little plastics consumption data is available for Rwanda.

3.3 Plastic import and export

Table *3-1* shows the 2001-2016 trend in international trade of sacks, bags, and cones made of ethylene polymers, listed in quantity and value. While the changes fluctuate over years, there is a drop in quantity right after 2004 when the Government of Rwanda started to introduce an instruction on banning the manufacture and trade of polythene bags. Export basically stopped from 2005-2010, except for 3 tonnes in 2008. And since 2011, import and export quantities have gradually increased. The quantity of import remains relatively low in comparison of Rwanda's rapid economic growth.

Table 3-1. Rwanda international trade of plastics products (ethylene polymers), 2001-2016

Products: Sacks, bags, and cones of ethylene polymers, for the conveyance or packing of goods (Code 392321)

Year	Import Quantity (Kg)	Import Trade Value (in 1000US$)	Export Quantity (Kg)	Export Trade Value (in 1000US$)
2016	322,691	914.7	197,211	84.6
2015	271,979	399.7	38,646	9.8
2014	359,808	436.9	40,065	32.3
2013	359,554	621.1	8,050	6.9
2012	260,771	230.2	67	0.3
2011	108,898	120.5	0	0.0
2010	108,914	246.1	0	0.0
2009	125,442	279.8	0	0.0
2008	45,412	135.9	3,309	2.3
2007	70,890	146.1	0	0.0
2006	18,194	52.1	0	0.0
2005	43,163	88.4	0	0.0
2004	269,028	396.5	0	0.0
2003	1,092,390	872.4	221	0.7
2002	602,639	436.8	1,000	7.6
2001	254,477	332.1	0	0.0

Source: WITS at https://wits.worldbank.org/

Figure 3.2 further illustrates the changes in quantity of imported polyethylene sacks, bags, and cones from 2001-2016. It shows that the import has begun to drop sharply since Rwanda started its public education campaign to prepare banning polyethylene bags in 2004, with numbers going from 1,092 tonnes in 2003 to just 18 tonnes in 2006, although the import did bounce back a bit after the National Law on banning polyethylene bags was formally introduced in 2008. Its import level remained low at some 100 tonnes per year in 2009-2011 and reached 323 tonnes in 2016. However, the import value increased constantly after a dip in 2005-2006. This reflects that the import of polyethylene products has a higher quality and unit value.

Figure 3.2. Imported quantity of polyethylene sacks, bags, and cones in Rwanda, 2001-2016

Table *3-2* below however shows how the import of plastic sacks, bags, and cones, except those of polyethylene, steadily increase after a drop in 2005-06. This indicates that producers and consumers of plastic bags have tried to substitute polyethylene products with non-polyethylene ones after learning about the government's polyethylene bags ban.

Table 3-2. Rwanda international trade of plastics products (except of ethylene polymers), 2001-2016

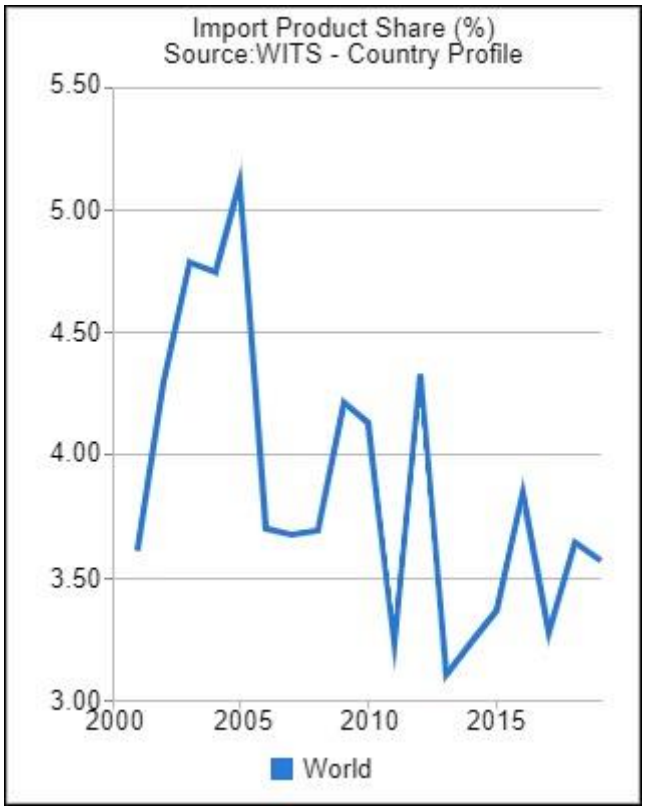
Products: Sacks, bags, and cones, for the conveyance or packing of goods, of plastics other than ethylene polymers (Code 392329)

Year	Import Quantity (Kg)	Import Trade Value (in 1000US$)	Export Quantity (Kg)	Export Trade Value (in 1000US$)
2016	634,661	879.3	60,954	15.8
2015	864,275	970.8	20,650	3.5
2014	646,972	953.1	5,965	7.6
2013	446,376	764.6	8,760	8.7
2012	351,833	705.2	0	0.0
2011	332,697	565.3	656	0.5
2010	257,522	461.7	0	0.0
2009	165,602	946.7	0	0.0
2008	303,887	993.7	0	0.0
2007	362,951	420.4	2,340	6.6
2006	189,213	383.8	650	2.3
2005	226,910	463.6	0	0.0
2004	450,878	575.9	43	0.6
2003	314,319	389.4	2,350	5.3
2002	141,330	165.8	3,143	2.3
2001	73,022	119.7	1,359	4.1

Source: WITS at https://wits.worldbank.org/

Figure 3.3 shows the share of Rwanda's plastics and rubbers import value in its total import values in 2001-2019. Despite the country's rapid economic growth during the period, the import of plastics and rubbers is generally declining.

Figure 3.3. Import share of plastics and rubbers in Rwanda, 2001-2019



3.4 SWM and end-of-life plastic waste management

SWM in Rwanda remains preliminary. Until recently, there has been no harmonized national policy or regulatory framework for integrated SWM in Rwanda. In 2011 the National Industrial Policy highlighted the need for industry specific waste management and suggested centralized systems as a means for cost reduction (Ministry of Trade and Industry, 2011). District authorities, households, community associations, NGOs, and the private sector have since undertaken SWM activities with limited financial and technical resources. As of May 2022, the Rwanda Integrated SWM Strategy has been prepared and validated by government agencies. It is expected to soon be approved by the Government of Rwanda.

To date, Rwanda's MSW information remains limited. Rajashekar, et al. (2019) reviewed data from 7 studies on Kigali between 2012 and 2018, where waste generation was reported in the range of 408-808 tonnes per day. Kabera, et al. (2019) estimated 638 tonnes, with 0.57 kg per capita per day, in Kigali. A study of GGGI (2019) on secondary cities shows about 50 tonnes per day in Huye and about 20 tonnes per day in Muhanga. No reliable national total is available.

Trash collection services are provided by private companies and cooperatives across the country, though coverage is clearly bifurcated between Kigali and the rest of the country. In Kigali, Kabera et al. (2019) estimate city waste collection coverage at some 88% while Rajashekar, et al. (2019) estimates real coverage, measured as households that actually receive a service, at approximately 50%. Access to trash collection service is much lower in secondary cities and rural areas.

Household waste collection services consist of door-to-door collections (predominantly in areas with sufficient road networks) and communal collection points in low-income areas or areas with limited road networks (Mucyo, 2020). The services are provided by private companies through service contracts with local governments. Households pay a collection fee for these solid waste collection services.

Sorting and recycling of MSW at collection and disposal sites is carried out by waste collection and management companies. A small fraction of recyclable plastics is also collected from households and business properties by informal collectors, then transported to neighboring countries, or sold to local markets, by middlemen (Mucyo, 2020). However, data on recycling are scarce, fragmented, and varied. The national recycle rate was estimated between two percent (Rwanda Environment Management Authority, 2018) and 10 percent (in cities such as Kigali) of MSW (Rajashekar et al, 2019).

Open dumps are a common final disposal solution in Rwanda. In Kigali, MSW collected by the city was predominantly disposed of at Nyanza landfill which, was closed in 2011, and Nduba landfills, which is currently Kigali's only landfill site, and began to receive MSW starting in 1983 (Rajashekar et al. 2019).

Plastic waste data are poor by city. Available SWM studies on Kigali suggest that plastics account for 1.5 to 7 percent of the total solid waste generated in the city. The city of Muhanga generates 4.38 kg of plastic per capita per year whilst Huye City generates 20.44 of kg plastic per capita per year (Global Green Growth Institute, 2019). The big variation between the two secondary cities is hard to justify. The average plastic waste per capita per year in the neighboring countries of Tanzania and Kenya is reported at 6-7 kg[5] which seems more realistic for Rwanda. If 6 kg per capita per year were assumed as the national average of Rwanda, the annual total of plastic waste produced in the country would be about 75,000 tonnes.

PET bottles are collected in Rwanda; however, no domestic recycling facility exists for PET bottles. Collected PET bottles (estimated to be in the region of 100,000 bottles used daily), are crushed and sold to recyclers in Uganda, Kenya, Tanzania and, until recently, China (Rajashekar et al, 2019), which would be considered a significant loss of a valuable recycled material. According to stakeholder input to the study, the government has recently taken action to eradicate the use of PET bottles entirely, through the Law No. 17/2019 Plastic bag and single use plastic ban (discussed further in Section 4.4).

The country's low recycling rates are in contrast with government targets to recycle 30 percent of non-organic solid waste by 2019/2020 (Rajashekar et al, 2019). As Rwanda has banned various plastic products, the volume of recyclable plastics (and therefore the share of plastic) will decline. This 30 percent target should not be the only measure of success. Elimination of plastic waste would be even better.

The National Strategy for Transformation (2018-2024) envisions waste management through a lifecycle perspective that will see a rise of "the resource management contracting" business model; a model that seeks to incentivize innovation in the redesign of product and service combinations between businesses and their suppliers, thus driving the circular economy (Mucyo, 2020). However, no data were found to explain how this has been implemented, or what results are emerging as a direct consequence of the National Strategy for Transformation.

3.5 Plastic pollution risks and impacts in Rwanda

Pollution from plastics has been a public concern in Rwanda for years. Prior to implementing the waste management laws and policies studied in the report, most solid waste, including plastic waste, was unsafely disposed of, including littering or open burning. Plastic bags and plastic litter were prevalent across the nation's streets and fields and known to cause blockages in drainage systems and water treatment plants (Hardin, T., 2018).

