

GHANA
NATIONAL PLASTIC
ACTION PARTNERSHIP

A Roadmap for Radical Reduction of Plastic Pollution in Ghana

November 2021



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Glossary

AGI	Association of Ghana Industries	MMDAs	Metropolitan and Municipal District Assemblies
AMA	Accra Metropolitan Assembly	SMEs	Micro-, Small- and Medium-sized Enterprises
BAU	Business as Usual	MSW	Municipal Solid Waste
CEO	Chief Executive Officer	NGO	Non-Governmental Organisation
CSO	Civil Society Organization	NIMBY	Not In My Back Yard
ECOWAS	Economic Community of West African States	NOAA	National Ocean and Atmospheric Administration
EHSU	Environmental Health and Sanitation Unit	NPAP	National Plastic Action Partnership
EPA	Environmental Protection Agency	NPMP	National Plastics Management Policy
EPR	Extended Producer Responsibility	NSDF	National Spatial Development Framework
GPAP	Global Plastic Action Partnership	PPE	Personal Protective Equipment
Ghana NPAP	Ghana National Plastic Action Partnership	PET	Polyethylene Terephthalate
GARID	Greater Accra Resilient and Integrated Development Project	PP	Polypropylene
HDPE	High-density Polyethylene	PS	Polystyrene
IESS	Institute of Environmental and Sanitation Studies	PVC	Polyvinyl Chloride
ISO	International Organization for Standardization	R&D	Research and Development
KMA	Kumasi Metropolitan Assembly	SCS	System Change Scenario
LCA	Life Cycle Assessment	SMS	Short Message Service
LDPE	Low-density Polyethylene	UG	University of Ghana
LMI	Lower Middle Income	UGPRP	University of Ghana Plastic Recycling Project
MESTI	Ministry of Environment, Science, Technology, and Innovation	UNDP	United Nations Development Programme
MDAs	Ministries, Departments and Agencies	UNEP	UN Environment Programme
		WRIC	Waste Recovery Innovation Challenge

Signatories

This Action Roadmap has been adopted on the 6th of December 2021 by the Ghana NPAP Steering Board and is hereby signed by:



Dr. Kwaku Afryie

Chair, Ghana, NPAP and Minister, Ministry of Environment, Science, Technology and Innovation



Mr. Georgios Badaro

Co-chair, Ghana NPAP and Managing Director, Nestlé Ghana Limited

Statements of Support



The UK is delighted to support the Ghana Action Roadmap and its strategy to protect the marine environment from the rising threat of plastic pollution. It is brilliant to see the Government of Ghana showcasing regional and global leadership in addressing this urgent challenge and pursuing a target of zero plastic leakage into its ocean and waterways by 2040. We recognise Ghana's commitment through their engagement with initiatives such as the Commonwealth Clean Ocean Alliance, and we look forward to continuing this partnership as we implement the Action Roadmap.

Minister Zac Goldsmith
Minister of State, United Kingdom



Nestlé Ghana Limited continues to support the implementation of the Ghana National Plastic Action Roadmap. As a company, globally, we are investing in research and development to ensure that 100% of our packaging is recyclable or reusable by 2025, and we are committed to reduce our use of virgin plastics by 1/3. The Action Roadmap provides us with a clear path towards our ambition of achieving the 2040 target of ridding Ghana's waterbodies of plastics. Nestlé Ghana Limited will continue supporting innovative technologies and waste collectors who are the heart and soul of the plastics recovery value chain.

George Badaro
Managing Director, Nestlé Ghana Limited



The Ministry of Environment, Science, Technology and Innovation, on behalf of the Republic of Ghana, is committed to unlocking a circular economy framework for the plastics sector, creating good jobs for Ghanaians, preserving our valuable natural resources and protecting our beautiful environment, especially the ocean and beaches. Thanks to the clear Action Roadmap brought together by the Ghana NPAP, we can lead targeted discussions with our many partners from the private sector, civil society, international organizations and other governments on specific activities needed to unlock a circular economy. We have laid out a clear plan of action that is as ambitious as it is holistic, and well aligned with the strategic pillars of the National Plastics Management Policy - behavioral change, strategic planning and cross-sectoral collaboration, innovation towards a circular economy, resource mobilization, and good governance, inclusiveness and shared accountability.

Dr Kwaku Afriyie
Minister, Environment, Science,
Technology and Innovation, Ghana



Dow is proud to be part of the partnership with the Ghanaian government and local industry to advance the Ghana Plastic Action Roadmap and plastics projects in Ghana. We believe in advancing a circular economy for plastics to ensure the material maintains value and supports local economy across its lifecycle.

Adwoa Colemean
Country Manager, Ghana; Africa Sustainability
& Advocacy Manager, Packaging and
Specialty Plastics EMEA, DOW



Canada recognizes the importance of addressing two of the biggest challenges of our time, climate action and gender equality, in a concerted effort to achieve the SDGs and meet the objectives of the Paris Agreement. Our commitment to support Ghana to tackle plastic pollution and advance the circular economy through the Ghana National Plastic Action Partnership (NPAP) reflects this concerted effort. Guided by Canada's Feminist International Assistance Policy, we will continue to provide targeted investments towards the Action Roadmap to support innovation and promote inclusion to address gender gaps for a successful transition to a circular economy.

Sara Nicholls
Country Development Program Director,
High Commission of Canada to Ghana



The Action Roadmap recommends key actions to boost innovation across the plastics landscape in Ghana that are essential to drive plastic innovation initiatives in Ghana. Our Waste Recovery Platform and the Ghana Waste Fair are examples of innovation initiatives that support R&D and businesses through programs such as the 'Waste' Recovery Innovation Challenge. The platform also hosts the Waste Resource Map, a digital tool that provides real-time information/data on waste management and facilitates material exchange. The UNDP endorses the Action Roadmap and will continue to commit resources and expertise to encourage innovation within the plastics value chain in Ghana.

Angela Lusigi
Resident Representative, United Nations
Development Programme, Ghana



Plastic pollution, particularly of marine environments, is a global challenge that will require intense collaboration to tackle, in a timeframe that mitigates the worst possible consequences to the World's natural resources. The World Bank will continue to leverage our resources, analytical capacities and investments in Ghana to support the government, private sector, civil society and the development community to fast-track targeted interventions that have demonstrable capacity to substantially reduce plastic pollution. Through projects such as the Greater Accra Resiliency and Integrated Development (GARID) and with PROBLUE support, the Bank is building the capacity of local and national regulators to capture and control plastic pollution at the highest environmental and social standards downstream, and building capacity of local industry players to shift to more circular manufacturing and product delivery practices in the upstream. The Bank will continue to provide leadership to the Ghana NPAP and to collaborate with other partners to advance the recommendations of the Action Roadmap.

Pierre Laporte
Country Director for Ghana, Liberia,
and Sierra Leone, World Bank Group

Executive summary

Background and the nature of the challenge

Background

Ghana has experienced significant economic growth and political stability over the past two decades, making it one of the most successful democracies in the West African sub-region. The country's economic growth has coincided with a significant increase in the consumption of plastic products, especially single-use plastics, and consequently an increase in plastic waste. It is estimated that Ghana generates around 0.84 million tonnes of municipal plastic waste each year – a total that is growing annually by 5.4%.¹ This rapid growth in plastic waste is driven by a population that is growing at 2.2% per annum and an increase in per capita plastic consumption of 3.4% per annum. The primary source of this plastic waste is municipal and does not account for industrial, institutional, and commercial sources.

Despite major commitments from the government, industry and civil society to address their environmental impacts, plastic leakage into the country's water bodies is projected to grow by 190% between 2020 and 2040, from approximately 78,000 tonnes per year to 228,000 tonnes per year.

The socio-economic costs of mismanaged plastics cannot be overemphasized. Already, livelihoods of the fishing communities along the coast are being affected. Ghana has stated its desire to achieve zero leakage into water bodies but does not yet have a specific target for reducing plastic waste generation or leakage.

At the global level, the Global Plastic Action Partnership (GPAP) was forged as a much-needed platform to bring together public, private and civil society actors to address plastic waste and pollution. Recognizing the urgent need to put in place effective solutions, the platform was launched in September 2018 with the goal of translating political commitment to address plastic pollution into tangible strategies and investible action plans.

GPAP provides tailored support to tackle plastic waste and pollution in individual countries. The Ghana National Plastic Action Partnership (NPAP Ghana) was established in 2019 in collaboration with the Government of Ghana under the leadership of the Ministry of Environment, Science Technology

and Innovation. It aims to support the development of a circular economy framework as the primary mechanism for reducing plastic waste and plastic pollution in the country. In that regard, NPAP Ghana acts as the national platform for multi-stakeholder cooperation, facilitating initiatives and funding to scale up and accelerate in-country partnerships that address plastic waste and pollution, while also contributing to the nation's progress towards achieving many of the Sustainable Development Goals. At the launch of NPAP Ghana in October 2019, President Nana Addo Dankwa Akufo-Addo pledged to achieve zero plastic leakage into Ghana's ocean and waterways: "Ghana, after this process, will make best efforts to be a model for other countries in the region and on the continent on issues related to plastic management".²

Plastic pollution affects diverse groups of women and men differently in terms of the opportunities, risks, exposure and health outcomes it creates. There are many disparate biological and social factors to consider, so transitioning to a circular economy in an inclusive and gender-responsive way is essential to successfully and sustainably preventing plastic pollution. This approach will systematically address existing inequalities in the plastics value chain and directly benefit the individuals and communities involved. In particular, it generates better quality and more numerous opportunities for traditionally marginalized communities to meaningfully participate in equitable economic growth, including women in the lowest wealth quintiles, and lowers the disproportionate impact that plastic pollution places on them.

NPAP Ghana is publishing this action roadmap to provide a clear pathway for the eradication of plastic pollution in the marine environment and other water bodies by 2040. It presents a set of actions for Ghana to deliver on its ambitious goals with regard to plastic waste pollution.

Analytical framework

The recommendations contained within this action roadmap are rooted in data and insights gathered from consultations with experts across the plastics value chain. They are also informed by a scenario analysis based on the tool presented in the **Breaking the Plastic Wave** report¹ by the Pew Charitable Trusts and SYSTEMIQ. The scenario modelling



builds on a **Baseline Study** undertaken by NPAP Ghana in 2020 and approved by its Steering Board in September 2020. It provides projections of population growth and plastic consumption from 2021 to 2040 and attempts to forecast the future state of plastics.

The scenario modelling presents a business-as-usual scenario (BAU) and a system change scenario (SCS). Under the SCS, two options are considered: realistic and ambitious. BAU assumes no interventions are made to current plastic-related policy, economics, infrastructure or materials and that cultural norms and consumer behaviour do not change. The SCS assumes that all selected system interventions are applied concurrently and ambitiously for both macroplastics and microplastics.³

The scenario analysis in the **Breaking the Plastic Wave** report defines eight system interventions and models the main economic, environmental and social implications of applying different combinations of these changes to the system at varying ambition levels and in a range of geographic archetypes. The following four archetypes are considered in this analysis, with the first three classifications aligned with the Government of Ghana's definition for metropolitan, municipal and district assemblies (MMDAs):

- i. Mega archetypes are highly urbanized and densely populated areas where the interface with plastics is intense.
- ii. Medium archetypes are moderately densely populated and adjoin mega archetypes where plastic usage is high.
- iii. Rural and remote archetypes have a low density in terms of population, and usage of plastics is low with limited access to recycling and waste collection services.
- iv. Remote archetypes demarcate low population density and long distances from recycling centres.

Challenges and opportunities

The impacts of plastic production, use and disposal on the environment and society present a number of challenges along the plastic value chain. However, there are potential opportunities that also offer solutions. These challenges and opportunities include:

1 Mismanaged plastic waste poses a threat to Ghana's environment and social cohesion.

According to the business-as-usual scenario, Ghana records a plastic waste collection rate of 49%. Managed plastics waste is estimated to be 25%, while 66% is mismanaged (26% dumped on land, 23% dumped at uncontrolled dumpsites and 17% burned openly) and 9% leaks into water bodies. As a result, about 1.8 million tonnes of plastics will be mismanaged per year by 2040 if urgent actions are not taken to address the root causes of plastic waste mismanagement. This problem, and the resultant leakage of plastic waste into water bodies, poses a threat to the health, social well-being and economic prospects of Ghanaians. For example, the open burning of waste releases toxic chemicals. This is especially prevalent in rural and remote communities where collection coverage is only about 28% and 18%, respectively. In addition, the effect of the leakage on fishing activities, which employs 20% of the national active labour force – almost 3 million people⁴ – is already being felt as fishermen report catching more plastics than fish⁵.

2 Business as usual will result in increased plastic leakage.

If the country maintains the current collection and treatment rates, plastic leakage will increase by almost 190% by 2040. This implies that annual leakage will increase from 0.08 million to 0.23 million tonnes by 2040. In a worst-case scenario, where no additional investments are made into current collection and treatment, annual leakage will increase by more than 310% to 0.33 million tonnes per year.

3 Potential exists for drastic reduction and substitution of plastics.

Under a realistic scenario that applies levers such as elimination, reuse and new delivery models, Ghana can reduce its plastic waste by 30% by 2040. This will require measures such as banning or avoiding certain single-use plastics. Through substitution activities, such as replacing plastics with paper and compostable materials, plastics consumption can be reduced by 10%. The success of reduction and substitution largely depends upon policy interventions, research, the development of substitute materials, support from stakeholders and public acceptance of likely cost implications.

¹The Pew Charitable Trusts (2020) Breaking the Plastic Wave, <https://www.pewtrusts.org/en/research-and-analysis/articles/2020/07/23/breaking-the-plastic-wave-top-findings>



4 The absence of relevant policies prevents concerted industry action.

There are no policies restricting the types of plastics imported nor enforcing the use of recyclable materials in Ghana. Various imported plastics are difficult to recycle, and there is no policy on the use of recyclates to create market opportunities for recyclers. There is no regulation compelling plastics manufacturers to use a minimum proportion of recycled material in their products.

5 Lack of financing and support mechanisms to attract industry players in plastic waste management.

Ghana operates an Environmental Tax and Levy on imported virgin plastic materials (Act 863, 2013) and has recently introduced a Sanitation and Pollution Levy under the Energy Sector Levies (Amendment) Act, 2021 (Act 1064). However, these funds have not been channeled into the management of plastics, where they are needed to support recycling initiatives and capital investment. Additionally, there is currently no extended producer responsibility (EPR) scheme to generate funds for financing plastic waste management. The country also lacks the necessary conditions to attract private capital and development finance into investable segments of the value chain.

6 Lack of inclusivity and limited gender mainstreaming.

The waste management value chain is dominated by informal workers of whom women constitute the majority. The lack of gender parity in the sector, coupled with limited protection for marginalized groups, could be attributed to several factors, including the absence of policy guidelines promoting inclusivity, inadequate financial support for women entrepreneurs, threat of personal security and minimal transparency on pricing of secondary plastics that places marginalized groups at a disadvantage.

7 There is no 'silver bullet' to solve the problem; collective action is required.

A combination of pre-consumer, upstream actions such as material redesign, plastic reduction and substitution, mid-stream actions such as behavioural change, and post-consumer, downstream solutions such as recycling and disposal are urgently needed to solve plastic leakage in Ghana. Multiple interventions need to be implemented in a coordinated manner with strong collaboration between all stakeholders. This should promote equal opportunities that ensure the needs of, and positive effects on, both women and men – particularly those from marginalized and disproportionately affected communities – are taken into account.



System change scenarios

Under the system change scenario, the following five interventions are considered:

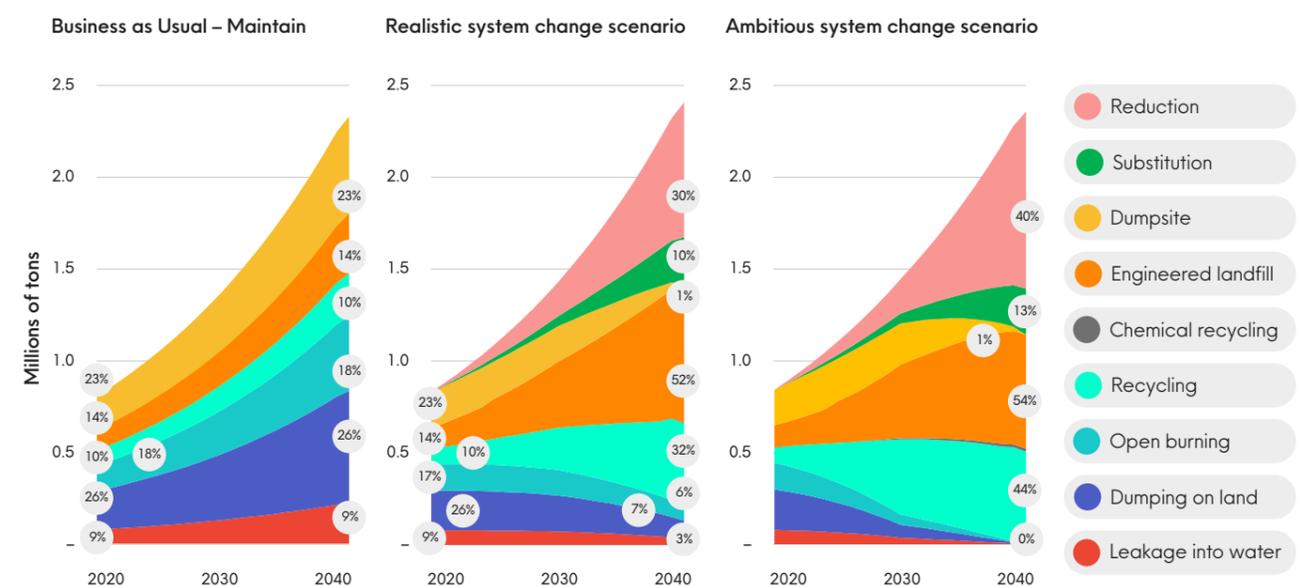
- 1 Reduce and substitute plastic usage to restrict year-on-year growth in the consumption of plastic-based materials. Under the realistic scenario, reduction and substitution targets are 30% and 10% respectively. Under the ambitious scenario, reduction and substitution targets are 40% and 13% respectively, all by 2040.
- 2 Redesign plastic products and packaging for reuse or high-value recycling. The target under both scenarios is to ensure 5% of plastics produced come from recyclable material by 2040.
- 3 Increase plastic waste collection from the current 49% to 85% under the realistic scenario and 100% under the ambitious scenario by 2040. This will be achieved by boosting state-funded, informal and private-sector collection systems.
- 4 Expand recycling rate from the current 10% to 32% under the realistic scenario and 45% under the ambitious scenario by 2040. This requires actions such as developing formal recycling facilities, increasing the involvement of informal and private sector players and the collection of source-segregated dry waste.
- 5 Build or expand controlled waste disposal facilities, such as engineered landfills, to safely manage and prevent leakage of plastic waste.

Under the realistic scenario, plastic usage by 2040 is projected to reduce by 40%, while recycling rates increase to 32% and collection coverage reaches 85%. Under the ambitious scenario, by 2040, plastic usage is projected to reduce by 53%, with recycling rates increasing to 45% and collection coverage reaching 100%.

The **realistic scenario** involves reducing plastic generation by 0.74 million tonnes per year (30% of the 2.43 million tonnes of plastic generated in 2040 under the business-as-usual scenario), substituting 0.25 million tonnes per year (10% of business-as-usual plastic waste), recycling 0.45 million tonnes per year (32% of business-as-usual plastic waste) and properly disposing of 0.8 million tonnes per year (52% of business-as-usual plastic waste) of the remaining plastic waste in controlled facilities. By taking these actions, the proportion of mismanaged waste and leakage decreases from 75% in 2020 to 13% in 2040.

The **ambitious scenario** involves reducing plastic generation by 0.96 million tonnes per year (40% of the 2.43 million tonnes of plastic generated in 2040 under the business-as-usual scenario) substituting 0.32 million tonnes per year (13% of business-as-usual plastic waste) recycling 0.52 million tonnes per year (45% of business-as-usual plastic waste) and properly disposing of 0.62 million tonnes per year (54% of business-as-usual plastic waste) of the remaining plastic waste in controlled facilities. Taken together, this actions reduce the proportion of mismanaged waste and leakage to 0% in 2040.

Figure 1: Plastic waste projections under the BAU and SCS models from 2020 to 2040



Summary of action points and accelerators

The SCS requires accelerated action across the five interventions as summarized in Table 1 and Figure 2.

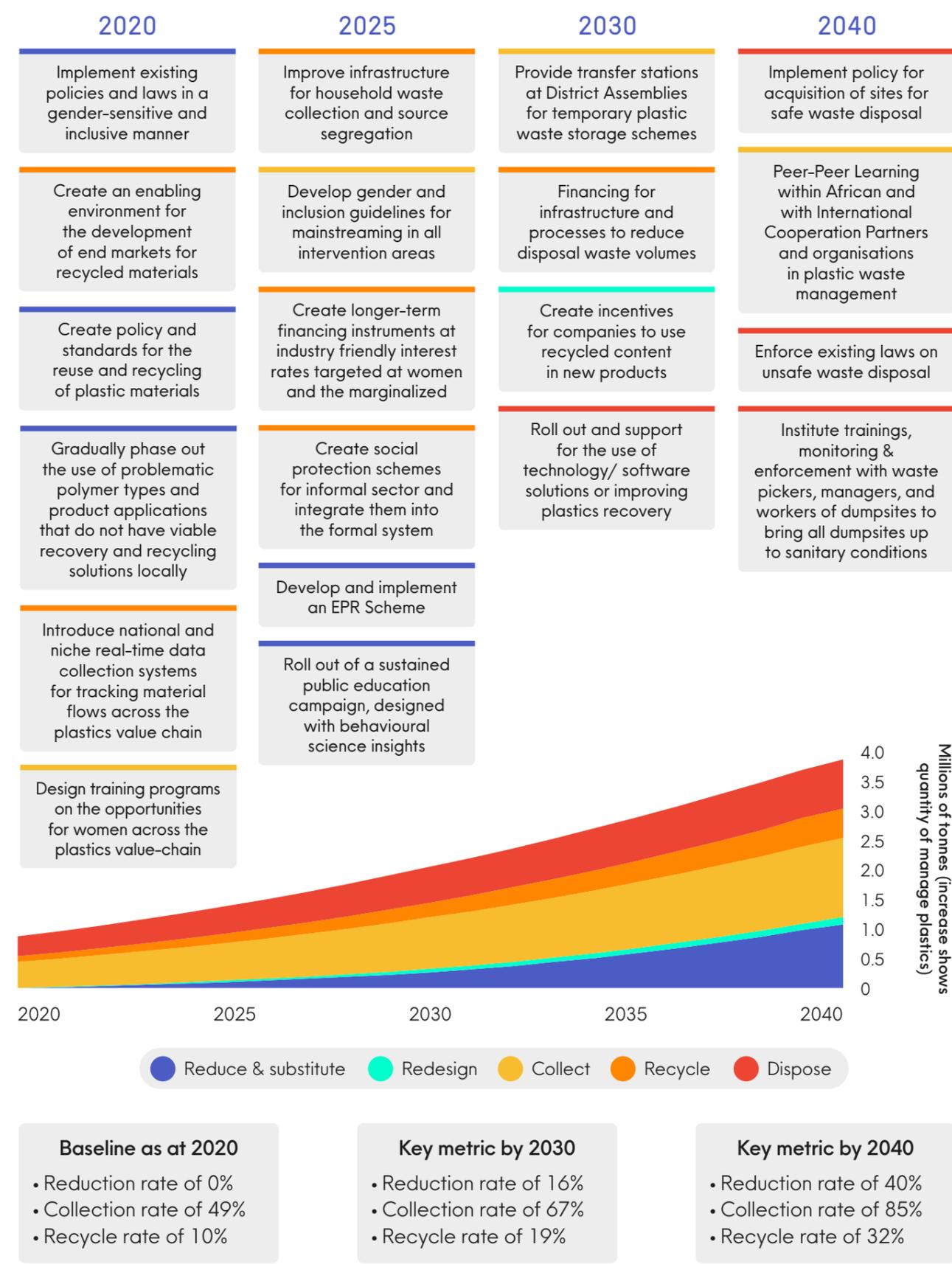
Table 1: Summary of critical accelerators

Accelerator		1	2	3	4	5
1	Implement the existing National Plastic Waste Management Policy, the Environmental Tax (Act 863), the Environmental Sanitation Policy and the National Environmental Sanitation Strategy and Action Plan in a gender-responsive and inclusive manner.		●	●	●	●
2	Create financial incentives for circular economy business models and new innovations with terms that are conducive to industry, particularly MSMEs, such as low interest rates and long payback periods. Financing schemes must be inclusive, addressing the unique needs of marginalized groups with a focus on creating an equal playing field throughout the value chain.	●	●	●	●	●
3	Create policy and standards for the reuse and recycling of plastic materials.	●	●	○	●	○
4	Create incentives for companies to use recycled content in new products (e.g., by setting targets, introducing tax breaks/waivers).	●	●	●	●	○
5	Develop and implement an EPR scheme to finance waste collection and recycling infrastructure, promote research and development for new materials, product delivery systems and recycling technologies, sustain behaviour-change campaigns, and encourage a shift towards products made from recycled content.	●	●	●	●	○
6	Introduce national and niche real-time data collection systems for tracking material flows across the plastics value chain.	●	●	●	●	●
7	Develop gender and inclusivity guidelines for mainstreaming in all intervention areas.	●	●	●	●	●
8	Gradually phase out the use of problematic polymer types and product applications that do not have viable recovery and recycling solutions locally.	●	○	○		
9	Roll out a sustained public education campaign, based on behavioural science, to promote desired plastics waste management behaviours. Foster inclusivity without stereotyping any group, communicating effectively to meet the needs of diverse demographics.	○	○	●	●	○
10	Create an enabling environment for the development of end markets for recycled materials (e.g. ensuring feedstocks, incentivizing recycled content and setting recycling targets).	○	○	○	●	○
11	Improve infrastructure for household waste collection and source segregation, incentivizing public participation and promoting the role of waste collectors, particularly marginalized groups, such as women and informal workers.			●	●	○
12	Provide transfer stations at District Assemblies for temporary plastic waste storage schemes.			●	●	
13	Set up industrial hubs for plastic waste recycling at regional and district levels with clear targets ensuring equal representation of beneficiaries and prioritizing traditionally marginalized groups, such as women and informal workers.			●	○	
14	Create social protection schemes for informal sector waste workers so that they are successfully integrated into the formal system.			●	○	●
15	Roll out and support the use of technology and software solutions for improving plastics recovery.				○	●
16	Provide financing for infrastructure and processes that reduce waste disposal volumes.	○	○		○	●
17	Institute training, meetings, monitoring, evaluation and enforcement for waste pickers, managers and workers of dumpsites to bring all dumpsites up to standard sanitary conditions.				○	●
18	Implement policy for the acquisition of sites for safe waste disposal.					●
19	Design training programmes exploring the opportunities for women across the plastics value chain, prioritizing the most marginalized groups, such as informal sector workers.	○	○	○	○	○
20	Initiate peer-to-peer learning within African and international cooperation partners, as well as with organizations that have a specific focus on plastic waste management.	○	○	○	○	○

● Direct influence ○ Indirect influence

1 Reduce and substitute 2 Redesign plastic items 3 Increase recycling 4 Increase waste collection 5 Expand safe disposal

Figure 2: Mapping key accelerators to five interventions



Transforming the plastics sector requires change to be both systemic and systematic. As with any complex problem, securing some key starting points can make a huge difference in the long run. Ghana already has high-level political support from the President. It is vital to translate that support into the day-to-day life choices Ghanaians make. The top four accelerators have been prioritized based on the number of interventions they relate to:

1 Implement the existing National Plastics Management Policy and related legislative instruments.

The National Plastics Management Policy (NPMP), revised in March 2020, is built on four focal areas that when combined will establish a comprehensive system for managing plastics and contribute positively to natural capital, environmental protection and socio-economic development. The following strategic actions will collectively enable the achievement of the four focus areas of the NPMP: (1) Behavioural change; (2) Strategic planning and cross-sectoral collaboration; (3) Resource mobilization towards a circular economy; (4) Good governance, inclusivity and shared accountability.

This would require realigning the existing legal and institutional framework to support circular economy-based management of the plastics sector. The NPMP adopts the waste hierarchy, accepting that the greatest challenges created by plastics for the economy, environment and public health are incurred during the waste phase of the plastics lifecycle. At the core of this policy's principles are the internationally recognized priorities of waste reduction first, followed by reuse, recycle, recover energy and, lastly, disposal. The harmony between the NPMP and the action roadmap is clear: actions such as the establishment of an EPR scheme, operationalization of the Environmental Tax Regime (Act 863) and promotion of local research and development (R&D) in plastic management are captured in both documents. The major issue for the NPMP has been its limited implementation. The action roadmap will help translate policy into action.

2 Create longer-term financing instruments for projects at industry-friendly interest rates.

The NPMP notes that financing is the major constraint inhibiting both the public and private sectors from achieving better plastics management. Existing financial models are inadequate, in part because of the state of the informal economy, which includes high rates of poverty compounded

by rapid population growth, internal and external migration to dense urban centres and ever-growing quantities of mismanaged plastics. However, the main issue is that current financing instruments are unattractive to investors as interest rates are too high and funding periods too short-term. Creating what would be, in effect, a new sector of industry demands friendly investment opportunities upfront. Once those investments take root, the resulting economic activity will be stronger and financial models could then be diversified. In the meantime, it is reported that as of the end of 2019, about \$40,000,000 has accumulated in revenue from the 2013 Plastic Wastes Management Environmental Tax, (Act 863), some of which could be used to support investment.⁶

3 Improve infrastructure by introducing household bins for plastic waste, and incentivize downstream waste segregation.

Effective waste segregation needs two components: one is the will to segregate and the other is the means. Several attempts have been made in the past to encourage segregation. In 2015, for example, about 60 institutions participated in an EPA-led programme that targeted educational establishments and provided a number of schools and universities with colour-coded bins. Compliance with separation appeared to be low, and this was considered an attitudinal problem. A well-designed public education programme and supporting activities that reward appropriate behaviours by households are therefore essential. An example of existing activity that could be adapted is the UNDP-Ghana Waste Recovery Platform's Waste Recovery Innovation Challenge (WRIC). The challenge provides technical and financial resources to innovative business, research and advocacy projects to demonstrate, contribute knowledge to and raise awareness of opportunities for waste recovery in Ghana.

4 Create an empowering environment for the development of end markets.

With a reliable and profitable end market, a viable industry could be created, overcoming the poor business outcomes and lack of added value for recyclers which negatively impact the waste management system. The action roadmap states that current inadequate marketing and business strategies for recycling plastic products, insufficient planning within the plastics value chain and unattractive policy incentives for plastic management are significant disincentives to satisfactory waste management services.

Costs and benefits of the system change scenario

Financial costs of SCS

The total capital expenditure (CapEx) required is estimated to be \$3 billion and \$3.3 billion under the realistic and ambitious scenarios, respectively. These figures include the cost of investing in capital assets like collections vehicles, recycling plants and landfill sites. Total operating expenses (OpEx) of \$5.1 billion and \$6.1 billion respectively are necessary to realize the SCS between 202 to 2040 for all waste, including non-plastics.

Benefits of SCS

By applying selected interventions, the realistic scenario can reduce the leakage of plastic into the ocean by 84%, versus the BAU scenario of 0.23 million tonnes per year, by 2040, while the ambitious scenario achieves zero leakage.. The SCS will enable Ghana to make significant progress towards Sustainable Development Goal 14 – Life Below Water. Mismanaged plastics will be reduced significantly, especially the proportion which is openly burned and has an adverse impact on the health of communities and the climate. The livelihoods of those who depend on the marine environment for their economic wellbeing will also be protected by the SCS.



Limitations and the need for further research

To capture the most detailed and representative picture, data sources for this analysis included: publicly available reports, data and presentations; in-depth interviews with 659 households; engagement with diverse stakeholders; and consultations with experts from across the industry, academia, the public sector and civil society organizations. Public and private sector experts have reviewed all data points and assumptions. Additionally, to validate selected data points, a limited primary study was conducted by researchers in two district assemblies, Adenta Municipality and Akuapim South District, that characterize urban and rural communities respectively. Where data points were unavailable, proxies were taken from the **Breaking the Plastic Wave** report and the model developed for NPAP Indonesia. These were adjusted to reflect the specific circumstances of Ghana.

Further research is, however, needed in the following areas:

1 The social and economic implications of the SCS and the unintended consequences of multiple actions. This report does not assess the economic impact of implementing recommendations such as substituting plastics for new materials or phasing out certain types of plastics. The economic costs of these solutions need to be thoroughly assessed.