[5] From One World in Data at https://worldpopulationreview.com/country-rankings/plastic-pollution-by-country

Plastics represent approximately 17 percent of electronics (Republic of Rwanda, 2015a). According to the National E-Waste Management Strategy for Rwanda (2015a), the plastic components of electrical and electronic equipment were disposed of at dumpsites or burnt. Oxidation of plastics occurs during disposal and burning, releasing persistent toxic pollutants such as dioxins and furans, that present a risk to human health and environmental systems (Republic of Rwanda, 2015b).

Stakeholder engagement has identified the range of risks which plastic pollution posed to the nation including pollution of drainage systems, water bodies, drinking water sources, greenspaces and the natural environment, soil contamination by hazardous plastics, amenity and land value losses, and health risks to humans and domestic animals. However, no published data was found to quantify the extent of the impacts of plastic pollution on health, the natural environment, and local economies.

4 Overview of Institutional, Regulatory, and Policy Frameworks Regarding Plastic Waste Management in Rwanda

This chapter presents findings regarding Rwanda's institutional, regulatory, and policy responses to plastic pollution including a summary of organizational arrangements in Rwanda for waste management and an overview of the policies related to plastic pollution control.

4.1 Organizational structure for SWM

The management of plastic pollution is commonly an extension of a country's SWM. Rwanda's government structure for SWM consists of policy making institutions, implementing agencies and entities, and regulatory preparation and enforcement authorities. Key government agencies and their role are illustrated in Table *4-1* below.

Table 4-1. Governmental structure for solid wastes management in Rwanda

Legislation	Policy, strategy, and planning	Regulation/standard and enforcement	Implementation
Parliament	MININFRA MOE MINALOG MINICOM	RURA RSB REMA RFDA	WASAC Local government units (e.g., environment and public health departments of cities and districts)

Source: Adapted from Rajashekar et al., 2019.

The Ministry of Infrastructure (MININFRA) and Ministry of Environment (MoE) currently have the overall oversight of SWM and is responsible for planning, strategy preparation, policy and legislation development with contributions from the Ministry of Local Governments (MINALOC), Ministry of Health (MoH), Ministry of Commerce (MINICOM), Rwanda Environment Management Authority (REMA) and Districts (MININFRA 2018; MININFRA 2016). To deliver and enforce the strategy and practices across Rwanda, MININFRA is empowered to introduce regulations with MoE (through its REMA) and MINALOC. The Rwanda Standards Board (RSB) is responsible for developing standards, with inputs from MININFRA, Rwanda Utilities Regulatory Authority (RURA), and REMA. REMA, RURA, and RFDA are the main national bodies with responsibilities to prepare and enforce relevant regulations and standards. MINICOM provides support to waste industry business development including development of incentives and capacity building such as training for resource efficiency.

Solid waste collection services are privatized and delivered by several waste collection companies whose license to operate is provided by RURA. RURA is also responsible for the publication of regulations to which utilities

service providers must adhere. The service providers are contracted and supervised by local government (sector authorities). MINICOM supports business development in waste management industry by creating incentives for recycling and alternatives to disposal and through capacity building initiatives aimed at improving resource utilization efficiency and waste recycling.

REMA is also responsible for safeguarding the environment and supports MININFRA to assess any applications for new technology or waste infrastructure. Water and Sanitation Corporation (WASAC), which is under MININFRA, has the mandate to guide and supervise the planning, implementation, operations, and maintenance of the SWM infrastructure and services which are under cities or districts (Rajashekar et al, 2019). Awareness raising, marketing and enforcement campaigns are undertaken by the Districts, RURA and MoE/REMA, with the latter providing technical supports.

Development of plastics policy is a multi-agency effort and no one agency has overall authority, or responsibility, for plastic production and plastic pollution control in Rwanda. Existing policies were introduced by MININFRA, MoE, and MINALOC, however policy implementation relies on support of relevant agencies and local governments.

4.2 Regulatory and policy framework for waste management

Rwanda has several national policies and laws that allude to the importance of sound waste management in Rwanda, but none focused exclusively on SWM. SWM has traditionally been considered as part of the water and sanitation sector, but the conflation of solid waste with sanitation (liquid) waste arguably undermines the strategic importance of the SWM sector in reducing pollution including plastic pollution, amongst others.

The main policies in which SWM features include the 2004 Sectoral Policy on Water and Sanitation, the 2010 National Policy and Strategy for Water Supply and Sanitation Services, the 2016 Sanitation Policy and the National Policy on Environment and Climate Change of 2019. The 2016 Sanitation Policy establishes the Ministry of Infrastructure (MININFRA) as the lead institution tasked with coordinating inputs from other key ministries, especially environment and health, towards developing an integrated approach for SWM in Rwanda. These policies set high-level goals that focus on topics such as public health, economic development, and environmental protection with the 2016 Sanitation Policy establishing the waste hierarchy as the foundation for prioritizing SWM actions. Issues related to waste, sustainability and climate change are captured in the National Policy on Environment and Climate Change, which promotes circular waste management systems and interventions to encourage innovation and reduce pollution and greenhouse gas emissions.

The first tier in the legislative hierarchy governing SWM is the Organic Law Determining the Modalities of Protection, Conservation, and Promotion of the Environment in Rwanda. It establishes principles as key to conserving environmental and natural resources. The second tier of the legal hierarchy governing SWM consists of the Law on Environment which brings focus on waste management in the realm of conservation and protection of the built environment. The law briefly provides generalities on handling of liquid wastes, solid wastes, hazardous and toxic wastes and guides readers to refer to detailed modalities of management from other existing laws or ministerial orders as well as guidelines prepared by competent authorities. The final tier of legal directives are the elaborated regulations and guidelines that govern the collection, transportation and recycling of wastes including plastic waste and are designed by RURA, REMA and Municipalities in the interest of their responsibilities and mandates. In 2021, the MININFRA and other relevant agencies, with the financial support of the World Bank, drafted the first national strategy for integrated SWM. The strategy was validated in early 2022 and is pending final approval from the government.

4.3 Overview of laws and policies regarding environmental protection, SWM, and plastic pollution control

This study identified a range of different types of policies and measures used for the management and reduction of plastic pollution. This section summarizes how these policies interact in Rwanda. Each policy reviewed in this section directly or indirectly influences the management of plastics within Rwanda.

As introduced in Section 2.3, policy instruments for plastic pollution management can be categorized into command-and-control (e.g., bans and standards) and market-based instruments (e.g., taxes, fees, and subsidies) as well as other instruments for behavioral changes, governance, and financing. Rwanda has introduced a number of C&C and MBIs such as bans, taxes and subsidies and also adopted other measures for public behavioral changes and governance improvement through national laws. Figure 4-1 below lists specific policy instruments introduced by stage of value chains. It provides a clear indication of how they collectively and individually influence the plastics value chain in Rwanda.

An implementation timeline for the identified policies and laws is further outlined in Figure 4-1. The **bolded** policies are taken forward for investigation in this study.

Figure 4-1. Policy implementation timeline

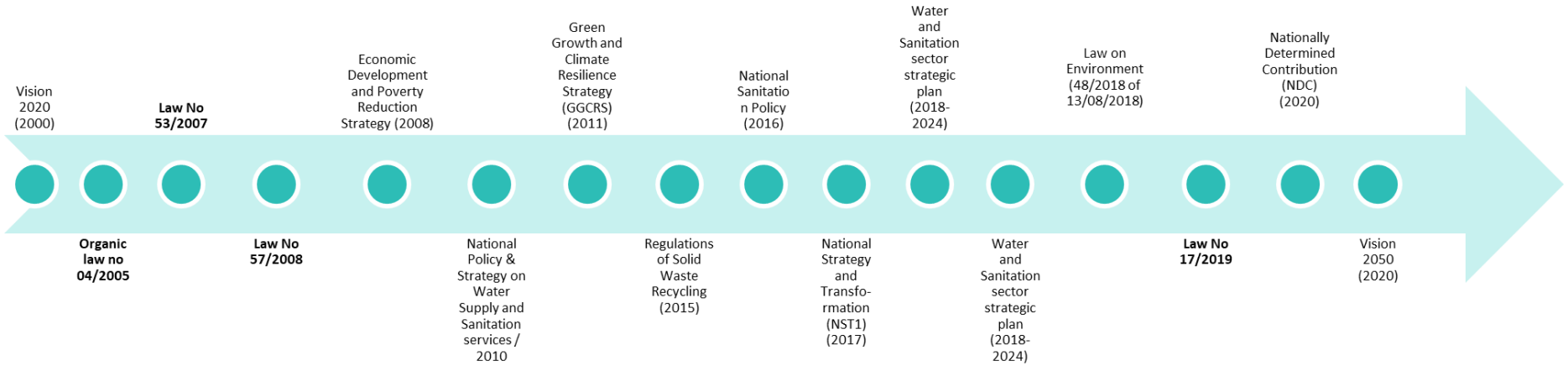


Table 4-2. Categorization of plastic pollution measures used in Rwanda

Type of measure	Applicability across plastics value chain					List of laws/policies
	Import	Production	Use	Waste management	Littering & pollution	
Taxes & fees	Yes	Yes	Yes	Yes	Yes	• Law No. 57/2008 of 10/09/2008 relating to the Prohibition of Manufacturing, Importation, Use and Sale of polythene bags in Rwanda • Law No. 17/2019 on the Prohibition of Manufacturing, Importation, Use, and Sale of Polyethylene Bags and Single-use Plastic Items • Organic Law No. 04/2005 of 08/04/2005 Determining the Modalities of Protection, Conservation, and Promotion of the Environment in Rwanda (2005)
Subsidies	Yes	Yes	-	Yes	-	• Law No. 57/2008 of 10/09/2008 relating to the Prohibition of Manufacturing, Importation, Use and Sale of polythene bags in Rwanda • Law No. 17/2019 on the Prohibition of Manufacturing, Importation, Use, and Sale of Polyethylene Bags and Single-use Plastic Items • Organic Law No. 04/2005 of 08/04/2005 Determining the Modalities of Protection, Conservation, and Promotion of the Environment in Rwanda (2005) • Law No. 53/2007 of 17/11/2007 Establishing Community Works in Rwanda (Umuganda)
Bans & standards	Yes	Yes	Yes	Yes	Yes	• Law No. 57/2008 of 10/09/2008 relating to the Prohibition of Manufacturing, Importation, Use and Sale of polythene bags in Rwanda • Law No. 17/2019 on the Prohibition of Manufacturing, Importation, Use, and Sale of Polyethylene Bags and Single-use Plastic Items • Organic Law No. 04/2005 of 08/04/2005 Determining the Modalities of Protection, Conservation, and Promotion of the Environment in Rwanda (2005) • Law No. 53/2007 of 17/11/2007 Establishing Community Works in Rwanda (Umuganda)
Governance	-	Yes	-	Yes	Yes	• Law No. 57/2008 of 10/09/2008 relating to the Prohibition of Manufacturing, Importation, Use and Sale of polythene bags in Rwanda • Law No. 17/2019 on the Prohibition of Manufacturing, Importation, Use, and Sale of Polyethylene Bags and Single-use Plastic Items • Organic Law No. 04/2005 of 08/04/2005 Determining the Modalities of Protection, Conservation, and Promotion of the Environment in Rwanda (2005) • Law No. 53/2007 of 17/11/2007 Establishing Community Works in Rwanda (Umuganda)
Behavior Change	Yes	Yes	Yes	Yes	Yes	• Law No. 57/2008 of 10/09/2008 relating to the Prohibition of Manufacturing, Importation, Use and Sale of polythene bags in Rwanda • Law No. 17/2019 on the Prohibition of Manufacturing, Importation, Use, and Sale of Polyethylene Bags and Single-use Plastic Items • Organic Law No. 04/2005 Protection, Conservation, and Promotion of the Environment Law No. 53/2007 (Umuganda)

The management of plastic pollution in Rwanda falls within a wider national policy and regulatory framework and strategies which sets the foundation for the management of wastes. The study first identified and briefly described the following policies., laws and strategies which provide a general base for waste management in Rwanda. These government documents were only briefly described below due to the limited direct impact they brought to the management of plastics in the country.

- **Vision 2020 (2000)** is a national strategy developed with six pillars for reconstruction of the nation. With regard to solid waste management, emphasis is on town and country planning and development of basic infrastructures where rural and urban development should include it. Several other policies were developed to support waste management including environment policy, the organic law of 2004, and water and sanitation policy. Vision 2020 aims to ensure that rural and urban areas have sufficient sewage and disposal systems, that each town is equipped with treatment and compressing unit for solid wastes, and that households practice waste disposal measures such as the separation of wastes and avoidance of burning wastes (Resource Efficient and Cleaner Production Programme of Rwanda, 2011).
- **The Economic Development and Poverty Reduction Strategy (2008)** supports Vision 2020; aims to extend the collection of waste to more households.
- **National Policy & Strategy on Water Supply and Sanitation services (2010)** draws greater focus on urban sanitation, defining a policy framework to support the Kigali City masterplan. The policy aimed to increase the percentage percent of domestic non-organic waste disposed properly by 10 percent each year to 70 percent by 2014/15 (United Nations Development Programme, 2013).
- **Rwanda Green Growth and Climate Resilience: National Strategy for Climate Change and Low Carbon Development (2011)** aims to guide national policy and planning in an integrated way, mainstream climate change into all sectors of the economy, and position Rwanda to access international funding to achieve climate resilience and low carbon (MINIRENA, 2011).
- **Regulations Governing Solid Waste Recycling in Rwanda (2015)** provide the regulatory framework for the design, installation and operations that recycle, compost or convert solid wastes in Rwanda. The regulations aim to protect the environment and public health and, to encourage the diversion and recovery of recyclable materials.
- **National Sanitation Policy (2016),** and its implementing framework approved by the cabinet December, outlines initiatives to overcome challenges and exploit existing opportunities in an integrated manner and will effectively contribute towards achieving the goals of the National Development Agenda, 2016 (MININFRA, 2016).
- **Law on Environment (48/2018 of 13/08/2018)** brings focus on waste management in the area of conservation and protection of the built environment. The law provides generalities on handling of liquid wastes, solid wastes, hazardous and toxic wastes.
- **Water and Sanitation Sector Strategic Plan 2018-2024** set out strategic objectives for sanitation services whereby 80 percent of domestic solid wastes are to be recycled, reused or disposed in the urban and peri-urban areas while 50 percent of e-waste is to be recycled and turned into usable materials (MININFRA, 2018).
- **Updated Nationally Determined Contribution (NDC) (2020)** serves as a blueprint for advancing targeted and measurable climate action in key sectors. The document will also serve to guide coordinated responses for both government agencies as well as international organizations, NGOs, civil society, and community-based organizations**.** The NDC was approved in May 2020 (Ministry of Environment, 2020).

- **Vision 2050 (2020)** continues the Vision 2020 with a target for Rwanda to be a developed climate-resilient, low-carbon economy by 2050 (MINIRENA, 2011)

In addition to the above, the following additional two national laws are considered second tier policies. Although they do not specifically focus on plastics, they play a key role in nurturing the systems, culture, and behaviors towards the management of wastes and plastics. Therefore, these laws are also reviewed and assessed in the study.

- **Organic Law No. 04/2005 of 08/04/2005 Determining the Modalities of Protection, Conservation, and Promotion of the Environment in Rwanda** (2005) which creates the legal framework for all waste management activities in Rwanda.
- **Law No. 53/2007 of 17/11/2007 Establishing Community Works in Rwanda** (2007), which governs Umuganda, a monthly community work including community cleanup, and is the first such national action. The law is later under Prime Ministerial Order Number 58/03, 2009.

Further review identified the following two important national law that direct Rwanda's approach to the management of plastic waste and pollution:

- **Law No. 57/2008 of 10/09/2008 Relating to the Prohibition of Manufacturing, Importation, Use and Sale of Polythene Bags in Rwanda** (2008). The law prohibits the manufacture, use, import and sale of polythene bags in Rwanda. This law was built upon an earlier instruction, in 2004, that was issued by the Minister of Land, Environment, Forestry, Water, and Natural Resources banning importation and manufacture of limited plastic bags. In contrast to law 57/2008 of 10/09/2008 which targets all Rwandans, the earlier instruction was directed at manufacturers, distributors and traders and was critiqued for having limited powers and influence.
- **Law No. 17/2019 Relating to the Prohibition of Manufacturing, Importation, Use and Sale of Plastic Carry Bags and Single-Use Plastic Items** (2019). The law repeals and expands the law No 57/2008 beyond polythene bags by prohibiting the manufacturing, use, importation, and sale of plastic carry bags and single-use plastic items.

4.4 Overview of plastics policies/laws in Rwanda

As identified above, there are four national laws that are strongly related to Rwanda's approach of managing plastic pollution. Among them, two are generally about environmental management or community clean-up and the other two directly guide plastic product and plastic waste management. The overview of each of them is summarized in chronological order in Table 4-3. Summary of national laws related to plastic pollution control in Rwanda

Table 4-3. Summary of national laws related to plastic pollution control in Rwanda

Policy name	Standardized policy summary
Organic Law No. 04/2005 of 08/04/2005 Determining the Modalities of Protection, Conservation, and Promotion of the Environment in Rwanda	• **Target areas**: Indirectly related to plastic use, waste management, litter, and pollution. • **General principles**: The objective of Organic Law No. 04/2005 of 08/04/2005 was to create a legal framework for waste management activities in Rwanda. The Organic Law sets out principles for the protection of the environment by installing responsible waste collection services to deter littering, landfill and burning of wastes. The policy also sought to promote natural resources, social welfare, and sustainable development whilst preventing environmental degradation. • **Exemptions**: Not applicable. • **Applicability**: Applies to whole country. • **Enforcement**: Fines can be issued ranging from US$ 10 (ten thousand Rwandan francs (RWF[6])) to US$ 10,068 (10,000,000 RWF) for poor management of wastes. The Law includes provision to fine anyone burning plastic materials between US$ 10 (10,000 RWF) and US$ 50 (50,000 RWF) • **Monitoring, targets, timeline**: The Law provides the lines of responsibility and legal limitations to ensure effective control, monitoring, inspection and prosecution of environmental crimes. The government aims to properly dispose of 60 percent of domestic waste by 2019/2020 and 80 percent of waste by 2029/2030 with an additional target to recycle 30 percent of non-organic solid waste by 2019/2020 and 40 percent by 2029/30. • **Type of policy:** Governance. Targets, Transparency and Reporting, Consumer Education Campaigns.
Law No. 53/2007 of 17/11/2007 Establishing Community Works in Rwanda	• **Target areas**: Indirectly related to Plastic use, waste management, litter, and pollution. • **General principles:** This provides the institutional structure surrounding the nationwide community clean-up and engagement programme. Umuganda takes place on the last Saturday of every month from 8:00am until 11:00am**.** • **Applicability**: Applies to the whole country. All able residents between the ages of 18 and 65 participate. People over the age of 65 can also take part should they wish to. Expatriates are also encouraged to participate in Umuganda. • **Enforcement**: Umuganda is coordinated by the General Directorate in charge of Social Welfare and Community Development in MINALOC. Residents are encouraged to participate however this is not enforced. But Rwandans who fail to participate in the clean-up can be fined. • **Monitoring, targets, timeline**: Not applicable. • **Type of policy:** Consumer Education Campaigns.

[6] RWF is the currency accepted code for the Rwandan franc.

Policy name	Standardized policy summary
Law No. 57/2008 of 10/09/2008 Relating to the Prohibition of Manufacturing, Importation, Use and Sale of Polythene Bags in Rwanda	• **Target areas**: Plastic manufacture, import and use, waste management, litter, and pollution. • **General principles**: The law introduces an absolute prohibition of polythene bag manufacturing, usage, importation, and sale in Rwanda. • **Exemptions**: The law allows for limited exceptions. Plastic bags are allowed to remain in place in food preparation and handling facilities only where no alternative product can be used. • **Applicability**: Applies to whole country. • **Enforcement**: Powers of control on polythene bag uses the judicial police, customs authorities, REMA, the Rwanda Bureau of Standards, security bodies and local authorities. Fines and prison sentences can be imposed upon offenders. • **Monitoring, targets, timeline**: No specific targets are outlined in the law. Rwanda is committed to having no plastic bags manufactured, imported, used or sold without prior authorization. • **Type of policy:** Plastic tax, Product restrictions and bans, Targets, Transparency and Reporting.

Law No. 17/2019 Relating to the Prohibition of Manufacturing, Importation, Use and Sale of Plastic Carry Bags and Single-Use Plastic Items	• **Target areas**: Plastic manufacture, import and use, waste management, litter, and pollution.
	• **General principles**: Law No. 17/2019 builds on the principles of Law No. 57/2008 by extending the prohibition of manufacturing, importation, use and sale of polythene bags in Rwanda to also include all single-use plastic items and provides definition of what constitutes a single use plastic item. The law also imposes a levy on imported consumer goods packaged in single-use plastics.
	• **Exemptions**: Article 4 of the law stipulates those exemptions may be granted following an application to the competent authority. Exemptions are available for those involved in the manufacture, use, import or sale of single-use plastic items. Authorization can also be sought for the manufacturing, importation, use and sale of home compostable plastics and woven polypropylene. Authorization to use single-use plastics may be granted where all of the following conditions are met:
	  ◦ The product is made in Rwanda.
	  ◦ The product has no alternatives to plastics as a packaging material on the local or international market.
	  ◦ The quality of the product is negatively and directly impacted by the absence of plastic packaging.
	• **Applicability**: Applies to whole country.
	• **Enforcement**: The law is enforced by the Rwanda National Police, the Institution in charge of Customs, the Rwanda Investigation Bureau, REMA, the Rwanda Standards Board, the Rwanda Inspectorate, Competition and Consumer Protection Agency, and administrative decentralized entities. The authorities carry out regular checks and inspections as well as targeted inspection. Enforcement of the law is also enabled by awareness raising campaigns which keep the public informed on prohibitions.