2 Data harmonization – Even though the data used is considered robust and a range of sources have been integrated to arrive at the baseline, it was emphasized during the Expert Panel discussions that a comprehensive primary survey is needed to obtain current and complete data on plastic waste generation and management.

3 Cost-benefit analysis – There is a need to quantify and characterize the economic, environmental and socio-cultural benefits – and potentially harmful impacts – of all proposed interventions prior to adoption. All partners responding to these calls for action need to undertake necessary social accountability due diligence to mitigate risks and unintended consequences, particularly on marginalized groups and the environment.

4 Holistic data capture – It is recommended to expand the scope of reporting to include sources of plastic waste beyond municipal solid waste and from sectors not captured in the baseline analysis, including those from electronics, vehicle, medical and construction industries, among others.

Chapter 1: Methodology

Overview of plastic waste in Ghana

Ghana is part of the global plastic waste crisis due to rapid expansion in its economy and poor waste management practices. As in other regions of the world, the huge demand for plastic products and the desire for safe packaging of food and other household consumables have resulted in a persistent increase in the proportion of plastic waste in the municipal waste stream. Growth in the use of plastics is compounded by poor waste management behaviour, insufficient waste management and recycling infrastructure, and governance structures that struggle to manage and reduce plastic waste. This has led to unsustainable pollution and leakage into inland water bodies and the ocean.

According to analysis performed by the World Bank,⁷ landfills and open incineration are the main methods for disposing of 90% of plastic waste in developing countries, including Ghana. COVID-19 has also introduced additional plastic waste from protective face masks and gloves. Ghanaians have become accustomed to using disposal face masks which have the potential to leak into water bodies and add plastic particles to the marine ecosystem.

Many countries have adopted a variety of programmes and efforts to address the challenge of plastic waste. For example, India has introduced a maximum resource recovery limit that is expected to lead to the recycling of a quarter of the country's annual 15 million tonnes of plastic waste.⁸

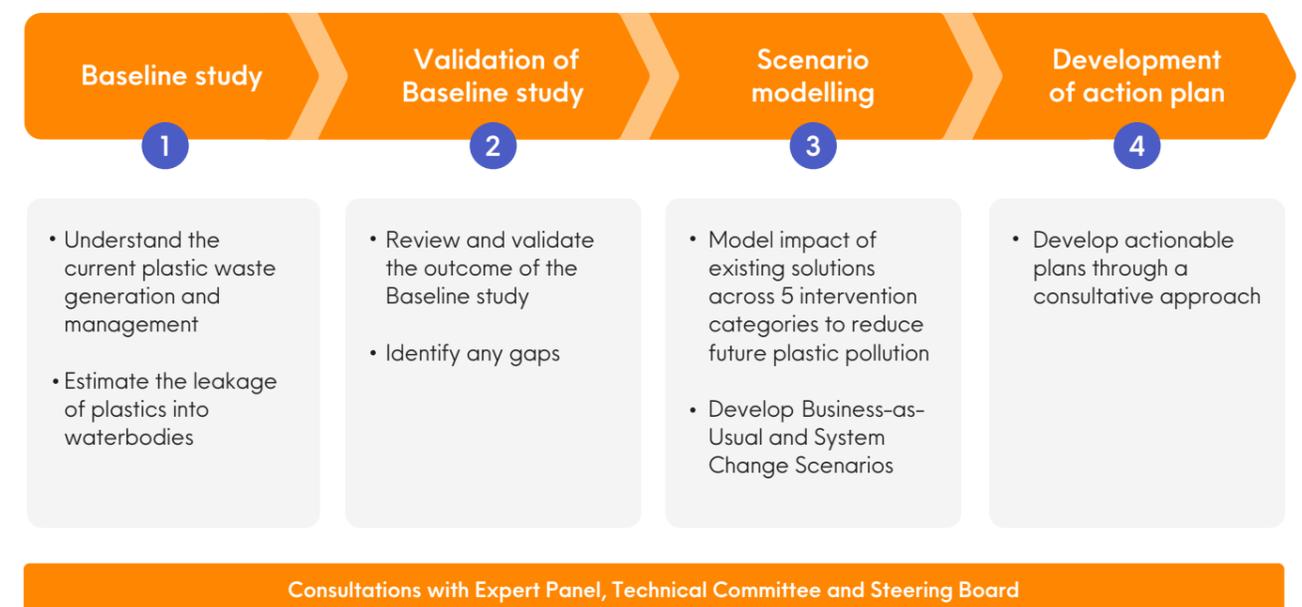
Similarly, the reverse logistics model in Indonesia has increased the recycling rate to 24%.⁹ Ghana's recycling rate is currently estimated to be just 10%.

To begin tackling the problem, Ghana became the first African country to join and collaborate with GPAP. In October 2019, the Government announced the Ghana National Plastic Action Partnership (NPAP Ghana), supporting the public, private and civil society sectors to transition to a circular plastics economy that reshapes the way the country produces, uses and re-uses plastics. The Government of Ghana also ratified the **National Plastic Waste Management Policy** (2019) to provide a "clearly defined pathway for dealing with the challenges of plastics waste."

Creating the action roadmap

Figure 3: Approach to the development of the action roadmap

Developing the Action Roadmap began with four key steps as presented below.



Baseline study

The baseline analysis was developed using a mass-balance systems model with best-available data from peer-reviewed research, local and national authorities and proxy data where appropriate. The model captures the flow of plastics through the various economic stages: from importation to production, consumption and demand, waste generation, waste management, recovery, recycling, disposal and environmental leakages. Data sources and assumptions were confirmed by an Expert Panel representing 21 key experts across the plastics value chain as well as leading authors of definitive research in the sector.

Validation of baseline study

A cross-sectional field survey was conducted to collect data and information on plastic use and plastic waste generation and management. As part of the survey, household questionnaires were distributed in two selected districts – Adenta Municipality and Akuapim South District.

The survey in Adenta Municipality was conducted under the guidance of the Environmental Health and Sanitation Unit (EHSU) of the Municipal Assembly. Three socio-economic residential clusters were covered under the survey: low income (Maamomo), middle income (Gbentanna), and high income (East Legon). The Assembly representatives of the Aburi township and Attakrom-Aman from rural community in the Akuapim South District were consulted about how to conduct the survey in their communities. An adult member of each household surveyed was interviewed by a team using questionnaires. In all, a total of 659 individuals were interviewed during the one-week survey period (See Appendix A.5).

Scenario modelling

The scenario analysis methodology was adapted from the model designed by Pew Charitable Trusts and SYSTEMIQ as well as the NPAP system map. The methodology relies

on assessing the outcomes that result from varying the intensity of the system interventions under different scenarios. These outcomes are categorized under two scenarios:

The **business-as-usual (BAU)** scenario, which does not incorporate any system interventions and consists of two cases:

- **Do nothing:** Zero expansion of waste management infrastructure and capacity. Assumes no intervention is made in relation to current plastic-related policy, economics, infrastructure or materials and that cultural norms and consumer behaviors do not change.

- **Maintain current efforts:** Waste management capacity is expanded to maintain current percentage rates of collection, recycling, landfill and leakage. Even though the current rates are maintained, due to greater use of plastics in the market, the total tonnage for each of the end destinations for waste will increase.

The **system change scenario** which consists of two cases with varying intensities of system interventions:

- **Realistic scenario:** In the realistic scenario, estimates suggest that plastic waste leakage into the ocean is reduced by around 84% by 2040 compared with BAU. This is achieved through the concurrent, realistic and strategic implementation of the five selected system interventions.

- **Ambitious scenario:** Under the ambitious scenario, plastic leakage is predicted to reduce to zero by 2040 by further intensifying the selected interventions.

The primary data for waste generation, waste management, collection, recovery, recycling, disposal and environmental leakage was taken from the **baseline study** report. The plastic waste reduction and substitution cost has been derived from NPAP Indonesia's model along with cost assumptions for waste collection, transportation and disposal. The cost assumptions for recycling were obtained from the **Breaking the Plastic Wave** report.

Development of action plan

The action plan was prepared alongside the five system interventions selected under the system change scenario: reduce and substitute, redesign, collection, recycling, and disposal. These were coupled with proposed actions across six identified impact areas for each intervention. The proposed actions for each intervention were analyzed and stakeholders were assigned lead or supporting roles, with proposed timelines for establishing the enabling actions also given.

Expert Panel

More than fifty experts convened across four meetings spanning one year (May 2020 to April 2021) to advise on and validate data sources, assumptions and the viability of proposed solutions. This process contributed to an enhanced understanding of the challenges and areas of concern that further strengthened the recommendations.

84%

Estimates suggest that plastic waste leakage into the ocean is reduced by around 84% by 2040 compared with BAU.

In-scope plastics

The action plan only covers plastics found in Ghana's municipal solid waste (MSW). It is acknowledged that plastic waste is also generated by the commercial sector, for example markets, and institutional establishments such as churches, offices and schools. There is no data available to estimate what proportion of plastics are generated by commercial and institutional sources, hence the report only addresses plastic at the household level. Plastic

packaging, carrier bags, diapers, toys and durable household goods are all examples of products containing plastics that become MSW after use. Out-of-scope plastics include those used in construction, industrial processes, textiles, transportation, medical, electrical and electronic appliances, agriculture, and fishing and aquaculture, for example. It also includes microplastics and plastic generated through fishing activities and by ocean-going vessels.

Data sources, analysis, limitations, and further research

The **baseline analysis** was the primary source of data for the scenario modelling. Key data points, such as population projections, were obtained from the Ghana Statistical Service. Other sources of data and information used for the preparation of this roadmap include Miezah et al,¹⁰ World Bank Ghana Plastic Pollution report,¹¹ and Ghana Living Standards Survey (Volume 7).¹²

All secondary data was validated through a structured household questionnaire. This was complemented by relevant information from published material derived from similar studies and records of other organizations and agencies. The structured questionnaire was designed to collect a range of data on respondents' demographic characteristics, household plastic use, trends in plastic usage, behaviour

towards plastic waste disposal and observations and perspectives on plastic waste. Research assistants administered the questionnaires to household members while respecting COVID-19 protocols during face-to-face interviews. The Statistical Package for the Social Sciences (SPSS) and Microsoft Excel were used for data entry and data editing, as well as for performing descriptive statistical analysis.

A key limitation of the validation survey was time, as data collection had to be completed during a short window. Nonetheless, this did not affect the analytical process or the reliability of the results, which ensured statistical significance of key findings. As a comprehensive understanding of the movement of materials through the value chain is critical for accurate planning, intervention, monitoring

and enforcement, the adoption of technologies and processes for real-time data collection and analysis to bridge existing data gaps is highly recommended.

For further research, a much larger cohort within the various broad geographical archetypes should be interviewed. This will provide a more detailed view of household plastic use and plastic waste management behaviour across various social classes. It is also recommended to document the quantity of plastic bags dispensed by sales outlets, including convenience shops, market stalls, retail stores, supermarkets and shopping malls, as this would provide useful extra data. Finally, institutions like schools, churches and offices could be studied to identify, adopt and scale up best practice in plastic waste management.



Chapter 2: A plastic crisis is brewing in Ghana

The nature of the plastic crisis

With the volume of plastic waste increasing every year, Ghana's plastic pollution problem is of grave concern. Soaring plastic use and the consequences of poor plastic waste management have led to widespread littering and fly-tipping in wetlands, along river banks and on beaches. Public concern about plastics in the environment has become a major issue due to the aesthetic, environmental and health challenges they present. The severity of the problem is tied to the visibility of plastic waste, especially in watercourses and as beach litter, and the fact that plastics block gutters, causing flooding. This results in the spread of diseases, such as cholera and malaria, with particularly high incidence rates in low-income communities. However, there is another, sometimes hidden, aspect to the plastic menace: conventional plastics are non-biodegradable and persist in the environment for hundreds of years. In the sea, through wave action and the effects of sunlight, plastics continually fragment into smaller particles that are ingested by marine life.

Waste from protective equipment, such as surgical masks and single-use gloves used to prevent the transmission of COVID-19 is also not included in the analysis. In some jurisdictions, due to the potential for infection, face masks are considered domestic hazardous waste and must be safely disposed of by disinfection and incineration.¹³ At the time the **baseline analysis** was completed in September 2020, the impact of mask usage on the generation of plastic waste in Ghana had not been fully assessed.



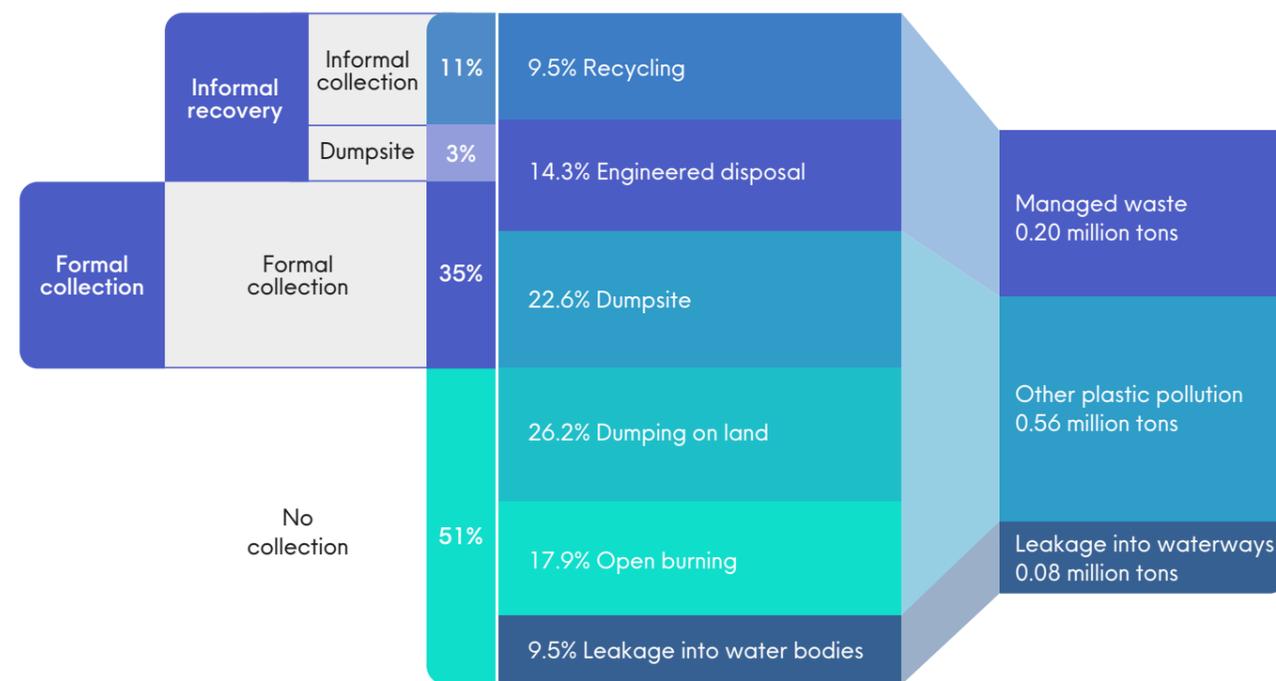
Plastic situation in Ghana

Using the NPAP model, it is estimated that Ghana generated about 0.84 million tonnes of MSW plastics in 2020. The aggregate collection rate for plastic waste is estimated to be 49%, with formal collection by municipal authorities representing 35% and

the remaining constituting informal collection (11%) and dumpsite recovery (3%). An estimated 9.5% of these collections go into the recycling system as shown in Figure 4 below. In this context, managed waste is estimated to make up 0.20 million tonnes (23.8%),

of the total while mismanaged waste constitutes 0.56 million tonnes (66.7%). The model estimates that 0.08 million tonnes of plastic leaks into water bodies, including rivers, streams, lakes and the ocean, representing about 9.5% of total plastic waste generated.