Policy name	Standardized policy summary
	• **Monitoring, targets, timeline**: No specific targets are outlined in the law. The law provided a transitional period. Existing factories manufacturing single-use plastic items must comply with the provisions of the law within two years from publication which occurred on 10th August 2019. • **Type of policy:** Plastic tax, Product restrictions/bans, Consumer education campaigns, Targets, Transparency and Reporting

5 Assessment of the Policy Responses to Plastic Waste Management in Rwanda

This chapter assesses the effectiveness of select policies in plastic waste management. It first presents the methods adopted for the assessment and then the results of the assessment by individual policy and of the overall policy framework. An analysis of the strengths, weaknesses, opportunities, and threats (SWOT) is presented at the end of this chapter to help understand the barriers and opportunities in developing and implementing effective plastics policy package in Rwanda.

5.1 Methods for assessing plastics policies

An ex-post analysis of select policies regarding plastic waste management was conducted to assess policy effectiveness in plastic waste management in Rwanda. The ex-post analysis first collected and processed the information and data regarding plastics policies through literature review, policy review and screening, and stakeholder inputs through targeted interviews and consultation. It then developed a method to evaluate policy effectiveness through a set of evaluation questions/indicators covering efficacy, efficiency, sustainability, social acceptability, scalability, etc. Each policy was assessed quantitatively (wherever possible) and qualitatively by a list of evaluation indicators, see Table *5-1*, against its intentions for plastic waste management described in previous chapter and baseline conditions.

Table 5-1. Evaluation indicators used to assess the policies

Impacts on the environment
● Materials: Change in plastic consumption
● Materials: Change in plastic recycling rates
● Environmental pollution: Change in quantity of plastic litter in drainage systems, watercourses, aquatic environment
2a Economic robustness
● Evidence of economic benefits
● Net economic benefit
2b Financial viability
● Financial impact to government & regulators
● Financial impact to citizens / consumers
● Financial impact to businesses
3. Institutional and administrative feasibility, social acceptability, political economy
● Evidence of clear responsibilities for management of plastic pollution
● Evidence of a legislation supporting implementation of policy objectives
● Evidence of enforcement of legislation
● Evidence of a policy framework for managing plastics
● Evidence of monitoring, reporting and evaluation of the impact of policy and legislative measures
4. Ancillary (Social) impacts
● Evidence of impacts of policies on health and/or safety of particular groups
● Evidence of impacts of policies on jobs
● Evidence of impacts of policies on social equality and inclusion aspects such as gender equality, socio-economic improvement
5. Scalability, replicability, sustainable market creation
● Evidence of replicability of policies to other polymers or products
● Evidence of scalability of policies to national level
● Evidence of transfer of skills, infrastructure and/or experience from the policies to other waste / plastic products
● Evidence of growth of relevant market segments (e.g. plastic recycling, alternative products/ materials)

The list of evaluation indicators was developed by the World Bank and Wood PLC for 3P ASA and applied to its ex-post policy analysis of ten country case studies including this one for Rwanda. The details of these indicators with standardized rating are provided in Annex 1.

5.2 Assessment of core plastics-related policies

The four plastics-related national laws, reviewed in Section 4.4, are assessed individually according to the above evaluation themes and indicators. The assessment results of each individual policy, in chronological order, are summarized below.

Organic Law No. 04/2005 of 08/04/2005 Determining the Modalities of Protection, Conservation, and Promotion of the Environment in Rwanda

The Organic Law No. 04/2005 creates the legal framework for all waste management activities in the country. The results of the assessment are summarized in Table *5-2*. The assessment concludes that **the law is on trend to meet its objectives**.

Table 5-2. Assessment of the Organic Law No. 04/2005

Evaluation question	Indicators		Overall rating
1. Environmental effectiveness			
1.1 Have objectives been achieved?	a	Materials: Change in plastic consumption	**No information available. The law itself does not directly link to plastic consumption and waste.**
	b	Materials: Change in plastic recycling rates	**Moderate positive impact.** According to the literature, the law achieved an estimated 88 percent coverage across the city of Kigali for waste collection services. Stakeholders interviewed further indicated that the introduction of waste collection systems (at households, communal collection points and from business premises) have increased the rate of plastics collected and recycled compared to the time before such collections took place, however no before and after data were available to make a formal assessment.
	c	Environmental pollution: Change in quantity of plastic litter in drainage systems, watercourses, local marine environment	**No quantitative information available.** But it is expected that the introduction of waste collection systems has reduced the quantities of litter entering natural environment, especially drainages and waterways.
2. Economic and financial impacts (positive and negative)			
2a Economic robustness			
2.1 Have there been significant/measurable economic costs and/or benefits?	A	Qualitative identification of significant economic benefits	**No quantitative information available but the existence of economic benefits owing to improved pollution management is expected.** The benefits include avoided costs from not appropriately collecting and disposing plastic waste, such as health costs from blocked drains and an environment polluted by plastic waste litter and the open burning of trash, tourism losses and the loss of other business investment opportunities due to dirty and unattractive cities, and the transaction cost of waste removal and disposal.
	b	Net economic benefit	**No cost-benefit information available but improving waste collection and reduction in**

Evaluation question	Indicators		Overall rating
			principle generates net benefit to beneficiaries as described above.
2b Financial viability			
2.2 What are the financial costs / benefits at the individual/ actor level?	a	Financial impact to government & regulators	**High negative impact.** Increased financial responsibility for pollution management by the government. Kigali city, for example, manages to recover only 23.3 percent of its budgeted landfill costs indicating high financial costs to the government for SW collection and disposal.
	b	Financial impact to citizens / consumers	**Moderate negative impact.** There is a moderate waste collection fee in place in Rwanda to finance waste collection services; it is set according to the income level of each household. According to stakeholder input, low-income and very low-income communities can be exempt from the fee and still have their waste collected. No data could be found to determine the precise costs upon citizens / consumers however the flexible charging mechanism suggests there is only a moderate negative impact.
	c	Financial impact to businesses	**Moderate negative or positive impact.** Business sector involving in plastic waste pays a fee to pay for waste collection services however data were not available to quantify the overall impact to businesses. Little is reported on the overall effects of the policy on the growth of the waste management industry. But generally speaking, plastic waste control will have a positive impact on waste recycling and the waste management industry.
3. Institutional and administrative feasibility, social acceptability, political economy			
3.1 What is the institutional structure & government mandate?	a	Evidence of clear responsibilities for management of plastic pollution	**Clear lines of responsibility established.** The law set the responsibilities for each party including the establishment of REMA to coordinate and oversee environmental management for sustainable development, as well as the National Fund of the Environment in Rwanda to oversee financial regulation of the sector.
3.2 What is the regulatory and policy framework for managing plastic pollution?	a	Evidence of a legislation supporting implementation of policy objectives	**Legislation in force.**
	b	Evidence of enforcement of legislation	**Multiple examples and evidence exist over years.** The law includes provision to undertake property inspections and to fine anyone burning plastic materials, or dumping wastes, with fines ranging from one million to five million Rwandan francs and an imprisonment ranging from six months to two years or one of these two penalties.
3.3 How are the policies monitored, reported on & evaluated?	a	Evidence of monitoring, reporting and evaluation of the impact of policy and legislative measures	**Some/ partial monitoring, reporting, evaluating.** Some monitoring data were available on waste management, however overall monitoring of waste management sites is limited and inadequate.
4. Ancillary (Social) impacts			
4.1 Have the policies had any negative or positive social impacts?	a	Evidence of the impacts of policies on health and/or safety of particular groups	**No information available but improved waste collection is supposed to benefit public health.**

Evaluation question	Indicators		Overall rating
	b	Evidence of the impacts of policies on jobs	**Moderate positive impact.** The introduction of waste collection and recycling services has created employment opportunities.
	c	Evidence of the impacts of policies on aspects such as gender equality, socio-economic improvement.	**No information available.**

Law No. 53/2007 of 17/11/2007 Establishing Community Works in Rwanda

The Law No. 53/2007 establishes Umuganda, a monthly community work for all adult citizens. Although the scope of Umuganda is broad; covering cleaning, erosion control, tree planting, infrastructure development and maintenance, Umuganda activities contribute to 56 percent of clean environment sites (RGB, 2017). The Ministry of Local Government (MINALOC) indicates that participation in Umuganda is high among Rwandans (average of 91.3 percent of those qualified adults nationwide in 2015-2016) and continues to be popular with the number of participations increasing by 3.5 percent between 2013 and 2016 (Rwanda Governance Board, 2017a).

The results of the assessment of the law (and later Prime Ministerial Order Number 58/03, 2009) is summarized in Table *5-3*. It concluded that **the law has broadly met its objectives**.

Table 5-3. Assessment of the Law No. 53/2007 on Umuganda

Evaluation question	Indicators		Overall rating
1. Environmental effectiveness			
1.1 Have objectives been achieved?	a	Materials: Change in plastic consumption	**The law has little to do with plastic consumption.**
	b	Materials: Change in plastic recycling rates	**No information available, but community cleanup contributes to waste collection and should help improve plastic waste collection and recycling.**
	c	Environmental pollution: Change in quantity of plastic litter in drainage systems, watercourses, local marine environment	**Significant decrease** Umuganda has reduced plastic litter in water treatment plants – preventing contamination or blockages of water resources – while also reducing microplastics.
2. Economic and financial impacts (positive and negative)			
2a Economic robustness			
2.1 Have there been significant/measurable economic costs and/or benefits?	a	Qualitative identification of significant economic benefits	**High positive impact anticipated** According to stakeholder engagement and feedback, Umuganda has reduced the government's spending on litter clean-up although no data are available to quantify this. Overall Umuganda activities are believed to have an estimated economic value of up to US$ 200 million from solid waste cleanup, a portion of which naturally contributes to mitigate the impacts of plastic pollution through litter clean-up exercises, although it is hard to split waste mitigation benefits into plastic litter cleanup and other wastes.
	b	Net economic benefit	**No cost-benefit data available.** But as above it is anticipated that this policy has a high positive net economic benefit because reduced pollution costs are achieved largely by voluntary community services.
2b Financial viability			
2.2 What are the financial costs /	a	Financial impact to government & regulators	**Moderate negative impact.**

Evaluation question	Indicators		Overall rating
benefits at the individual/ actor level?			Organizing Umuganda incurs some public budgets from the government to cover some equipment and material costs for cleaning up wastes including plastic waste. But its financial cost is relatively small since communities provide free labor costs to clean up their communities.
	b	Financial impact to citizens / consumers	**Moderate negative impact.** Because the contribution of participants is a 3-hour labor time per adult in a monthly Sunday morning, the equivalent opportunity cost to each person is small and largely affordable to residents.
	c	Financial impact to businesses	**No information available to** evaluate the impact on businesses.
3. Institutional and administrative feasibility, social acceptability, political economy			
3.1 What is the institutional structure & government mandate?	a	Evidence of clear responsibilities for management of plastic pollution	**Clear lines of responsibility established.** Stakeholder engagement indicated that clear lines of responsibilities exist between communities/citizens and governmental bodies.
3.2 What is the regulatory and policy framework for managing plastic pollution?	a	Evidence of a legislation supporting implementation of policy objectives	**Legislation in force.**
	b	Evidence of enforcement of legislation	**Existence of evidence.** The authorities do encourage residents to participate and residents who refuse to do so without valid reason may face fines.
3.3 How are the policies monitored, reported on & evaluated?	a	Evidence of monitoring, reporting and evaluation of the impact of policy and legislative measures	**Some/partial monitoring, reporting, evaluating.** The government produces an annual report with estimates on the rate of participation and the value of the work undertaken (MINALOC, 2016) however this report appears to be published on an ad hoc basis.
4. Ancillary (Social) impacts			
4.1 Have the policies had any negative or positive social impacts?	a	Evidence of impacts of policies on health and/or safety of particular groups	**Positive impact.** Umuganda has improved environmental quality in communities and therefore human health through the reduction of plastic litter which eventually break into microplastics in soils, and then affect human health. This has not been quantified however.
	b	Evidence of impacts of policies on jobs	**No information available.**
	c	Evidence of impacts of policies on aspects such as gender equality, socio-economic improvement	**Positive impact.** Through Umuganda, communities and residents including women have a chance to participate in and contribute to community activities and have their voices and needs heard by the government. Umuganda helps the governments to building public consensus and support to community development and cleanup.

Law No. 57/2008 Relating to the Prohibition of Manufacturing, Importation, Use and Sale of Polythene Bags in Rwanda

The Law No. 57/2008 bans the manufacturing, importation, use and sale of polythene bags in Rwanda. As the trade data shown in Chapter 3, the import of polyethylene sacks, bags, and cones begun to drop sharply in 2004 when Rwanda introduced its public education campaign to prepare banning polyethylene bags, from 1,092 tonnes in 2003 to just 18 tonnes in 2006. Although the import bounced back a bit after, the import level remained low at some 100 tonnes per year in 2009-2011 and reached 323 tonnes in 2016. Before the implementation of this law, improper disposal of plastic bags led to widespread problems in local drainage

systems. According to stakeholders interviewed in the study, since the implementation of this Law visible plastic bag litter has been significantly reduced in Rwanda.

The introduction of the plastic bag ban did encounter some challenges in public behavioral changes. A three-year transition period was introduced in advance of the ban, to build awareness and support across Rwanda overall. According to stakeholder input, there was early confusion among residents and businesses, who had a limited understanding of the need for the ban to begin with, however the ongoing engagement and awareness initiatives successfully reversed this, with the majority of residents and businesses ultimately on board. The government also undertook multiple awareness raising campaigns for the three years preceding the law's establishment to ensure that the population understood the purpose of the ban, how it would work (and the expectations of citizens), as well as to promote the benefits for the environment and their own health, through reduced contamination in water system and soil quality (according to stakeholder input).

The ban on polythene bags has been successful due to effective enforcement of the law by the government. Enforcement practices include spontaneous inspections of shops and closures and fines for offending businesses. Some 70 to 80 business owners have been jailed for violating the ban although fines are the most common form of prosecution (Dsilva, 2019).

However, the law has some unintended impacts. Since the law prohibits the domestic manufacture, import, use and sale of polythene bags within Rwanda, there has been increased smuggling of plastics bags from nearby countries, such as the Democratic Republic of the Congo (Pilgrim, S. 2016). This is because neighboring countries lack similar plastics bans and there is a weak legal coordination among countries which have promoted free movement of people and goods across their borders. In response, Rwanda has had to introduce stronger enforcement at the border and border control officials have been tasked to catch smugglers and dispose of illicit plastics. The smuggling of plastics can now bring a prison sentence of up to six months (de Freytas-Tamura, 2017) however no data has been found of fines and sentences issued

The plastic bag ban has impacted Rwanda's exporters of fruits and vegetables, who have to import plastics packaging for wrapping and exporting their products. The ban limits their ability to source optimal packaging products. Nevertheless, produce exporters can apply to REMA for an exemption to the ban provided that their reasons for such exemption are reasonable (Ministry of Trade and Industry, 2011).

There is concern that single-use plastic items may merely be replaced with multiple-use plastic following the ban on the former. Indeed, plastic manufacturers have suggested that they will adapt to the new law by focusing on multiple-use plastic production (Mugisha, I. 2019). The impact of this shift is not yet known; multiple-use plastic may simply replace single-use plastic in littering, or it may create positive behavioral changes by encouraging re-use.

Rwandan people now understand that a clean environment can support tourism, which in turn supports the country's economic development. This motivates them to maintain the environment free of plastic bag litter, which encouraged the positive perception and support of the ban. According to stakeholder interviews, Rwandans now reuse a lot of materials such as textile and paper bags, showing a demonstrable behavioral change, with plastics being replaced by alternative materials. Rwanda is considered to be a leader and example in the developing world in implementing plastic bag bans (Kardish. 2014).

The results of the assessment of the law are summarized in Table *5-4*. The assessment concludes that **the law broadly met its objectives**.

Table 5-4. Assessment of the Law No. 57/2008 on Polythene Bags

Evaluation question	Indicators		Overall rating
1. Environmental effectiveness			
1.1 Have objectives been achieved?	a	Materials: Change in plastic consumption	**Decrease in plastic bags indicated** Although no statistical data were available to quantitatively demonstrate the impact of the ban on consumption of plastic bags, stakeholder

Evaluation question	Indicators		Overall rating
			engagement helped confirm that it is now difficult to find plastic bags in circulation in Rwanda and materials such as textile and paper bags are reused. The changes indicate a behavioral change with plastics being replaced by alternative materials.
	b	Materials: Change in plastic recycling rates	**Increase in plastics recycling indicated.** This policy did not aim to adjust plastic recycling rates. However, prior to 2008, there were no businesses recycling plastic. Since the ban, recycling practices of plastic waste began and some studies indicate 70-80% of plastics waste is recycled (Dsilva, 2019).
	c	Environmental pollution: Change in quantity of plastic litter in drainage systems, watercourses, local marine environment	**Significant decrease.** According to stakeholders participating in interviews, the implementation of this Law has helped reduce plastic waste clogged in water treatment systems, however no data is available to quantify.
2. Economic and financial impacts (positive and negative)			
2a Economic robustness			
2.1 Have there been significant/measurable economic costs and/or benefits?	a	Existence of economic benefits	**Positive impact indicated** According to stakeholder input, the government has been able to spend less on street cleaning due to reduced plastic litter. A cleaner and tidier environment, with reduced litter, has shown to have a potential link to improved visitor and tourism numbers. Waste reduction will make operations at existing landfills with the ban last longer than without. However, no data were available to estimate the economic benefits of this policy.
	b	Net economic benefit	**No cost-benefit analysis available.**
2b Financial viability			
2.2 What are the financial costs / benefits at the individual/ actor level?	a	Financial impact to government & regulators	**Moderate negative impact.** About 40 million RWF is spent per year on inspections to ensure compliance with the plastic bags ban.
	b	Financial impact to citizens / consumers	**No information available** to indicate that the ban creates any financial impact on residents.
	c	Financial impact to businesses	**Moderate positive impact.** The ban does not impose costs on businesses in general, and a subsidy is available for businesses that adopt new alternatives. While the ban could negatively impact Rwandan exporters of fruits and vegetables due to a lack of suitable alternative packaging products, the implementation of well-defined and controlled exemptions has helped to limit the financial impact on these businesses and avoid non-compliance.
3. Institutional and administrative feasibility, social acceptability, political economy			
3.1 What is the institutional structure & government mandate?	a	Evidence of clear responsibilities for management of plastic pollution	**Clear lines of responsibility established.**
3.2 What is the regulatory and policy framework for	a	Evidence of a legislation supporting implementation of policy objectives	**This law has been repealed by Law No. 17/2019.** The Law granted powers of control on polythene bag uses to the judicial police, customs authorities,

Evaluation question	Indicators		Overall rating
managing plastic pollution?			REMA, the Rwanda Bureau of Standards, security bodies and local authorities. The Law introduced penalties, ranging from fines to prison sentences.
	b	Evidence of legislation enforcement	**Examples and evidence observed over years.** "Plastic-bag vigilantes" were common in both rural and urban areas and were known to tip off the authorities about suspected sales or use of plastic bags. Offenders, particularly plastic bag smugglers and non-compliant institutions, were made to publicly confess and pay a fine (de Freytas-Tamura, 2017). Site inspections were also undertaken to ensure compliance. However, there was a proliferation of smuggling and illegal activities following the law's introduction (Werft, 2015).
3.3 How are the policies monitored, reported on & evaluated?	a	Evidence of monitoring, reporting and evaluation of the impact of policy and legislative measures	**No information available.** Although there was information issued by the government to track plastic bag use, its quality and robustness has been questionable.
4. Ancillary (Social) impacts			
4.1 Have the policies had any negative or positive social impacts?	a	Evidence of impacts of policies on health and/or safety of particular groups	**Positive impact indicated.** Plastic bags lead to the contamination or blockages of water channels and water treatment plants and produce microplastic contamination of soil and water resources and affect human health. Stakeholder engagement indicated that the ban has led to improved environment and human health through the reduction of plastic bags in water channels and water treatment plants.
	b	Evidence of impacts of policies on jobs	**Moderate positive impact.** Given the government financial supports such as subsidies provided to manufacturers of alternative materials and products in response to the ban on plastic bags, new businesses have emerged across Rwanda, offering alternative biobased products including paper bags, textile bags, and bags made of hemp, papyrus, bamboo etc. As a result, new green jobs were created.
	c	Evidence of impacts of policies on aspects such as gender equality, socio-economic improvement	**No specific information available.** The ban was accompanied by educational interventions including campaigns aimed at teaching children to avoid the use of plastic bags and to appreciate the environment (de Freytas-Tamura, 2017)

Law No. 17/2019 Relating to the Prohibition of Manufacturing, Importation, Use and Sale of Plastic Carry Bags and Single-Use Plastic Items

The Law No. 17/2019 further extends the Law No. 57/2008 to ban plastic carry bags and single-use plastic items. Published on 9 December 2019, the law recognizes that plastic bags have contributed to flooding and reduced agricultural productivity by preventing rainwater from reaching the soil; and that burning plastic contributes to air pollution. The law also states that adopting the expanded single-use plastic ban in 2019 was in recognition that other types of plastics are equally harmful and that the law is "intended to check the increasing habit of unnecessary consumption and disposal of single use plastic items which becomes a burden to the environment." The Law No. 17/2019 repeals and expands upon law No. 57/2008 and makes

Rwanda the first African nation to introduce a comprehensive ban on production, importation, and use of plastic carry bags and single-use plastic items.