Figure 4: Where Ghana’s plastic waste ends up today (percentage of total plastic waste generated)



Key drivers of plastic leakage

- Uncontrolled dumping of waste at dumpsites
- Waste deliberately discarded into water ways from households
- Plastic dumped on terrestrial places that get dislodged into drains

Source: GH-NPAP Baseline Study, September 2020

Fate of plastic waste in 2020

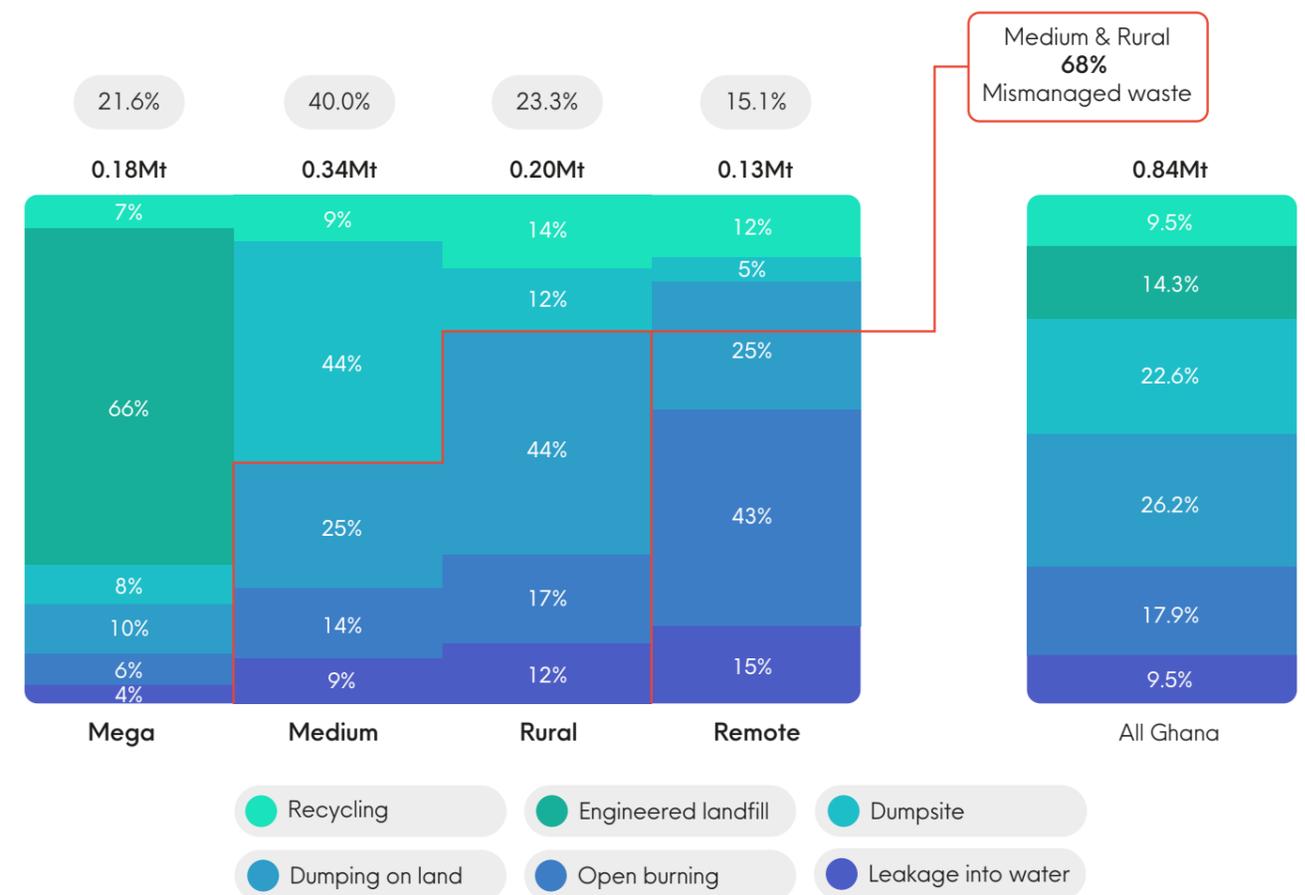
Plastic waste generation and mismanagement continues to increase in Ghana. In 2020, the national average MSW generated in Ghana was estimated at 0.50kg per person, per day, of which 0.06kg is plastic, or 12% of all MSW generated.¹⁴

The high proportion of mismanaged waste is mainly due to poor collection coverage. Over a quarter (26.2%) of plastic waste generated was dumped

on land and 22.6% was disposed of at uncontrolled dumpsites. There is high potential for these plastics to leak into waterways, especially during heavy rains. They are easily dislodged into drains during mild storms and, particularly carrier bags and sachets, are blown by the wind over wide distances, before finally arriving at waterways. The remaining proportion of mismanaged plastic waste is burned openly (17.9%) or directly leaks into

water bodies (9.5%). Many households use large open storm drains to dispose of waste, an issue further compounded by the slums built along the banks of large rivers and stormwater channels. These communities often do not have access to municipal solid waste services and therefore use rivers and drains as primary waste dumps. Figure 5 describes the fate of plastics in Ghana by archetype.

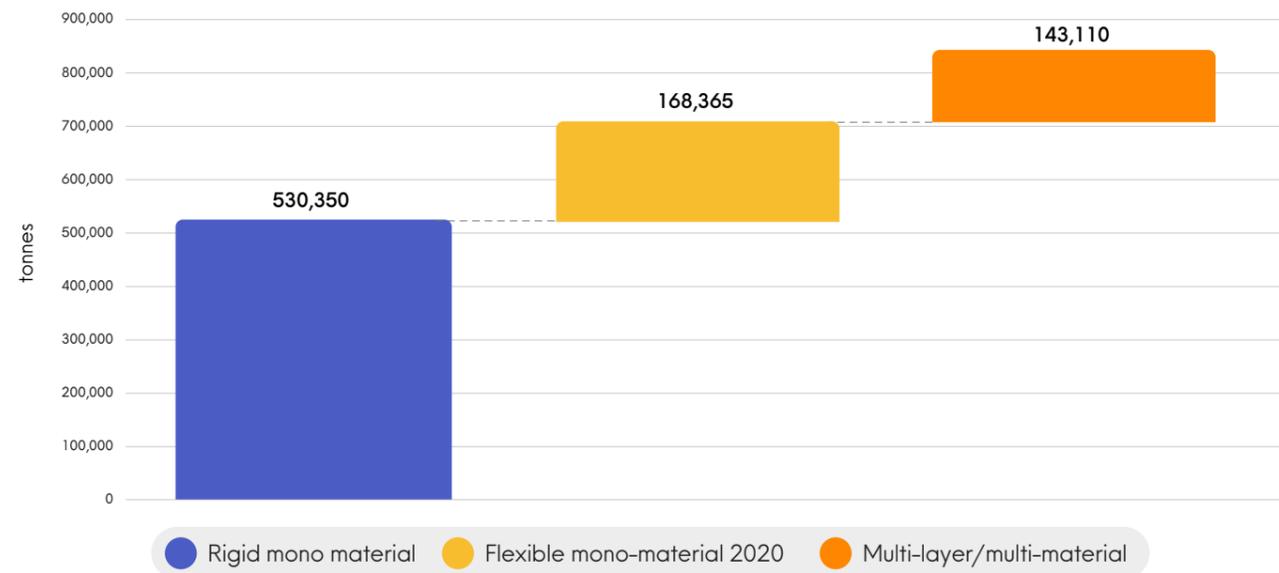
Figure 5: The fate of all Ghana’s plastic waste by archetype (million tonnes per year, 2020)



Source: GH-NPAP Baseline Study, September 2020

Figure 6: Distribution of plastics waste in Ghana by type of plastic in 2020

The three main types of plastic waste generated in Ghana, according to the baseline study, are: (i) rigid mono-materials, such as PET and plastic chairs that constitute the largest share of 63%; (ii) flexible mono-materials, such as carrier bags and sachets (20%); and (iii) multi-layer materials, such as cookie and chip wrappers (17%).



Business-as-usual scenario for 2040 and baseline for leakage

The **Breaking the Plastic Wave** report (2020) by Pew Charitable Trusts and SYSTEMIQ documented that globally 11 million tonnes of plastic leaked into the ocean in 2016. The report forecasted that leakage may almost treble by 2040 to 29 million tonnes per year¹⁵. This leakage will become increasingly hazardous since plastic in the oceans takes over 450 years to biodegrade¹⁶. Therefore, the amount of plastic in the ocean could accumulate to hundreds of million tonnes over the next 20 years –with disastrous consequences for biodiversity, the ocean and human health.

In Ghana, annual plastic waste production is also projected to treble

from 0.8 million tonnes in 2020 to 2.4 million tonnes in 2040,¹⁷ increasing the possibility of engulfing water bodies with plastic waste if swift and significant action is not taken.

The BAU scenario explores the consequences of addressing plastic waste by: (i) maintaining current rates of capacity for plastics collection, recycling and disposal (known as “maintain”); and (ii) doing nothing beyond existing efforts (“do-nothing”). Figure 7 below demonstrates the fate of all plastics under the BAU maintain scenario. The data suggests that retaining current capacity will result in millions of tonnes of additional plastic waste leaking into water

bodies. According to the system analysis, the per-year volume of mismanaged plastic waste will increase by 190.7% from 0.4 million tonnes in 2020 to 1.3 million tonnes in 2040, generating a cumulative total of 17 million tonnes by 2040. The model estimates the annual leakage of plastic waste will increase from 0.08 million tonnes in 2020 to 0.23 million tonnes by 2040, leading to cumulative leakage of 2.99 million tonnes (Figure 8). However, if the current waste management capacity is not maintained, (do-nothing), the volume of plastic leakage into water bodies in 2040 will reach approximately 0.33 million tonnes, with a cumulative leakage of 3.89 million tonnes.¹⁸

Figure 7: The fate of cumulative plastic waste in Ghana by 2040 under BAU maintain scenario

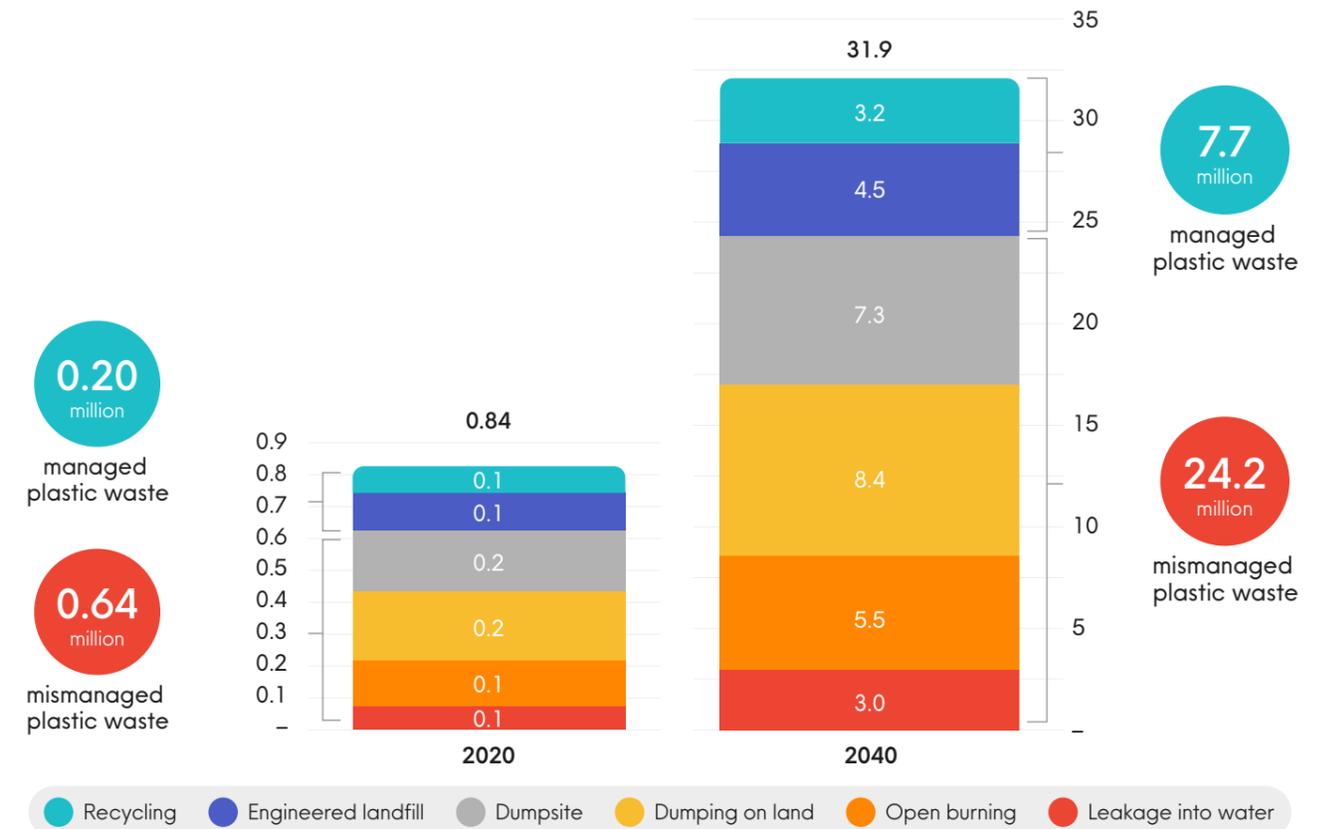
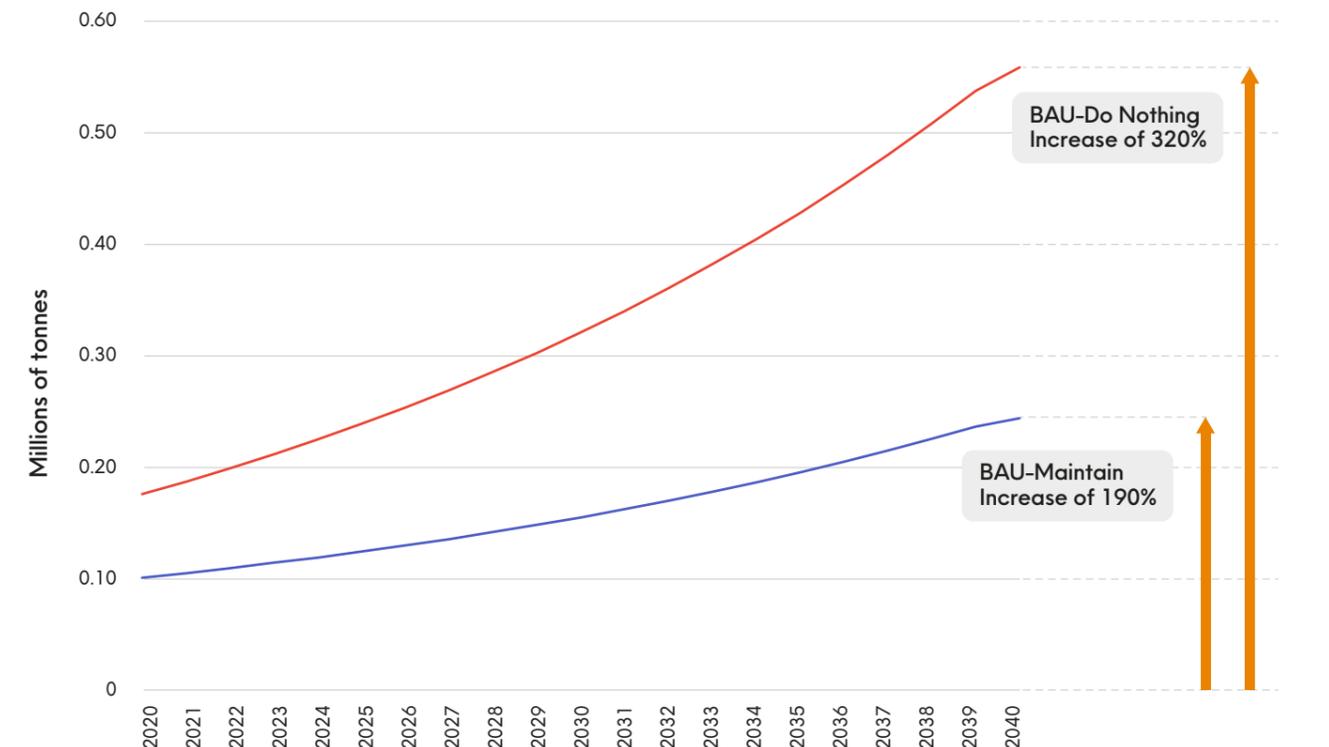


Figure 8: Leakage of plastic waste into waterways



Business-as-usual is no longer an option



As Ghana's population continues to grow, its capacity to generate plastic waste grows with it. According to the baseline study, plastic waste generation per capita per year will trend upwards by 83% from 0.027 tonnes in 2020 to 0.050 tonnes in 2040. This per-person rise will be compounded by population growth projected to be 58%, taking Ghana's population from 30.9 million in 2020 to 48.8 million twenty years later. The anticipated explosion in plastic waste generation demonstrates that business as usual, whether maintain or do-nothing, is not an option for Ghana.