Due to its recent implementation and lack of implementation results, it is too early to assess the law's effectiveness. However, the new law was built on Rwanda's successful experience and existing systems to implement the preceding Law No. 57/2008. According to stakeholder consultation, political will to implement the law is strong and political leadership engages heavily with stakeholders across society and industry and listens to their concerns. Confusion, tension and opposition to the law are low and public support is strong.

REMA published specific guidelines for the law in December 2019. Inspections of commercial premises, including seizures of all single-use plastic items from shops, hotels, and restaurants, has supported the law's implementation. A variety of penalties, including fines, imprisonment, and public naming of those who infringe upon the rules, are deployed to those who violate the ban. In addition, the law allows for a brief transition period, exempting single-use plastic items already in stock or ordered for three months. In addition, factories in Rwanda that are manufacturing prohibited items have two years to comply (Art 17) with the law.

The challenges which faced the 2008 Ban (Law. No. 57/2008) still exist. For example, alternative materials may be unsuitable for use with locally sold products, which will cause businesses to continue to risk prosecution by selling products in plastic packaging. Despite these challenges and risks, **the law is anticipated on the right track to meet its objectives**.

5.3 Assessment of Rwanda's policy package for plastic pollution control

This section provides a combined assessment of the plastics-relevant policies outlined above acting together in a policy package. The package is first considered according to the evaluation indicators already explored individually in the previous section, and then looks at the scalability and replicability of the policy package.

Assessment according to the indicators

The combined policies of interest have generated a noticeable positive impact (e.g., environmental, institutional, and social benefits) with an indication of positive economic impacts, despite some identified financial costs to government, residents, and businesses. Table *5-5* summarizes the impacts of the policy package against the list of 20 evaluation indicators, based upon the available evidence.

Table 5-5. Assessment of the combined policy package for plastic pollution control

Evaluation question	Indicators		Overall rating
1. Environmental effectiveness			
1.1 Have objectives been achieved?	a	Change in plastic consumption	**Decrease indicated.** No data were available, however, a decrease in plastic bags consumption was indicated as a result of Law No. 57/2008.
	b	Change in plastic recycling rates	**Significant increase indicated.** According to available data and stakeholder input, Law No. 04/2005 has improved recycling rates with the introduction of plastics recycling collections, however no before and after data were available to make a formal assessment. While Law No. 57/2008 did not aim to adjust plastic recycling rates, following its implementation a reported 70-80 percent of waste plastics are recycled (Dsilva, 2019).
	c	Environmental pollution: Change in quantity of plastic litter in drainage	**Moderate decrease.** Evidence shows that drainage systems are no longer blocked with plastics, stagnant water has reduced, and

Evaluation question	Indicators		Overall rating
		systems, watercourses, local marine environment	fewer diseases are stemming from blockages and resulting stagnant water (DW News, 2018)
2. Economic and financial impacts (positive and negative)			
2a Economic robustness			
2.1 Have there been significant/measurable economic costs and/or benefits?	a	Qualitative identification of significant economic benefits	**Moderate positive impact.** According to stakeholder input, the government has reduced expenditures on street cleaning. A cleaner and tidier environment, with reduced litter, has shown to have a potential link to improved visitor and tourism numbers. Waste reduction will make operations at existing landfills with the ban last longer than without. However, no data were available to substantiate the policy's economic benefits.
	b	Net economic benefit	**No information available.** There is insufficient data to evaluate the net economic benefit of the plastics policies.
2b Financial viability			
2.2 What are the financial costs / benefits at the individual/ actor level?	a	Financial impact to government & regulators	**High negative impact.** According to Rajashekar et al. (2019), the city of Kigali recovers only 23.3 percent of budgeted landfill costs and 12.3 percent of actual costs incurred, meaning the government continues to subsidize poor waste management practices like landfill. Law 53/2007 is believed to have cost the Government of Rwanda US$ 49.8 million (49.4 billion RWF). For the plastic bag ban, according to stakeholder input, US$ 40,400 (40 million RWF) is spent annually on-site inspections for the plastic bags ban.
	b	Financial impact to citizens / consumers	**Moderate negative impact.** Rwanda has a waste collection fee in place in to finance waste collection services; it is set subject to the income level of each household. However, it is not known if the total fees collected cover the costs of the collection services.
	c	Financial impact to businesses	**Moderate negative impact.** There is a waste fee in place in Rwanda to finance waste collection services which also applies to business properties; however data were not available to quantify the overall impact to businesses. The ban does not impose costs upon businesses, and support is available for businesses to adopt new alternatives.
3. Institutional and administrative feasibility, social acceptability, political economy			
3.1 What is the institutional structure & government mandate?	a	Evidence of clear responsibilities for management of plastic pollution	**Clear lines of responsibility exist.**
3.2 What is the regulatory and policy framework for managing plastic pollution?	a	Evidence of a legislation supporting implementation of policy objectives	**Legislation in force.** This includes legislation allowing inspectors to enter business premises to ensure compliance, and to remove any items that do not comply with the legislation i.e., plastic bags or single-use plastic items.
	b	Evidence of enforcement of legislation	**Multiple examples and positive evidence of enforcement spanning multiple years.**
	c	Evidence of a policy framework for managing	**Partial policy framework exists.** Plastic single use items and waste management in place, but no supply chain management or polymer ban. Policy

Evaluation question	Indicators		Overall rating
		plastics (*full assessment only*)	framework is supported by clear legislation, roles and responsibilities.
3.3 How are the policies monitored, reported on & evaluated?	A	Evidence of monitoring, reporting and evaluation of the impact of policy and legislative measures	**Some/ partial monitoring, reporting, evaluating.** The quality of data is weak, and limits the ability to monitor, or assess, progress.
4. Ancillary (Social) impacts			
4.1 Have the policies had any negative or positive social impacts?	a	Evidence of a policy's impact on health and/or safety of particular groups	**Positive impact.** Service coverage for waste collection now spans most of the nation which has supported improved approaches to the country's waste management. Stakeholder engagement has indicated that the plastic bag ban is believed to have improved human health through the reduction of plastic bags in water treatment plants – preventing contamination or blockages of water resources. The policies are also believed to have reduced the volume of microplastics ingested by cattle and humans through soil contamination or open burning of plastic waste.
	b	Evidence of a policy's impact on jobs	**Moderate positive impact.** The introduction of recycling and waste management services has introduced employment opportunities and the ban on bags has generated a growth of manufacturers using alternative materials.
	c	Evidence of a policy's impact on outcomes such as gender equality, socio-economic improvement	**No information available.**
5. Scalability, replicability, sustainable market creation			
5.1 Are the policies replicable to other polymers or products?	a	Evidence of replicability of policies to other polymers or products	**Indication of replicability.** Rwanda is now expanding the ban on single-use plastic items
5.2 For sub-national policies, are policies scalable to the national level?	a	Evidence of scalability of policies to the national level	**No information is available.** However, the expansion of the plastic bag ban to now incorporate a ban on single-use plastic items, demonstrates an example of scalability. The success of this, however, is not yet known.
5.3 Has there been a transfer of skills, infrastructure and/or experience from the policies to other plastic streams?	a	Evidence of transfer of skills, infrastructure and/or experience from the policies to other waste streams or other plastic products	**No information is available.** There was insufficient information and no qualitative data identified for this indicator, however it appears that bag manufacturing skills are now being deployed in the manufacture of bags from other materials (stakeholder engagement).
5.4 Have sustainable, commercially viable market segments been established as a result of the policies?	a	Evidence of the growth of relevant market segments (e.g., plastic recycling, alternative products/ materials)	**Positive impact.** The end of tax incentives for plastic manufacturing led to the creation of a market for alternative material products in Rwanda such as paper bags however no data has been found to demonstrate the extent to which this sector has grown (Hardin, 2018). While most plastic materials in Rwanda were previously imported, most of the alternative materials replacing them as a result of the policies are locally manufactured (Twiringire, S. n.d.). According to stakeholder input, small businesses have emerged across Rwanda, offering alternatives as a result of the plastic bag ban, however, subsidies are needed.

Evaluation question	Indicators		Overall rating
			According to the literature, prior to 2008, there were no businesses recycling plastic but in 2019, 14 recycling companies were in operation (Dsilva, 2019). This source further indicated that unverified reports claimed these businesses are now concerned there is not enough plastic waste for them to remain in business.

Scalability and replicability of the policies

Four indicators were used to evaluate the scalability and replicability of the policies:

- *Evidence of replicability of policies to other polymers or products:* there was evidence of replicability. Rwanda has already expanded from a ban on polythene bags to the ban on plastic carry bag and single use plastic items (Law No. 17/2019) following the success of implementing the Law No. 57/2008.
- *Evidence of scalability of policies to the national level:* Insufficient information and no qualitative data were identified for this indicator.
- *Evidence of transfer of skills, infrastructure and/or experience from the policies to other waste streams or other plastic products:* Insufficient information and no qualitative data were identified for this indicator.
- *Evidence of growth of relevant market segments (e.g., plastic recycling, alternative products/ materials):* Insufficient information and no qualitative data were identified for this indicator.

A program of engaging stakeholders has underpinned the government approach of plastic pollution control. Plastics bans were initiated by REMA and then disseminated to the community level. There were communications between all institutions, governmental and non-governmental, to inform society of the upcoming legislation and what must be done to comply. Political leadership has also been important, wherein the government has led by examples of banning single-use plastic bottles from government meetings and events.

Pressure for action within the East African Community (EAC), along with the persistence of the Rwandan government, has motivated discussions across the region to tackle plastic pollution, showing how regional institutions are becoming influential in supporting change and promoting the transfer and implementation of good practices. The officials of other EAC member states have noted that the Rwandan government's persistent talk of banning use of plastic bags across EAC member states at EAC meetings has made anti-plastic bag policies difficult to ignore (Behuria, 2019).

5.4 Barriers and opportunities for plastics policy in Rwanda

To develop and implement more effective plastics policy package, it is necessary to further understand the barriers and opportunities in Rwanda. An analysis of the strengths, weaknesses, opportunities, and threats (SWOT) of plastics policies and plastic waste management was carried out and presented in Table *5-6* below.

Table 5-6. SWOT analysis of Rwanda's plastics policy and plastic waste management

Strengths	Weaknesses
• High political recognition of and public support for plastic waste control and prevention • Proactive national laws for waste management in place, with a plastic bag ban as an important step towards waste prevention and avoidance	• Disjointed policy and regulatory framework and, in particular, the lack of policies and regulations specifically targeting SWM • Lack of institutional capacity in developing and enforcing coherent legislation and regulations

• Umuganda participatory approach and broad public appreciation of the need for a clean environment • Recycling activities available although still limited • Initial private sector participation in waste collection and recycling in Kigali • Informal sector active in waste recycling and recovery in Kigali • The need for improving SW management practices and promoting integrated SWM acknowledged by the government and the public • Waste collection and disposal fees already charged, with a certain degree of willingness to pay by households for reliable services	• Nonexistence of monitoring systems for plastics consumption and plastic waste and, consequently, limited waste data and subsequent difficulty in measuring the efficacy of plastics policies • Poor SWM infrastructure, varying across cities / districts and between urban and rural communities • Inappropriate waste management capacity for promoting plastic waste separation, recycling and reducing plastic waste • Insufficient alternatives to plastic bags and, as a result, plastic bag smuggling from neighboring countries • Limited market and demand for recyclable materials locally • High input costs to recover materials due to a lack of source separation • Concern over affordability issues in poorer communities and consequently full cost recovery not practiced • Lack of financial resources for new SW and plastic recycling infrastructure
Opportunities	**Threats**
• Leveraging the current momentum and public support for plastic bag bans and Integrated SWM • Strengthening the capacity, including monitoring and data management, to enable the government to better understand and evaluate the effectiveness of plastics policies in plastic waste control and identify and implement more effective interventions • Leveraging Umuganda participatory approach as a means to increase public awareness and participation in plastic waste management • Enhancing the use of economic and financial instruments (such as EPR) to fund plastic waste separation and recycling activities • Strengthening the enforcement of policies and regulations for plastic waste management • Increasing investments in waste separation and collection points to help recycling • Increase scope of private sector participation and investment in plastic waste separation and recycling • Engaging with Multilateral Finance Institutions to increase technical assistance and financial support to reduce and prevent plastic waste. • Incorporating the informal sector in the waste collection and separation systems to expand existing latent capacity • Strengthening border control and enforcement of the plastic bag ban to reduce plastic bag smuggling • Cooperating with neighboring nations in plastics policy development and enforcement to reduce the risk of smuggling	• Lack of public investment in systematic waste monitoring, data collection and reporting, and data management systems • Weak ownership of plastics policies where there is low stakeholder participation and support • Environmental and public health impacts of a growing population and demand for plastics products • Recycled materials unable to compete with low-cost imports • Increasing marginalization of the informal sector • Low investor confidence for financing waste management projects, including plastic waste recycling • Slow economic growth to limit the scope of affordable waste management interventions • Poorly coordinated policies of neighboring nations to pose the risk of increasing the supply of banned items that can then be smuggled across the border into Rwanda

The SWOT analysis shows that Rwanda faces a number of barriers and challenges to developing and implementing plastics policies. Addressing the barriers and challenges also brings the country opportunities in the future.

For development of plastics policies, the main barriers include incomplete policy framework and lack of data. Rwanda's policy and regulatory framework still falls short of completion. The fragmented nature of waste management regulation means that policy goals, regulatory oversight and implementation are not always coherent. This causes disruption and confusion to national efforts to tackle plastic pollution. Rwanda needs to further develop policies and regulations which are necessary to provide a comprehensive basis for integrated SWM and the control of plastic pollution. The recent governmental effort to prepare a national strategy for integrated SWM may bring an opportunity to strengthen the policy framework and fill some policy gaps for plastic waste management.

A lack of monitoring and data management systems limits the government's ability to quantitatively measure and assess the impacts and effectiveness of plastics policies needed to design, improve, and implement plastics policies for the effective management of plastic waste. Rwanda needs to invest in establishing data collection and management systems for plastics and plastic wastes.

To effectively implement and enforce plastics policies and regulations, Rwanda has to address the barriers such as weak institutional capacity, poor SWM infrastructure, limited local market and demand for recyclable materials, and insufficient supply of alternatives for single-use plastics.

Many government agencies do not have the necessary capacity for policy implementation, such as financial resources, staffing, and expertise. In addition to clarifying the mandates of each line agency, the government can step up its international cooperation for financial support, staff training and learning.

SWM service remains very limited and poorly funded in Rwanda, with noticeable challenges in financial limitation and lack of waste management infrastructure. Current waste management fee mechanisms do not recover full costs, or incentivize waste separation, recycling and reduction. In Kigali, at Nduba landfill, gate fees are based on the size (volume) of truck entering the site. Due to the lack of a weighbridge, trucks are charged per trip with smaller trucks being charged RWF 3,000 and larger trucks RWF 5,000, regardless of tonnage (Rajashekar et al., 2019). Overall, the full costs of landfill and SWM operations are not being recovered in Rwanda. SWM systems and financing mechanisms for SWM and plastics reduction should be reviewed to effectively facilitate investments and innovation in new technologies and practices of SWM.

Although the government is providing financial support to enterprises developing alternatives to plastic bags and alternative materials such as textile and paper bags have been used, there are still not enough alternatives to substitute single-use plastic bags. The ban on the use of single-use plastic bags when no viable alternative materials are in place has led to single-use bags being smuggled into Rwanda from its neighboring countries. To manage this, Rwanda has stepped up its border control for catching smugglers and disposing of illicit plastics. There have been increased diplomatic talks with bordering nations and the Rwandan government has successfully pushed the East African Community (EAC) to tackle plastic pollution across the region. Cross-boundary cooperation in plastic waste management will benefit Rwanda and its neighboring countries in the long run.

6 Conclusions and Recommendations

Rwanda has adopted a policy and regulatory framework which sets the foundation for waste management. The following two national laws have a direct focus on plastic waste control in Rwanda:

- **Law No. 57/2008 of 10/09/2008 Relating to the Prohibition of Manufacturing, Importation, Use and Sale of Polythene Bags in Rwanda** (2008). The law prohibits the manufacture, use, import and sale of polythene (or polyethylene) bags in Rwanda. Built on a 2004 government instruction on banning importation and manufacture of limited plastic bags, the law also targets the consumers.
- **Law No. 17/2019 Relating to the Prohibition of Manufacturing, Importation, Use and Sale of Plastic Carry Bags and Single-Use Plastic Items** (2019). The law repeals and expands the law No 57/2008 beyond polythene bags by prohibiting the manufacturing, use, importation, and sale of plastic carry bags and single-use plastic items.

In addition, the following two more national laws are considered as second tier policies. Although they do not specifically focus on plastics, they play a key role in nurturing the systems, culture, and behaviors towards the management of wastes and plastics.

- **Organic Law No. 04/2005 of 08/04/2005 Determining the Modalities of Protection, Conservation, and Promotion of the Environment in Rwanda** (2005) which creates the legal framework for all waste management activities in Rwanda.
- **Law No. 53/2007 of 17/11/2007 Establishing Community Works in Rwanda** (2007), which governs Umuganda, a monthly community work including community cleanup, and is the first such national action. The law is later under Prime Ministerial Order Number 58/03, 2009.

These four national laws were reviewed and assessed in the study. The policy package has generated noticeably positive environmental, institutional and social impacts with an indication of economic benefits, however, implementation costs to government, citizens and businesses and net economic benefit to the society need to be studied. Each of the policies was assessed individually with the following findings:

- **Organic Law No. 04/2005 has broadly met its objectives.** The policy instigates the "polluter pays" principle as well as a range of financial incentives and disincentives, to promote better management of wastes. Collection services have been introduced to households and communities, with an estimated 88 percent coverage across the city of Kigali (Rajashekar et al, 2019), leading to a reduction in the government clean-up costs (Stakeholder engagement) and providing responsible and sustainable methods to manage wastes. This is, however, an expensive approach for the country, one that still continues to landfill the majority of wastes; according to Rajashekar et al. (2019), Kigali city recovers only 23.3 percent of budgeted landfill costs and 12.3 percent of actual costs incurred.
- **Law No. 53/2007 is considered to have met its objectives showing tangible benefits of cleaning up wastes including plastic waste in communities.** This law's objectives were to promote clean-ups of the nation and empower residents to develop policies for communities through a medium for engaging with decision makers. Umuganda is believed to have an estimated total economic value of up to US$ 200 million, which has helped build roads and schools and mitigate the impacts of solid and plastic wastes through community participation in litter clean-up exercises. The direct financial contribution of the governments is reported US$ 49.8 million (49.4 billion RWF) and the rest are the in-kind contribution of local residents and businesses of participating communities.
- **Law No. 57/2008 has generally achieved its objectives.** This was introduced following a 2004 instruction (a measure with less legal weighting and influence in Rwanda) that focused on banning manufacturers from producing and using plastic bags. This law extended the focus to residents as well as businesses. Overall, the plastic bag ban has almost eradicated the use of polythene bags across

Rwanda. According to Dsilva (2019), implementation of the law further helped to improve plastics recycling rates with claims that 70-80 percent of plastics were being recycled after use. Stakeholders have highlighted further success, indicating that the law prohibiting plastic bags has delivered significant results, including reduced pollution within water treatment systems and reduced litter clean-up costs. This reduction in plastic waste entering the natural environment is believed to be contributing to a reduction of microplastics in soils with a potential improvement upon the health of Rwanda's livestock and human beings.

- **Law No. 17/2019 repeals and expands Law No. 57/2008. It is relatively recent, so a full analysis is not possible. However, given the successful experience from implementing the preceding law, Rwanda is anticipated on the right track toward achieving the objective of the recent law.** There's a continuous trend of drainage systems no longer blocked, stagnant water being reduced, and fewer related diseases are in evidence. Stakeholder interviews also indicate that inspections of commercial premises, including seizures of all single-use plastic items from shops, hotels and restaurants, has supported the policy's success. In addition, tough penalties are deployed to those violating the ban.

Overall, the ex-post policy analysis concludes that the package of existing national laws/policies has generated a noticeable result for plastic waste control and positive environmental, social, and institutional impacts, despite some identified financial costs to government, residents, and businesses.

Rwandans have gradually adopted new behaviors and attitudes toward plastic waste reduction through successful awareness-raising, marketing and enforcement campaigns introduced by the government. The nation is generally engaged in good waste management practices, with a particular driver being residents' concerns for local environments. Most of Rwandans are now committed to reducing litter accumulations across communities and are critical of those who do litter, or who do not participate in the Umuganda initiative.