Mismanaged waste results in leakage into waterways

According to a UN Environment report, human activities are impacting on the deepest parts of the ocean as far as 1,000 kilometres from land. The report documents that over 33% of the more than 3,000 pieces of manmade debris found in the deep ocean are macroplastics. It also highlights that more than 50% of the debris found in areas deeper than 6,000 metres was plastics, almost all of which were single-use¹⁹. Plastic waste is demonstrably posing several threats to the environment and its inhabitants. Unfortunately, plastic waste persists for thousands of years, so its effects in water bodies are not easily reversible. Many studies have shown the negative consequences of plastic debris on marine life. One study documented that significant numbers of most marine species worldwide ingest or become entangled in debris, including 86% of all sea turtle species, 44% of all seabird species, 43% of all marine mammal species, and numerous fish and crustacean species²⁰.

The socio-economic wellbeing of Ghanaians is at risk from plastic pollution of water bodies too. It impacts on both income-generating activities, such as fishing, as well as the volume and quality of seafood available for consumption. Fishing communities around Accra, including La, Jamestown and Korle Gonno, have reported catching plastics in their fishing nets. This phenomenon seems quite common and Ga residents popularly refer to it as "Tsaani"^{ii, 21}. The dependence of Ghanaians on fish is significant, with an average annual per capita consumption of 26kg – significantly higher than the ECOWAS-wide per capita estimate of approximately 14kg. It is also important to note that fish consumption comprises 60% of animal protein consumed in Ghana and 70% of local fish production is from marine sources.²² Marine fishing operations in Ghana consist of small-scale (artisanal or canoe), semi-industrial (or inshore) and industrial (deep-sea) fishing activities. This issue, therefore, creates several risks, including for the economic

wellbeing of fishing communities, food security and the health implications from consumption of plastic-ingesting fish.

The consequences of plastic leakage on the tourism sector in Ghana have also been documented. A number of studies have shown that plastic makes up a high proportion of waste found on Ghanaian beaches. For example, at the Korle and La tourist beaches in 2009, plastic materials comprised 66% and 53% of waste, respectively. An earlier survey conducted in 2003 at Sakumono and Centre for National Culture beaches found plastic comprising 46% and 58% of total waste, respectively²³. Undoubtedly, this factor has reduced the number of visitors to key tourist communities like Jamestown, thus reducing income generated from tourism by these communities.

Plastic entering river systems can also affect the quality and quantity of drinkable water available to neighbourhoods around river bodies and across the country.

ⁱⁱ The Ga name for fishing net



Where is the plastic leaking from?

To address the growth and inevitable consequences of plastic management, it needs to be targeted by a wide range of policy-making. It is therefore imperative that the sources of plastic leakage are identified and specific actions are developed, backed by concerted effort from all stakeholders.

Results from the baseline analysis demonstrate that most plastic leakage comes from direct dumping on land and into water bodies. Land-based sources account for 49.5% of total environmental leakage, with 40.3% from direct dumping into water and 10.2% from loss from dumpsites (Figure 9).

According to the analysis, rigid mono-material plastics represent 62.3% of all environmental plastic leakage. Flexible mono-material plastics make up 19.1% and multi-layer and multi-material plastics account for 18.6%. Figure 10 shows the percentages of these plastic types and the sources of leakage for each. An estimated 42.7% of flexible material and 40.2% of multi-material is directly dumped into water as households find it easy to discard them into drains. Flexible and multi-material waste is also easily transported into drains during the rainy season.

Photographs of plastic leakage into waterways throughout Ghana²⁴

Figure 9: Breakdown of the sources of plastic leakage into water bodies

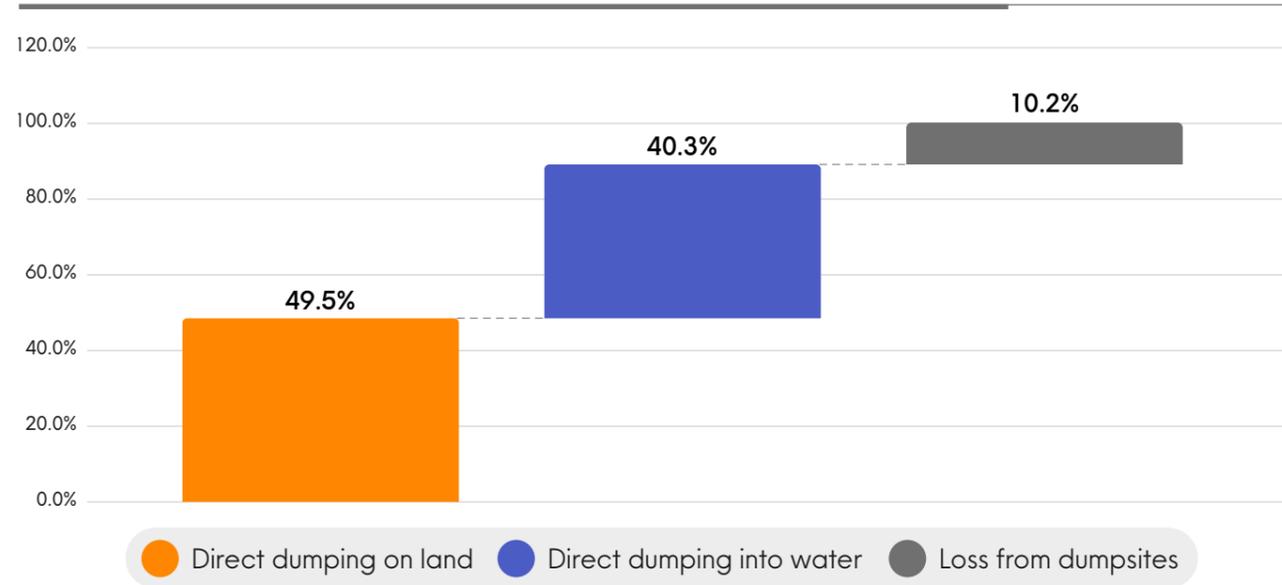
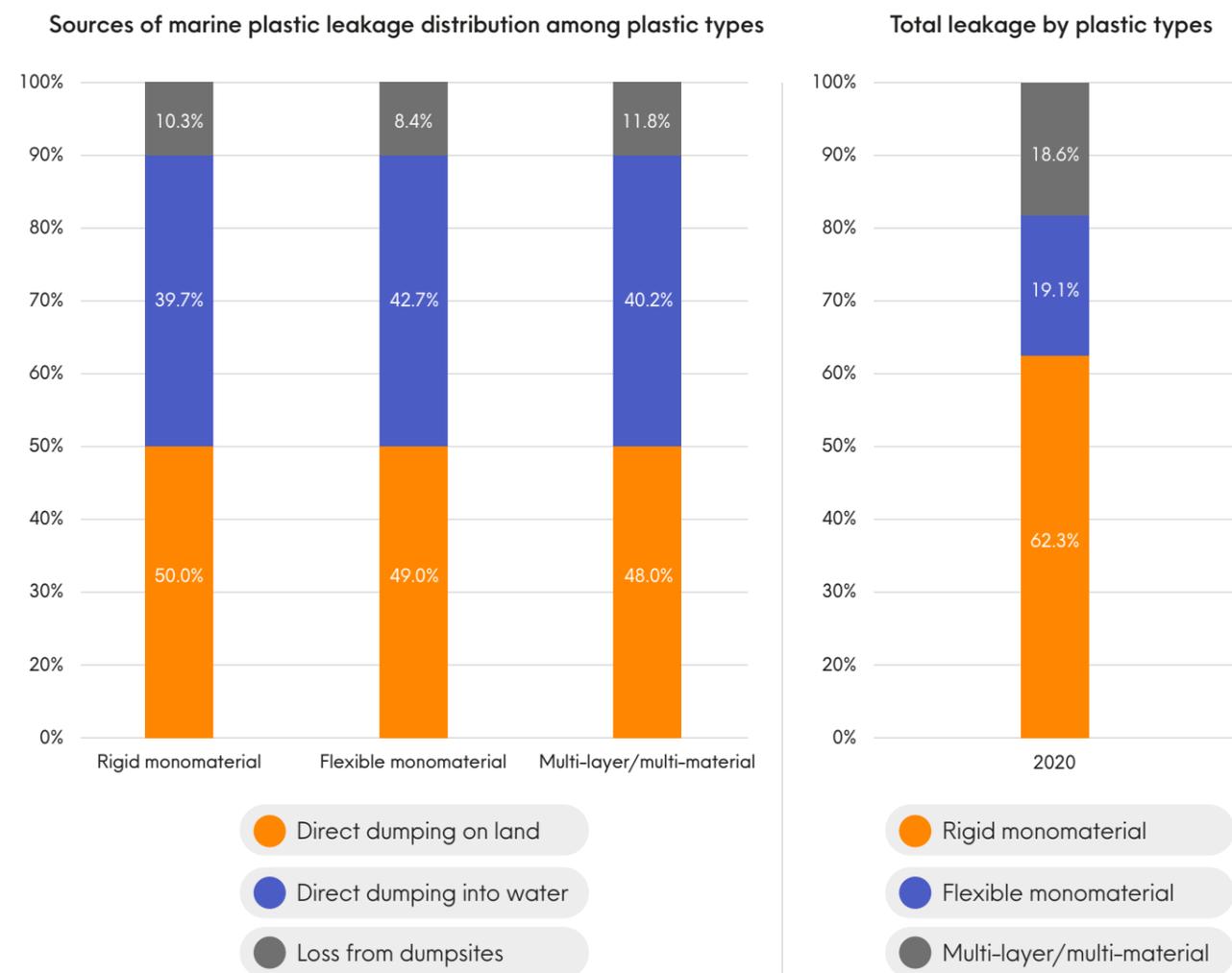


Figure 10: Sources of marine plastic leakage distribution among plastic types



What are the key drivers of business as usual?

NPAP Ghana has adopted six impact areas, setting up a focused Task Force for each impact area to ensure recommendations are fully implemented. Each Task Force brings together national and international partners to identify problems, generate solutions and take action. The six

impact areas are: (i) inform policy, (ii) unlock financing, (iii) transform behaviour, (iv) enable innovation, (v) harmonize metrics, and (vi) promote inclusion (Figure 11).

During consultation and engagement with the Expert Panel, these six

impact areas were used to map the key challenges. The aim was to identify specific challenges within each impact area and ascertain how proposed actions can be implemented by Task Forces in their respective thematic area.

Figure 11: Drivers of business as usual

During the engagement with the Expert Panel, the six impact areas adopted by the GH-NPAP was used to map the key challenges. The impact areas are inform policy, unlock financing, transform behaviour, enable innovation, harmonise metrics, and promote inclusion.



Policy

- Lack of policy on recycling and recyclates use in new packaging & products.
- No policy restrictions of types of plastics used.
- No standards on safe reuse & recycling.
- No enforcement of waste segregation.
- Limited inter-ministerial coordination.



Financing

- Weak financial incentives for recyclers.
- Missing R&D needed for upstream investments.
- Lack of infrastructure for waste collection & recycling.
- Absence of Extended Producer Responsibility Scheme (EPR).



Behaviour

- Cheap, single-use packaging is expected & littering is socially acceptable.
- Low understanding of the impact of plastic pollution on the environment, public health & livelihoods.
- Wrong perception of the social status of waste collectors.



Innovation

- Limited incentives for capital investment for improved technologies.
- No committed R&D or first-loss capital funds.
- Lack of a conscious effort to scale up innovative technologies such as conversion of plastics to building materials.



Metrics

- No central database for plastic use or waste treatment.
- Undermining enforcement, monitoring & evaluation of policy.
- Lack of harmonized metrics and definitions.



Inclusivity

- Lack of policy guidelines to promote inclusivity.
- Lack of financial support for women entrepreneurs.
- Lack of security or transparency on pricing, putting the marginalized at a disadvantage.
- Informal workers are overlooked by social protection schemes.



The key drivers of business as usual are explained below:

Policy issues

Ghana adopted its National Plastics Waste Management Policy in 2019, but implementation has been slow. There is no specific policy on recycling or the use of recyclates in new packaging and products. The country has not set any minimum proportion of recycled material to be used for plastic products. Food and beverage companies use virgin materials for the manufacturing of packaging as they appear to be cheaper to import and use compared with recycled materials. Additionally, food and beverage companies have concerns around the lack of standards for food-grade recycled materials which could compromise food safety.

Another dimension is trade policy, including the absence of clear guidelines and restrictions on the type and composition of imported plastics. The lack of guidance makes it difficult to regulate the type of plastics that enter the country or their recyclability. Without defined standards, recycling companies are unable to identify the chemical composition of each plastic and break down the polymers into reusable forms. Several non-recyclable plastic products are on the market, and these eventually end up discarded with high likelihood of being mismanaged and potentially leaking into waterways. The role of trade and trade policy is discussed in greater detail in [Trade and the Circular Economy: A deep dive into plastics action in Ghana](#).

Ghana has also not implemented any policy to segregate waste in homes or in either the public or private sectors.

The lack of segregation implies that all waste, including organic solid waste, is disposed of alongside plastics. This increases the cost of plastics recycling due to the expenditure incurred in sorting and washing materials to make them recyclable.

Finance factor

Ghana has not created a market for recycled plastics, hence recyclers are not incentivized to scale up operations. The lack of market linkage from collection through to the end user is a key limitation in driving private capital into the value chain, especially in recyclingⁱⁱⁱ. The country has an Environmental Tax and Levy on imported virgin plastic materials (Act 863, 2013), but these funds are not directed into supporting waste management activities. In the 2021 National Budget Statement, a new Sanitation and Pollution Levy was introduced to help mobilize funds for waste management. It remains to be seen if the proceeds from these levies and taxes will be channeled into infrastructure that supports improved management of waste, including plastics.

Insufficient R&D, essential for developing upstream solutions, also poses a critical challenge. Tackling plastics usage upstream requires a proactive approach, either by investing in research to redesign plastic at the chemical or product level or by supporting industry retooling to shift to new materials and business models for product delivery. The lack of financing could be attributed to the absence of first-loss capital and the unwillingness of local fund managers to take first-level risk to attract private capital and blended finance. Moreover, lack of financial inclusion limits opportunities

for groups in the informal sector, especially women, to access funds.

Infrastructure

The lack of infrastructure for waste collection and recycling remains a major problem. Waste management is primarily funded by central and local governments through the district assemblies. It has been reported that authorities face substantial barriers to improvement, such as inadequate supplies of waste bins and poor waste transportation systems. These are compounded by the limited operational funds to support waste collection and disposal.²⁵

Establishing an Extended Producer Responsibility (EPR) scheme is one of the main channels through which funds could be mobilized to support plastic waste management. According to a study commissioned by the Netherlands Enterprise Agency in 2019,²⁶ Ghana's Environmental Excise Tax (a 10% import duty on virgin plastics in place since 2013), together with its predecessor (a 20% Ad Valorem on Plastics), has accrued about GH¢912 million (roughly €157 million). These funds, as well as those collected through an EPR scheme, could be channeled into investment opportunities along the value chain to enhance current infrastructure.

Behavioural factor

The easy prevalence of plastic coupled with lax attitudes towards waste management are key drivers of the business-as-usual scenario. A preference for cheap, single-use packaging combined with a casual attitude to littering is creating a plastic

ⁱⁱⁱ WRAP

pollution crisis. Single-use plastics are easy to access and available for the packaging and manufacture of items such as food take-away packs, stirrers, disposable cups, carrier bags and diapers. These materials litter the streets, clogging open drains and making neighbourhoods susceptible to flooding.

Amongst Ghanaians, there is limited understanding of and appreciation for the impact of plastic pollution on the environment, public health and livelihoods. The general public has become so comfortable with using and discarding plastics that the negative impact of such behaviour is not widely considered.

Additionally, there is a stigma attached to the social status of waste collectors, who are seen to be conducting low-grade work. Waste collection or picking is not considered a respectable job and therefore does not attract the personnel required to support this work along the value chain.

Innovation factor

Sound management of plastics requires the allocation of significant investment

into new technologies. There are, however, limited incentives for capital investment into improved technologies as so many types of plastics are allowed into the country. The lack of import restrictions does not inspire innovation among plastic manufacturers.

In addition, there is no committed R&D or first-loss capital funding available to drive investment in the sector and no conscious effort to scale up innovative technologies, such as the conversion of plastics into building materials. There are several innovative technologies that could be commercialised. There is, however, no connection between research institutions and industry to explore such technologies towards a commercial case for investment.

Data challenges

Only a small number of studies have been undertaken on solid waste in Ghana, some of which show differences in their key findings. The country also lacks key metrics and has no central database for plastic use or waste treatment to provide relevant and reliable data that could inform policy creation. In instances where data is available, there is generally no

disaggregation by gender, rural or urban setting, geographic location, and so on. Granular information such as this is key to understanding both the extent of discrimination and inequality in the value chain and how plastic pollution affects different communities, including men and women. In view of this data challenge, developing responsive actions becomes ad hoc. Similar challenges were faced while developing this roadmap, so appropriate proxies had to be used to enable the modelling.

Lack of inclusivity

The waste management value chain is dominated by informal workers, with women making up the largest proportion of the informal sector.²⁷ The lack of gender parity and protection amongst marginalized groups could be attributed to factors such as harmful gender, cultural and social norms and stereotypes, the absence of policy guidelines promoting inclusivity, limited financial support for women entrepreneurs, insecurity and opacity of pricing which puts marginalized groups at a disadvantage, and the exclusion of informal workers from social protection schemes.

Box 1: Gender and inclusion along the plastic waste value chain

Plastic waste management can be more effective if a gender and inclusion strategy is integrated into a circular economy model. A person's relationship with waste is determined by factors such as lifestyle, social structure, gender, class and ethnicity. Gender differences and inequalities affect how value chains operate at every level.

Critical findings from the gender baseline analysis²⁸ indicate that women make approximately 70% to 80% of consumer purchasing decisions in homes. They are usually the main cooks, caretakers and shoppers for their families.²⁹ In Ghana, the majority of working class families continue to rely on individually packaged serving sizes for foodstuffs and other basic products. Thin plastic films – LDPE and HDPE – are most commonly used in these applications, resulting in a large quantities

of plastic waste generated in households in Ghana, with low-income families using higher proportions of thin films than higher income families, ranging from 60% of total plastic usage to 38%, respectively.³⁰

There is limited information about the size of the workforce in the plastic and waste management value chains, but data gathered for this roadmap indicates that men constitute about 61% of workers and women about 39%. However, their roles are not equal. More than 60% of women work in the informal economy as itinerant waste-pickers or in recycling facilities as washers and sorters. The formal economy, such as waste management firms and plastic sourcing, production and manufacturing companies, which enjoy greater protections, social security and higher status, have the lowest representation of female workers (12%).

In analysing gender roles along the value chain, the data suggests a widespread perception that certain roles are suitable only for men while others are considered solely for women. Gender norms disproportionately affect women in the informal sector, as women working informally typically do so at lower hierarchical levels, while a few women in the formal sector do achieve mid-level or senior-level positions. Roles such as machine operators, drivers, riders, janitors and procurement in the formal sector are heavily skewed towards men and account for over 80% of the industry's workforce. Over 60% of managerial positions are held by men. Whereas washers, sorters and cash collectors in the formal sector are skewed towards women. Administrative roles appear fairly well gender balanced.

Informal waste pickers and workers generally lack access to personal protective equipment (PPE) or training in occupational health and safety. In comparison, the formal sector commonly provides PPE for staff. Waste pickers at dumpsites work in unhygienic and dangerous conditions, and the tedious task of continuously bending to pick causes waist and knee problems amongst the majority of female pickers. Itinerant pickers are not paid the actual cost of recyclables sold.

In the informal sectors, men have more access and control than women regarding equipment, finance, transportation and market information. Male itinerant pickers have more opportunities to secure push carts and tricycles as they work in groups or under an aggregator who supports them with tools and transportation. Women, however, tend to work independently. Also, collateral is required to secure a loan from financial institutions, usually in the form of land, property or a required minimum balance – all of which most women do not have.

National and organizational policies are generally perceived to be gender-neutral as they do not address the specific needs of men and women. Organizations do not pay specific attention to establishing policies that benefit women and marginalized groups, such as flexible working, gender quotas or employing people with disabilities. National policies must detail how gender equality can be achieved, beyond simply identifying gender equality as a policy principle. Policies must clearly identify actions to bring about gender equality – and provide a budget for doing so.

- To address gender gaps, the national action roadmap makes the following recommendations that make gender an integral consideration across the plastics waste system
- Increase access to finance and market information for female waste pickers, recyclers and women entrepreneurs in both the formal and informal sectors.

- Set up financing schemes and target women and marginalized groups within the sector, so they can compete with foreign industries along the value chain.

- Create industrial hubs for informal sector recyclers, addressing the issue of a lack of land to fix recycling machines.

- Within formal institutions, encourage the employment of women workers in the production and manufacturing sectors and bring about new and diverse ideas for redesigning plastics through the initiation of challenges requiring gender-inclusive teams to compete.

- Formalize the informal sector to protect the livelihoods of workers through fair and improved wages, the provision of PPE, organization of occupational health and safety training, access to social security and clear opportunities for social and professional mobility.

To ensure a fair representation of women in decision-making positions, there is a need to build the capacity of women in government agencies and ministries so they can take up leadership roles. Additionally, institutional policies must introduce mechanisms that will protect female staff.

Women as consumers and primary household purchasing decision-makers could be utilized as behavioural change champions to increase demand for reusable and biodegradable business models. However, this would need to be coupled with improved accessibility, affordability and convenience of such solutions. Another beneficial initiative would be to raise awareness of the negative impacts of plastic usage on the health and environment of all citizens, particularly focusing on those disproportionately affected, including women, those living in poverty, and certain marginalized communities. There is also a need to conduct outreach programmes to women. As major consumers of plastics, they often assume the role of managing waste in the home. They are a target audience for awareness-creation campaigns focusing on transforming behaviour to reduce plastic pollution.

Mainstreaming gender in the approaches, documentation and initiatives of NPAP Ghana will go a long way to helping close existing gender inequalities in the sector. Zero plastic leakage into the ocean is only possible through a concerted effort of engagement with all stakeholders across the value chain, providing necessary support to increase their capacity in waste reduction, management, collection and recycling.



Table 2: Recommendations towards the promotion of inclusion across six impact areas

The recommendations to ensure the promotion of inclusivity are presented across the six impact areas below.



Inform policy

- Advocate for national studies to revisit safe exposure levels for men and women, taking into consideration both sex-based physiological differences and gender, social and cultural norms, as well as roles and relations that affect exposure.
- Provide examples and best practice to the Government with the goal of ensuring that legislation aligns with gender-sensitive and inclusive chemical exposure standards for men and women workers in the plastics value chain.



Unlock financing

- Seek and systematically prioritize gender-responsive projects that benefit disproportionately affected communities when connecting to funding sources, as well as female-led and community-led solutions providers. At a minimum, all projects connected to funding sources should be gender-sensitive.



Transform behaviour

- Design a high-impact behavioural change campaign with dual aims of: 1) reducing household plastic waste, and 2) dismantling negative social and gender roles that cause women to take on a disproportionate burden when making greener choices in the domestic sphere.
- Tailor all NPAP products and stakeholder resources to be gender-responsive and inclusive of marginalized communities, with the purpose of informing relevant initiatives to be inclusive and gender-responsive.



Boost innovation

- Support local change-makers in using innovation to address gender inequity. For example, create at least one national innovation challenge on a specific gender inequality issue in plastic pollution that has been identified by the national gender analysis.
- Ensure that all solution clusters are gender-inclusive (50/50 gender parity) and geographically diverse.
- In national innovation challenges, actively seek out innovators and teams that are female-led and/or gender-inclusive as well as inclusive of marginalized communities. Require statements on diversity statistics and commitments to gender inclusion. Prioritize participants with high levels of diversity and inclusion in financial decisions on funding.



Harmonize metrics

- Ensure that the NPAP baseline and conducted scenarios on plastic waste flows are systematically gender-sensitive.
- Work with knowledge partners to identify potential topics where additional research is needed to support the inclusion of key gender equality considerations and the particular needs of differently exposed communities in investment solutions. The aim of this activity is to encourage an inclusive and gender-responsive circular plastics economy.



Promote inclusivity

- Create content and knowledge exchanges featuring diverse women and men to provide an additional platform for traditionally marginalized voices, which will convey their challenges, leadership and solutions.

Chapter 3: Waking up to the challenge – case studies and examples of emergent action in Ghana

Figure 12: Mapping selected existing initiatives and case studies

Reduction

- 1 Trashy Bags converted used plastics to innovate products such as handbags, dresses, pencil cases, etc.
- 2 Y&M Regeneration introduces the concept of using coir/coconut husk to replace plastic bags for nurseries.

Redesign

- 3 Voltic Ghana has redesigned its PET water bottles by making them thinner.

Collection

- 4 Nestlé currently supports the sachet water waste pickers association with tricycles, picking tools and PPE to facilitate collection of plastics for recycling.
- 5 Boano Environmental Services is an aggregator that is developing a reward-for-recycling scheme where households can drop their plastics at collection points for incentives.
- 6 Reaval World utilizes and incentivizes a network of waster pickers and aggregators to collect large volumes of PET bottle waste to reduce plastic pollution.
- 7 Coliba collects and recycles PET, PP and HDPE.

Recycling

- 8 Nestlé currently supports the sachet water waste pickers association with tricycles, picking tools and PPE to facilitate collection of plastics for recycling.
- 9 Boano Environmental Services is an aggregator that is developing a reward-for-recycling scheme where households can drop their plastics at collection points for incentives.
- 10 Reaval World utilizes and incentivizes a network of waster pickers and aggregators to collect large volumes of PET bottle waste to reduce plastic pollution.
- 11 Caliba collects and recycles PET, PP and HDPE.
- 12 Asase Foundation enables Ghanaian women entrepreneur to play a key role in cashing in on the plastic waste of Accra for the benefit of their own communities.

Disposal

- 13 The Greater Accra Resilient and Integrated Development (GARID)^{iv} project involves flood risk management and solid waste management in the Odaw River Basin of the Greater Accra region and improves access to basic infrastructure.

^{iv} GARID is a World Bank sponsored project



Inform policy

- 14 Government has endorsed the National Plastic Waste Management Policy.

Unlock financing

- 15 Government has introduced the Sanitation and Pollution Levy.

Transform behavior

- 16 UGPRP is a project which involves the segregation of plastics for recycling covering a population of 20,000.

Boost innovation

- 17 SAP, in collaboration with WEF and GH-NPAP, is piloting a technology to measure the quantities and types of plastics collected by a group of waste pickers.
- 18 Empower facilitates the digitization and reporting of waste streams.

Harmonize metrics

- 19 UNDP is creating a digital platform to provide real-time information/data on waste management.

Promote inclusion

- 20 WIEGO empowers the working poor, especially women, in the informal economy to secure their livelihoods.

Case Study 1:

Reduce and substitute

Initiative name: Bel Aqua Goes Green: PET bottles made from recycled plastic

Organization name: Blowchem Industries Limited

Resources: <https://belaqua.com.gh/>

Challenge addressed: PET predominantly used for packaging represents 23%^{vii} of all plastic municipal solid waste. While bottle-to-bottle recycling technology is available, there has been limited uptake in Ghana due to regulatory and economic barriers.

Action taken: Blowchem Industries Limited, manufacturers of Bel-Aqua and Bel-beverages, have invested in an in-house PET recycling plant to recycle industrial PET bottle waste for the production of its new Bel-Aqua bottles. As a result

of the aforementioned, Blowchem Industries Limited has committed to ensuring that every bottle of Bel Aqua mineral water released onto the market from June 1, 2021 contains 10% recycled plastic.

Impact achieved: This initiative has enabled the company to cut down on its production costs and increase its profit margins. Spurred on by the latest achievement, Blowchem has set a higher target to increase the recycled content of its PET bottles to 50% by the end of 2022 as an urgent effort to drastically reduce the beverage manufacturer's plastic footprint and reduce the amount of plastic waste released into the environment daily. Blowchem is also partnering with another bottler in Ghana to explore how recycled plastic can be incorporated into the packaging of its products.

**1ST GHANAIAN
MINERAL WATER BRAND
BOTTLE MADE
WITH RECYCLED
PLASTIC**



For the Greater Good

BELAQUA Goes Green
MINERAL WATER

^{vii} Troutman, Heather, and Kwadwo Aseidu-Dankwah. 2017. "Waste Valorization as a Sustainable Strategy for Plastic Waste Management in Developing Economies: A Case Study of Accra, Ghana." M.Sc. Thesis. Resource Efficiency in Architecture and Planning, HafenCity University Hamburg, Germany

^{viii} Miezah, Kodwo, Kwasi Obiri-Danso, Zsófia Kádár, Bernard Fei-Baffoe, and Moses Mensah. 2015. "Municipal Solid Waste Characterization and Quantification as a Measure Towards Effective Waste Management in Ghana." Waste Management 45: 15-27)

Case Study 2:

Redesign plastics for recycling

Initiative name: Same Voltic New Twist

Organization name: Voltic GH Limited

Resources: www.volticghana.com

Fast facts

- New Twist bottle is easy to twist and recycle
- New Twist bottle preferred by recyclers and aggregators
- New Twist bottle is more eco-friendly

Challenge addressed: PET bottles used to package beverages have a high volume to weight ratio. This makes it costly to transport PET waste to recycling facilities and consequently impacts recycling costs.

Action taken: Voltic's new Twist bottle was rolled out as part of the company's goal to drive home the message of recycling and to encourage consumers to take action for the environment. The bottle contains 7% less plastic and is designed to allow consumers to easily twist it after consumption, which then renders the bottle more compact and more conveniently stored and more economically transported by waste pickers to recycling facilities.

Impact achieved: The new Twist bottle creates a smaller volume of waste per bottle and encourages consumers to segregate waste bottles for recycling. The redesigned bottle is aesthetically appealing to consumers, and is easier to collect and recycle. Consequently, the Twist bottle is preferred by recyclers and aggregators.



Case Study 3:

Increase plastic waste collection

Initiative name: Shifting Perceptions from Waste to Resource

Organization name: rePATRN Limited

Resources: www.repatrn.com

Fast facts

- Recovered for recycling over 6,000 tons of PET bottles since January 2019
- Engaged with more than 5,000 people involved in informal plastic collection
- Created 150 direct jobs

Challenge addressed: While PET has a vibrant recycling industry on the global market, there was virtually no PET recycling in Ghana before 2019 despite large quantities of PET used in beverage packaging. In absence of local demand, waste PET bottles were overlooked by waste pickers and were a common source of marine plastic pollution.

Action taken: rePATRN is committed to establishing Ghana's first bottle-to-bottle recycling plant in partnership with its operating partner, Veolia Ghana Limited. It works closely with its network of informal collectors to secure the feedstock necessary to run the plant.

Impact achieved: Since the beginning of 2019, rePATRN has enabled informal waste collectors to generate revenue of GH¢6 million through the supply of PET plastic bottles. The impact these collectors have had on the environment, along with being able to build businesses, benefits over 5,000 people.

Case Study 4:

Increase current recycling capacity

Initiative name: Sustainable Initiative
Organization name: Miniplast Limited
Resources: www.miniplast.com

Fast facts:

- Creating an inclusive value chain that enhances economic opportunities by integrating people with disabilities, women and young people in waste collection and aggregation activities
- Repairing land and marine environments by recycling thousands of tonnes of plastic waste and using clean energy technologies
- Preventing further ecological degradation by providing training for informal waste collectors that improves public education about plastic recycling
- Encouraging behavioural mindset changes towards industrial and household recycled products to change consumer purchasing and develop new markets

Challenge addressed: Due to poor solid waste management, plastic waste is widespread across Ghana. This causes health, environmental and infrastructure risks. These risks are amplified by a lack of education for environmental sustainability, incomprehensive waste collection infrastructure and services, limited technology for recycling and stigmatization of recycled products and waste workers.

Action taken: Miniplast Limited's objective is to contribute to positive economic growth and sustainable plastic recycling and manufacturing in Ghana. The company's approach focuses on the prevention of further environmental degradation by educating the public about recycling, improving economic opportunities by integrating women, young people and people with disabilities into the system, and achieving an efficient collection, recycling and manufacturing value chain that creates a financially and environmentally sustainable economy.

Impact achieved: Since October 2019, Miniplast has:

- Reduced 800 tonnes of CO2 emissions annually by switching to solar energy and sharing transportation logistics with local SMEs and NGOs.
- Trained 138 new informal waste collectors on plastic identification and COVID-19 safety.
- Generated 86 new employment opportunities (filled by 34 males and 52 females).
- Recycled thousands of tonnes of plastic waste annually.
- Opened two new plastic waste collection centres.
- Piloted four projects that focus on plastic recycling and clean energy with a range of stakeholders and local businesses.