Although the laws/policies assessed in this case study have achieved degrees of success in plastic pollution control, Rwanda continues to face challenges. The study shows that Rwanda still faces a number of barriers and challenges to developing and implementing national laws or policies for plastic pollution management. They include incomplete policy framework, lack of monitoring data, weak institutional capacity, poor SWM infrastructure, limited local market and demand for recyclable materials, and insufficient supply of alternatives for single-use plastics.

The ex-post analysis of the policies further provides the following recommendations which will help Rwanda improve policy development and implementation for better management of plastic pollution.

- *Completing the policy and regulatory framework for integrated SW (including plastic waste) management*. A comprehensive and complete policy framework is fundamental for introducing and implementing policy instruments for plastic waste control.
- *Setting clear targets regarding plastics reduction, reuse, and recycling*. Clear targets help develop a path to reduce plastic pollution, assess financial needs, and promote behavioral changes and investments in plastic waste management.
- *Developing robust waste monitoring and data management systems to gather, record and report on plastics data*. Such a system is essential to facilitating policy performance measurement and improvement. It will allow the nation to track waste accumulation, movements, and end destinations (e.g., tonnages recycled, recovered, or disposed) including public behavioral changes towards plastic waste management practices, and enable the government to identify and assess opportunities for future interventions.
- *Encouraging source separation of plastic waste*. The government needs to step up its support to separate waste at source and to handle separated waste during its collection and transportation with the right financial incentives. Gradually increasing landfill tipping fees, fines of illegal dumping, deposit refund schemes, and other financial incentives according to society's increasing affluence will help

encourage both households and entities to separate recyclable plastics from other wastes, reduce landfill disposal and curb illegal dumping in Rwanda.

- *Promoting a circular economy to increase reuse and recycling of plastic waste by local businesses in Rwanda*. The government needs to develop effective mechanisms to support local industries – such as the construction and manufacturing sector – to incorporate recycled materials into their manufacturing processes and products. Existing incentives, such as business rate cuts, can be supplemented through grants to support the incorporation of secondary materials into manufacturing or introduce cleaner materials to substitute for plastics.
- *Providing financial support packages for businesses to adapt to policy, and legal requirements for circular economy and new green markets*. These could include greater accessibility to grants, subsidies, loans, or blended funding streams (partnerships and direct investments from both the private and public sector) for new investments by manufacturers, retailers, and waste management companies that manufacture, separate, and recycle plastics.
- *Supporting local development and use of biobased plastics*. This should be further supported in Rwanda as this is an area where attention is slowly beginning to focus. The government, in the form of a national working group with grants, subsidies, and exemptions, should support industries, research institutes, and academics to research, investigate, and develop locally produced and biodegradable (or recyclable) biobased materials. In particular, environmental impact assessments, development of standards and lab testing methods should be adopted to determine whether the biodegradable qualities are realistic and whether the biodegradation can actually happen in the natural environment.
- *Seeking regional cooperation and synergy with neighboring nations on plastics policy development and enforcement*. Because plastic products banned in Rwanda can be smuggled in from neighboring countries, plastic waste reduction cannot be achieved without regional cooperation across countries. Rwanda needs to continue its efforts in regional cooperation, which will benefit both Rwanda and its neighbors.

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Annex 1. Evaluation Questions and Indicators

This Annex provides a summary of the evaluation questions used to provide a more detailed analysis via the use of specific, identified indicators. The indicators are presented in a table format with options for ratings and notes on metrics and information sources.

Evaluation question		Indicators		Rating *(single choice)*	Further notes
1. Environmental effectiveness					
1.1	Have objectives been achieved?	**a**	Materials: Change in plastic consumption	0 - No information available 1 - significant increase 2 - moderate increase 3 - neutral impact 4 - moderate decrease 5 - significant decrease	Metric: plastic import/ production at national level (% change based on published tonnes p.a.)
		b	Materials: Change in plastic recycling rates	0 - No information available 1 - significant decrease 2 - moderate decrease 3 - neutral impact 4 - moderate increase 5 - significant increase	Metric: plastic recycling rates (% of total waste; % of plastic consumption) based on published data at national or sub-national level
		c	Water pollution: Change in quantity of plastic litter in drainage systems, watercourses, local marine environment	0 - No information available 1 - significant increase 2 - moderate increase 3 - neutral impact 4 - moderate decrease 5 - significant decrease	Metric: Qty of plastic litter in drainage systems, water courses and local marine environments
2. Economic and financial impacts (positive and negative) where such analysis is possible using available data					
2a Economic robustness					
2.1	Have there been significant/measurable economic costs and/or benefits?	**a**	Economic benefits	0 - No information available 1 - neutral / no impact 2 - moderate positive impact 3 - high positive impact	Environmental policy typically addresses externalities and other market failures, often involving natural goods and services that are not well reflected in market prices. As such, the economic benefits of environmental policy are often not easily quantifiable, especially in monetary terms. Metrics: direct, indirect/external/global benefits to entire society e.g., Improved provision of ecosystem services, avoided pollution
		b	Net economic benefit	0 - No information available 1 - neutral / no impact 2 - moderate positive impact 3 - high positive impact	As far as quantitative estimates of costs and benefits are available, a net present value is calculated to compare the balance of costs and benefits that may occur over different time periods. However, considering not all costs and benefits may be quantified (or quantified in monetary terms), qualitative evidence on the likely balance was also considered.
2b Financial viability					

Evaluation question		Indicators		Rating *(single choice)*	Further notes
2.2	What are the financial costs / benefits at the individual/ actor level?	**a**	Financial impact to government & regulators	0 - No information available 1 - high negative impact 2 - moderate negative impact 3 - neutral impact 4 - moderate positive impact 5 - high positive impact	Metrics: additional or reduced revenues from tax/levy/fee, administrative costs, reduced costs from cleaning
		b	Financial impact to citizens / consumers	0 - No information available 1 - high negative impact 2 - moderate negative impact 3 - neutral impact 4 - moderate positive impact 5 - high positive impact	Metrics: additional tax/levy/fee, reduced spending on plastic items, increased spending on alternative products/materials
		c	Financial impact to businesses	0 - No information available 1 - high negative impact 2 - moderate negative impact 3 - neutral impact 4 - moderate positive impact 5 - high positive impact	Metrics: additional tax/levy/fee, administrative costs, reduced revenue from plastic items, increased revenue from alternative products/materials, additional revenue from services (e.g., recycling), reduced costs from cleaning
3. Institutional and administrative feasibility, social acceptability, political economy					
3.1	What is the institutional structure & government mandate for implementation of the policies?	**a**	Evidence of clear responsibilities for management of marine plastic pollution	0 - No information available 1 - No clear lines of responsibility 2 - Lines exist in part (e.g., at national government level only) 3 - Clear lines of responsibility exist	Identification/ mapping of government departments / institutions responsible for development, implementation, monitoring and enforcement of the polices and the interactions between them. Policies with clear objectives to manage plastic pollution prevention across the value chain and summary tables in Section 2.
3.2	What is the regulatory and policy framework for managing plastic pollution?	**a**	Evidence of a legislation supporting implementation of policy objectives	0 - No information available 1 - No implementing legislation 2 - Legislation exists but not implemented 3 - Legislation in force	Policies with clear objectives to manage plastic pollution prevention across the value chain and summary tables in Section 2.
		b	Evidence of enforcement of legislation	0 - No information available 1 - No evidence of enforcement of plastic pollution policies 2 - Some / sparce evidence of enforcement of plastic pollution policies 3 - Multiple examples and or evidence spanning multiple years	Number of court cases / enforcement actions over time
		c	Evidence of a policy framework for managing plastics	0 - No information available 1 - No evidence of policy framework 2 - Partial policy framework exists (e.g., managing aspects only) 3 - Policy framework exists to manage plastics across the value chain	This could be related to plastic production, import, use, management, waste (i.e., anywhere along the plastic value chain so long as it is focused on overall reduction in litter/ waste plastic / impact of mismanaged plastics

Evaluation question		Indicators		Rating *(single choice)*	Further notes
3.3	How are the policies monitored, reported on & evaluated?	**a**	Evidence of monitoring, reporting and evaluation of the impact of policy and legislative measures	0 - No information available 1 - No evidence of monitoring, reporting, evaluating 2 - Some/ partial monitoring, reporting, evaluating 3 - Policies monitored, reported on, evaluated	Reports / data from/ authorized by the government pertaining to monitoring system, feedback from government stakeholders. Evaluation of policy impact (ex-anti and /or ex-post)
4. Ancillary (Social) impacts					
4.1	Have the policies had any negative or positive social impacts?	**a**	Evidence of impacts of policies on health and/or safety of particular groups	0 - No information available 1 - negative impact 2 - neutral impact 3 - positive impact	Metrics: Change in life expectancy related to particular groups e.g., within informal waste sector
		b	Evidence of impacts of policies on jobs	0 - No information available 1 - high negative impact 2 - moderate negative impact 3 - neutral impact 4 - moderate positive impact 5 - high positive impact	Metrics: Net employment change, quality of jobs (e.g., based on average salary)
		c	Evidence of impacts of policies on aspects such as gender equality, socio-economic improvement	0 - No information available 1 - high negative impact 2 - moderate negative impact 3 - neutral impact 4 - moderate positive impact 5 - high positive impact	Metrics: Change in household income for women
5. Scalability, replicability, sustainable market creation					
5.1	Are the policies replicable to other polymers or products?	**a**	Evidence of replicability of policies to other polymers or products	0 - No information available 1 – no indication of replicability 2 - indication of replicability	Incidence of extension / new policy development for other polymers / products and/or in neighboring countries
5.2	For sub-national policies, are policies scalable to national level?	**a**	Evidence of scalability of policies to national level	0 - No information available 1 – no indication of scalability 2 - indication of scalability	Reports showing policy extension from local / subnational level to national
5.3	Has there been a transfer of skills, infrastructure and/or experience from the policies to other plastic streams?	**a**	Evidence of transfer of skills, infrastructure and/or experience from the policies to other waste streams or other plastic products	0 - No information available 1 – no indication of skills, infrastructure, infrastructure transfer 2 - indication of skills, infrastructure, infrastructure transfer	Reports / data showing businesses in one sector applying learning to another (e.g., PET to PP); increase in collection of different plastic streams
5.4	Have sustainable, commercially viable market segments been established as a result of the policies?	**a**	Evidence of growth of relevant market segments (e.g., plastic recycling, alternative products/ materials)	0 - No information available 1 - negative impact 2 - neutral impact 3 - positive impact	Data on sector turnover; data on turnover of businesses selling recycled products or reusables; growth in new recycling companies registered; feedback from stakeholders

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