Case Study 5:

Improve and expand safe disposal

Initiative name: GARID – Greater Accra Resilient and Integrated Development Project
Organization name: World Bank Group
Resources: <https://projects.worldbank.org/en/projects-operations/project-detail/P164330>

Challenge addressed: Accra, the capital city of Ghana, is susceptible to regular flooding, especially during the rainy season. One of the contributory factors has been the poor network of drains to direct the flow of water through the city to the ocean. This is compounded by widespread and indiscriminate dumping of solid waste into the limited drainage network. Efforts have been made to desilt the drains ahead of the rainy season, but this work has not achieved the desired results.

Action taken: The GARID project has five components. The second component, improve solid waste management capacity, aims to reduce the amount of solid waste flowing into the primary Odaw channel and the ocean. Major activities to be carried out under this component include:

- Community-based solid waste management (SWM) interventions in targeted low-income communities, including a major outreach program to sensitize and improve public behavior about SWM.
- Construction of Waste Transfer Stations.
- Capping of old dumpsites.
- Extension of final solid waste disposal capacity in the Greater Accra Region.

Impact achieved: With an investment of about \$200 million, the project is expected to improve flood risk management and solid waste management in the Odaw River Basin of the Greater Accra Region. It will also improve access to basic infrastructure and services in the targeted communities within the Odaw River Basin.

Case Study 6:

Inform policy

Initiative name: National Plastics Management Policy
Organization name: Ministry of Environment Science Technology and Innovation
Link to website / additional resources: www.mesti.gov.gh; https://mesti.gov.gh/wp-content/uploads/2021/02/Revised-National-Plastics-Management-Policy_-FINAL.pdf

Challenge addressed: Plastics have been indiscriminately disposed over the years choking our water drains and open gutters resulting in perennial floods across the country year in- year-out. Some of these plastics find their way into the ocean which affects aquatic life leading to low fish yields, the major source of protein to most Ghanaians.

Action taken: The objective of the policy is to grow the economy, create jobs and protect the environment to ensure sustainable development. It will also develop a roadmap to progressively reduce the use of plastics, recover, recycle and re-manufacture plastics. The policy is anchored around four strategic pillars: (1) behavioural change, (2) strategic planning and cross-sectoral collaboration, (3) resource mobilization towards a circular economy, and (4) good governance, inclusiveness and shared accountability. The ministry is building partnerships for the implementation of the policy from the public sector, academic and research institutions, development partners, civil society organisations, private sector, among others. The policy was considered and approved by cabinet on 21st May 2020 and it is yet to be launched.

Impact achieved: It is expected that the policy when implemented will:

- Enhance the adoption of innovative technologies to deal with plastics
- Identify innovative sources of financing for plastics management
- Promote effective institutional coordination, good governance and inclusiveness for effective plastics management
- Build capacity for sustainable plastics management
- Help establish circular economy for plastics
- Promote alternative material for plastic products and packaging.

Case Study 7:

Unlock financing

Initiative name: Country Financing Roadmap for the SDGs: Ghana

Organization name: Government of Ghana in collaboration with World Economic Forum's Sustainable Development Investment Partnership (SDIP)

Resources: [Country Financing Roadmap for the SDGs: Ghana | World Economic Forum \(weforum.org\)](#)

Challenge addressed: Ghana is one of Africa's leading and most stable economies. While Ghana's economic outlook is still positive, it does face several risks and challenges to sustained growth and stability, in particular in meeting its Sustainable Development Goals (SDGs) by 2030. These challenges have been exacerbated by the extended COVID-19 crisis.

Action taken: The Government of Ghana, in partnership with the World Economic Forum's SDIP, initiated the Country Financing Roadmap (CFR) for SDGs initiative as part of its efforts to identify, quantify and develop strategies to bridge the SDG financing gap in line with immediate and longer-term national development priorities. The Ghana CFR report is the result of consultations with more than 50 local and global stakeholders – involving public-sector institutions, thought leaders, investors, development finance institutions and other actors.

Impact achieved: The Ghana CFR is designed to foster consensus through a multistakeholder approach to unlocking capital and financing that will help the country progress towards its SDGs. Working through SDIP in Africa, the process undertaken for this CFR, with Ghana as the pilot country, serves as an important launchpad to expand the initiative to other countries.



Case Study 8:

Transform behaviour

Initiative name: Eco-conscious Kofi and Ama: Experiments by UNDP Accelerator Lab, Ghana on plastics segregation and recycling

Organization name: United Nations Development Programme (UNDP) Ghana, in collaboration with GRIPE (Ghana Recycling Initiative for Private Enterprises), Total Petroleum Ghana PLC, Coliba Limited and local communities.

Link to website / additional resources:

https://www.gh.undp.org/content/ghana/en/home/blog/2019-/_eco-conscious-kofi-and-just-passing-ama--experiments-by-undp-gh.html
<https://youtu.be/T3EmCYstaFo>

Fast facts:

- Experiments by UNDP Accelerator Lab Ghana using behavioural insights (BI) methods led to increases of 18% and 44% in plastics deposited responsibly by communities.
- BI methods, including personas and archetypes, show great potential for driving behavioural change towards better plastics segregation and recycling.
- Survey results indicate that limited access to collection points and companies that collect plastics are often barriers to developing segregation habits.

Challenge addressed: How does the design of communications about plastics segregation and recycling affect people's attitudes? How do attitudes translate into behaviours? Can communication create behavioural change so that segregation is more likely to become a habit? UNDP Accelerator Lab Ghana has been running experiments based on behavioural insights to explore these questions.

Action taken: UNDP designed information experiments to test if deploying social norms, cognitive dissonance and localized messages would increase responsible disposal of plastics at two sites. Experiments were based on personas of people who segregate frequently (known as 'eco-conscious Kofi and Ama'), intermittently ('Maybe Mansa') or not at all. A survey and conversation on the TroTro diaries online community provided contextual data.

Impact achieved: Experiments led to increases of 18% and 44% in plastics collected at the two sites, with some evidence of secondary behavioural effects triggered by information shared through social networks.

- Some communities said that idealized levels of environmental awareness portrayed in advocacy campaigns can appear unattainable, so using different personas to reflect the realities of plastics segregation may help to trigger incremental behavioural change.
- Based on about 400 respondents, the survey highlights limited access to plastic collection points and collection services as key barriers to plastics segregation.



Case Study 9:

Boost innovation

Initiative name: Manufacturing of pavement blocks with low-value mixed plastic waste

Organization name: Nelplast Ghana Ltd

Link to website / additional resources:

<http://www.nelplastgh.com/>

<https://www.youtube.com/watch?v=r4li9zGq4QI>

Challenge addressed: Nelplast is a Ghanaian limited liability company located in Ashaiman Municipality that upcycles plastic waste into slabs, bricks and blocks. The initiative was inspired by the desire to help clean the environment of plastic waste. Nelplast uses all forms of plastic waste except PVC pipes.

Action taken: In 2013, Nelplast began moulding pavement blocks of varying shapes and colour from aggregates of plastic waste and sand. The company produces slabs and blocks for housing, paving compounds, playgrounds, driveways and sidewalks. Nelplast is open to receiving plastic waste from the general public and has about 300 waste pickers who aggregate plastic waste to feed the production process. The company can process up to three metric tonnes of plastic waste per day.

Impact achieved: Nelplast hopes to expand its operations to recover and recycle more plastic waste and build more houses for the Ghanaian community. A two bedroom house built with Nelplast blocks made from 16 tonnes of plastic is estimated to cost around GH¢70,000 to 80,000. The company is also working on coming up with roofing materials that are made from recycled plastics.



Case Study 10:

Harmonize metrics

Initiative Name: SAP and Ghana MESTI Plastic Traceability Project

Organization Name: SAP

Link to website / additional resources:

https://www.youtube.com/watch?v=89-B-0OLBqE&feature=emb_logo

Fast facts

- Improve the lives of plastic collectors
- Allow traceability of material
- Increase the amount of recycled plastic and stop plastic leaking into the environment

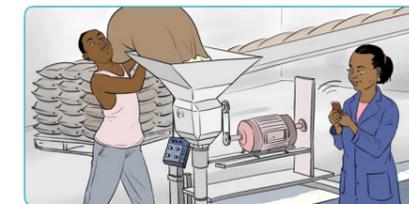
Challenge addressed: With recycling on the rise to combat plastic being leaked into the environment, more and more waste collectors find work in collecting plastic. Since this job is often done informally, the socio-economic and

working conditions of the collectors are often unknown to governments and buyers of their plastic.

Action taken: This initiative is introducing a system that captures data about plastic collectors, leading to improved organization, better rewards for pickers and enhanced traceability that gives this plastic greater value.

Impact achieved: In the initial pilot, 300 to 500 plastic collectors will use this system, allowing for thorough research of the current situation and leading to actions that improve collectors' lives. Hundreds of tonnes of plastic will be tracked through the system and recycled. Once the pilot is proven, the project aims to scale the initiative to other locations and increase the volumes. With that in mind, the project organizers are currently looking to connect with other systems, collectors and recyclers.

Processing (optional)



Register the weight and state of the plastics before processing

Loading



Register goods being loaded onto the truck

Offloading



Receive plastic delivery from middlemen/-women or Aggregator

Collector Registration



Register new collectors to join the SAP Rural Sourcing Management system

Collector PIN



Set a new PIN number or change the PIN number for a collector

Promote inclusivity

Initiative Name: Promoting Doorstep Waste Collection in a Coastal Community via the Kpone Waste Pickers Cooperative

Organization Name: WIEGO and Kpone Waste Pickers Association

Link to website / additional resources:

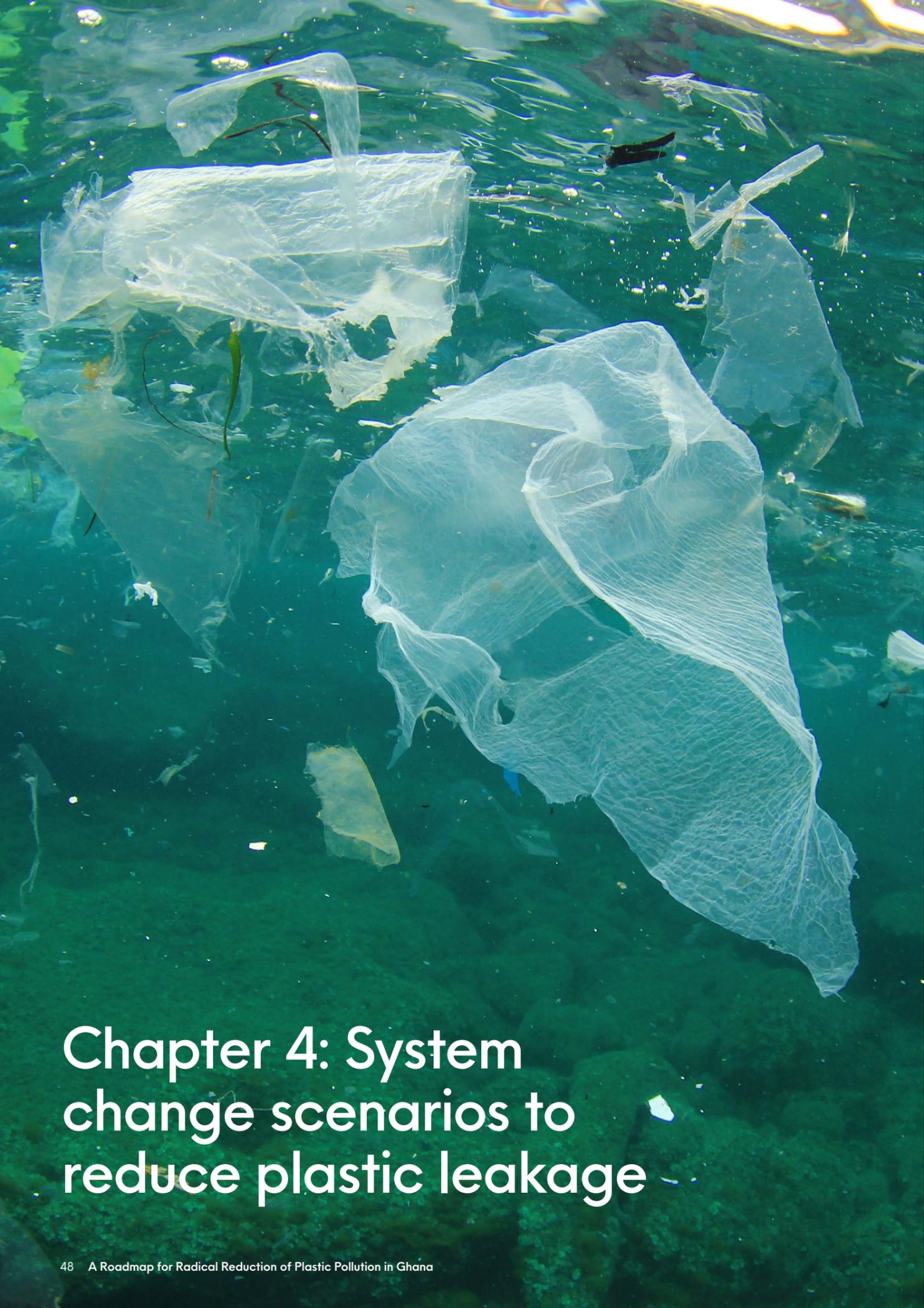
<https://www.wiego.org/resources/press-release-ghana-waste-pickers-say-closure-threatens-survival-and-demand-government>

Challenge addressed: Proper waste management in the Kpone coastal community remains a challenge. Waste generated in the community from households, market centres, lorry stations and streets are often not collected or disposed of effectively, and a large proportion of the waste ends up in the ocean, endangering marine ecosystems.

Action taken: WIEGO has supported female and male waste pickers at the Kpone landfill site to undertake pilot waste collection exercises in the Kpone community. This work has informed subsequent engagement with community residents, traditional and elected leaders as well as municipal authorities. Results from the pilot collection exercises have been used to develop a proposal to advocate for a waste collection contract between the Kpone Waste Pickers Association and the Kpone Municipal Assembly.

Impact achieved: After the second pilot waste collection exercise, 30 female and male waste pickers were able to collect about 1.7 tonnes of waste from households, with 14.2% and 66.3% being plastic waste and non-recyclable and organic waste respectively. If the goal of securing a waste collection contract for the waste pickers' cooperative to undertake waste collection within the Kpone Community is achieved, the project will provide alternative livelihoods and decent working conditions for female and male members of the Kpone Waste Pickers Cooperative.





Chapter 4: System change scenarios to reduce plastic leakage

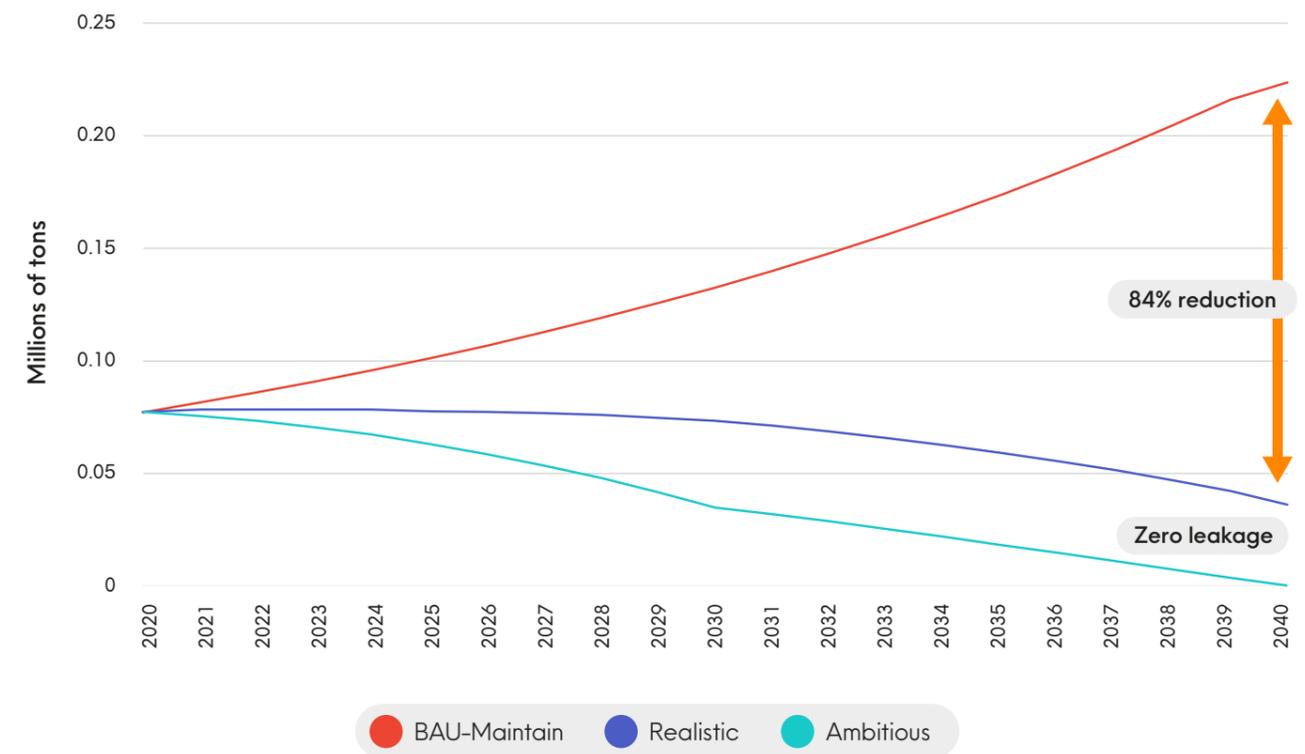
In this chapter, we present two system change scenarios (SCS) to address mismanaged plastic waste in Ghana. Based on an existing model for plastic flows³¹ the scenario considers three key criteria: (i) the impact and relative cost of different system changes; (ii) the risk of unwanted consequences for people and the environment; and (iii) expert opinions on the feasibility, technology readiness and speed of implementation of different solutions. These intervention areas have been chosen based on the characteristics of the plastic waste value chain in Ghana, the availability of technology, and the convenience and affordability of these interventions. Expert consultations with representatives from academia, civil society organizations, government bodies, the media and the private sector were held to elicit a range of perspectives

on the feasibility and practicability of these system change scenarios.

The scenario modelling covered two broad scenarios; BAU and SCS. BAU is further divided into two sub-scenarios – maintain and do nothing, while the SCS is broken down into realistic and ambitious scenarios.

To solve the plastic leakage problem, the SCS shows that several upstream and downstream solutions need to be implemented concurrently, ambitiously and urgently. Under the realistic scenario, an 84% reduction in plastic leakage in Ghana can be attained. Under the ambitious scenario, plastic leakage would be reduced to zero by 2040. Both of these scenarios provide a significantly different future to the BAU maintain scenario (Figure 13).

Figure 13: Plastic leakage into waterways under system change scenarios and BAU maintain scenario



System change scenarios

The realistic SCS consists of five system interventions:

1 Reduce and substitute plastic usage to restrict year-on-year growth in the consumption of plastic-based materials. Under the realistic scenario, reduction and substitution targets are 30% and 10% respectively. Under the ambitious scenario, reduction and substitution targets are 40% and 13% respectively, all by 2040.

2 Redesign plastic products and packaging for reuse or high-value recycling. The target under both scenarios is to ensure 5%

of plastics produced come from recyclable material by 2040.

3 Increase plastic waste collection from the current 49% to 85% under the realistic scenario and 100% under the ambitious scenario by 2040. This will be achieved by boosting state-funded, informal and private-sector collection systems.

4 Expand recycling rate from the current 10% to 32% under the realistic scenario and 45% under the ambitious scenario by 2040. This requires actions such as developing formal

recycling facilities, increasing the involvement of informal and private sector players and the collection of source-segregated dry waste.

5 Build or expand controlled waste disposal facilities, such as engineered landfills, to safely manage and prevent leakage of plastic waste.

Based on the discussions of the Expert Panel, these interventions have been prioritized using the waste hierarchy framework described in the **World Bank's What a Waste** report (Figure 14).³²

Figure 14: Waste hierarchy



Table 3 below summarizes the actions under each of these five system interventions for both the realistic and ambitious scenarios and the respective achievements required by 2030. The key differences between the two scenarios centre on reduction and

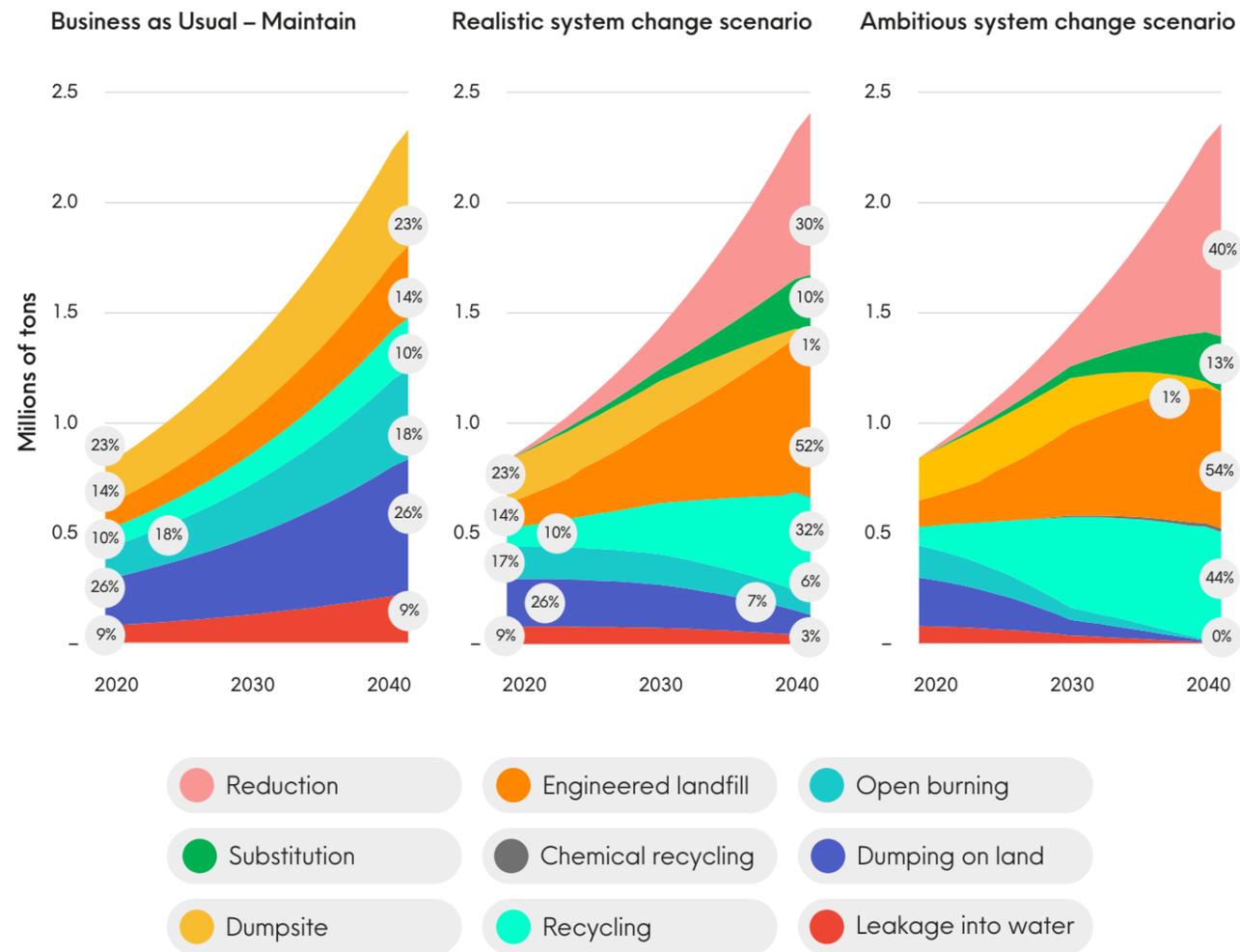
substitution, waste collection coverage and safe disposal capacities. For reduction and substitution, the realistic and ambitious scenarios are based on Pew's scoring for lower middle-income countries in the **Breaking the Plastic Wave** report.³³

There is a credible path to significantly reducing plastic leakage to the ocean. However, it requires all solutions to be implemented concurrently, ambitiously and urgently. The total impact of scaling all interventions concurrently in the realistic and ambitious scenarios is shown in Figure 15, below.

Table 3: System change scenario interventions which need to be applied together and immediately

System change scenario interventions	Key actions / Sub-interventions	Realistic SCS (84% plastic leakage reduction by 2040)	Ambitious SCS (zero plastic leakage by 2040)
Reduce and substitute plastics	Reduce plastic consumption via elimination, reuse and new delivery models.	30% of plastic consumption can be avoided - equivalent to 0.74 million tonnes reduction in 2040 .	40% of plastic consumption can be avoided - equivalent to 0.96 million tonnes reduction in 2040 .
	Substitute plastics with suitable alternative materials: paper, coated paper and compostables.	A further 10% of plastic consumption can be avoided - equivalent to 0.25 million tonnes reduction in 2040 .	A further 13% of plastic consumption can be avoided - equivalent to 0.33 million tonnes reduction in 2040 .
Redesign plastic products and packaging for reuse and high-value recycling	Target frequently consumed and littered products with limited recyclability for redesign for improved waste management.	Conversion of 38% of sachets and multilayer packaging to flexible mono-material packaging plus 5% of multi-material household goods converted into rigid mono-material products. This is equivalent to 0.11 million tonnes of non-recyclable plastic materials converted to recyclable plastic by 2040 .	
Increase plastic waste collection	Expand MSW collection coverage.	Expand the collection coverage from 49% to 85% by achieving a target of 100% in mega and medium archetypes, 70% in rural and 50% in remote.	Expand the collection coverage from 49% to 100% for all archetypes.
Increase current recycling capacity	Institute waste segregation from source.	Introduce waste segregation policies and invest in infrastructure to support segregation at every household by 2040.	
	Use policies and economic incentives to make growth in the recycling system economically viable.	Increase plastic collected for recycling from the current 10% to 32% in 2040 . This can be achieved through a deliberate effort to: segregate waste, standardize pricing for waste collection and support recyclers with levies on plastic imports.	Increase plastic collected for recycling from the current 10% to 45% in 2040 . This can be achieved through a deliberate effort to: create market linkage from collection to end users, segregate waste, standardize pricing for waste collection, and support recyclers through levies on plastic imports and an environmental levy. Chemical recycling is included at minimal levels, converting about 1% of the total waste generated.
	Increase mechanical recycling capability.	Increase annual recycling from a yearly figure of 0.08 million to 0.45 million per year . This will require 0.37 million tonnes additional capacity being built, implying at least 12 new facilities (assuming each has a processing capacity of 30,000 tonnes) being added over the next 20 years.	Increase annual recycling from a yearly figure of 0.08 million to 0.52 million per year . This will require 0.44 million tonnes additional capacity being built, implying at least 15 new facilities (assuming each has a processing capacity of 30,000 tonnes) being added over the next 20 years.
Build and expand safe disposal capacity	Expand controlled disposal to eliminate dumpsites and improve engineered landfills to completely stop plastic leakage.	Build an additional 8.0 million tonnes of engineered landfill capacity and about 3.2 million tonnes of controlled dumpsites. Assuming a capacity of one million tonnes each, eight additional landfill sites and four controlled dumpsites will be needed to prevent leakage.	Build an additional 8.0 million tonnes of engineered landfill capacity and about 3.4 million tonnes of controlled dumpsites. Assuming a capacity of one million tonnes each, eight additional landfill sites and four controlled dumpsites will be needed to prevent leakage.

Figure 15: The fate of plastics in Ghana under BAU and SCS



Under **maintain**, we do not anticipate any change in the metrics in 2020. Total waste generated per annum will grow from 0.84 million tonnes per year to 2.4 million tonnes in 2040. With the current capacity maintained, the model shows that annual leakage will amount to 0.22 million tonnes per year, representing 9% of total waste generated.

The **realistic scenario** involves reducing plastic generation by 0.74 million tonnes per year (30% of the 2.43 million tonnes of plastic generated in 2040 under the business-as-usual scenario),

substituting 0.25 million tonnes per year (10% of business-as-usual plastic waste), recycling 0.45 million tonnes per year (32% of business-as-usual plastic waste) and properly disposing of 0.8 million tonnes per year (52% of business-as-usual plastic waste) of the remaining plastic waste in controlled facilities. By taking these actions, the proportion of mismanaged waste and leakage decreases from 75% in 2020 to 13% in 2040.

The **ambitious scenario** involves reducing plastic generation by 0.96

million tonnes per year (40% of the 2.43 million tonnes of plastic generated in 2040 under the business-as-usual scenario) substituting 0.32 million tonnes per year (13% of business-as-usual plastic waste) recycling 0.52 million tonnes per year (45% of business-as-usual plastic waste) and properly disposing of 0.62 million tonnes per year (54% of business-as-usual plastic waste) of the remaining plastic waste in controlled facilities. Taken together, these actions reduce the proportion of mismanaged waste and leakage to 0% in 2040.

Intervention 1:

Reduce and substitute

Under business as usual, plastic consumption is estimated to almost triple (a 190% increase) due to the combined effects of 83% per capita plastic consumption increase (from 0.027 tonnes of plastic per person per year to 0.050 tonnes of plastic per person per year) and 58% population growth by 2040. This highlights the critical need for mechanisms enabling reduction and substitution of plastic.

Under the **realistic scenario**, this intervention reduces growth in plastic production and consumption to avoid 30% of projected plastic waste by 2040 versus BAU. Substituting plastic with paper, coated paper and compostable materials avoids a further 10% of plastic waste by 2040, resulting in a total cut of 40% by 2040.

Under the **ambitious scenario**, reduction avoids 40% of projected plastic waste by 2040 and substitution avoids a further 13% of plastic waste by 2040, resulting in a total cut of 53% by 2040.

Reduction

It is realistic to reduce plastic consumption in Ghana by 30% as compared to BAU. But if Ghana is more ambitious, it can achieve a 40% reduction by 2030 versus BAU. These strategies would deliver physical reductions of 0.74 and 0.96 million tonnes, respectively.

The reduction achievable by 2040 was determined by analysing three reduction strategies: 1) elimination; 2) reuse; and 3) new delivery models. (See Appendix A.3 for methodology). Under the realistic scenario, elimination (for example, eliminating unnecessary items and over-packaging) provides a 7% reduction in plastic production, expanding reuse options provides a 4% reduction and new delivery models (such as refill systems) provide a 19% reduction.

Under the realistic scenario, out of the 15 product applications analysed, the following account

for approximately 67% of total reduction potential (Figure 16):

- **Household goods** and other rigid mono-materials (25% of total plastic waste generated before interventions), such as high-density polyethylene (HDPE) used for packaging bleaches, soap, shampoo, paints and oil products, can be reduced through elimination interventions that limit over-packaging of goods and allow for reuse. For example, using soap bars and take-back services.

- **Flexible films** (13% of total plastic waste generated before interventions), such as sachet pouches, rolls, wrappers and twisted wrappings can be reduced through new delivery models that prevent over-packaging. For example, using packaging- and label-free products, as well as using paper wrappers for food packages. This will be driven by innovation from industry players and specific policies limiting the use of wrappings on products.

- **Food-grade bottles** (water bottles, 1%, and other food-grade bottles, 10%, of total plastic waste generated before interventions), specifically water bottles and PET, can be reduced through both reuse and new delivery models. Consumers can be encouraged to use reusable bottles and stores can charge a fee for refilling bottles.

- **Pots, tubs and trays** (10% of total plastic waste generated before interventions), such as rubber buckets, display or serving trays and mono rigid tubs can be reduced through elimination and new delivery models. This can be achieved through the introduction of legislation banning the use of plastic pots, tubs and trays and encouraging the use of alternatives.

- **Business-to-business packaging**, both rigid mono-material and flexible mono-material, (8% of total

plastic waste generated before interventions) is usually for large applications. Flexible packaging can be reduced through the establishment of deposit return systems for the reuse of packaging.

Substitution

The substitution achievable by 2040 was determined by analysing three substitution strategies: 1) paper; 2) coated paper; and 3) certified and appropriate compostable materials (including compostable plastic and non-plastic materials).

In the realistic scenario, 10% (0.62 million tonnes) of plastic consumption can be avoided via substitution with paper (2% of BAU plastic consumption in 2040), coated paper (2%) and compostable materials (6%) in 2040. Under the more ambitious scenario, 13% (0.33 million tonnes) can be substituted. This is achievable without significantly affecting the performance, affordability or social and environmental acceptability of packaging and single-use items.

Under the realistic scenario, six plastic applications account for approximately 57% of total substitution potential. They are as follows:

- **Other rigid mono-material packaging** (17% of total plastic waste generated before interventions) includes products such as plastic baskets. Plastic baskets can be switched to woven baskets made of wood.

- **Flexible films** (13% of total plastic waste generated before interventions), as mentioned previously, include sachet pouches, rolls and wrappers. These plastic products can be replaced with paper and compostable alternatives.

- **Sachets and multilayer films** (9% of total plastic waste generated before interventions). Compostable

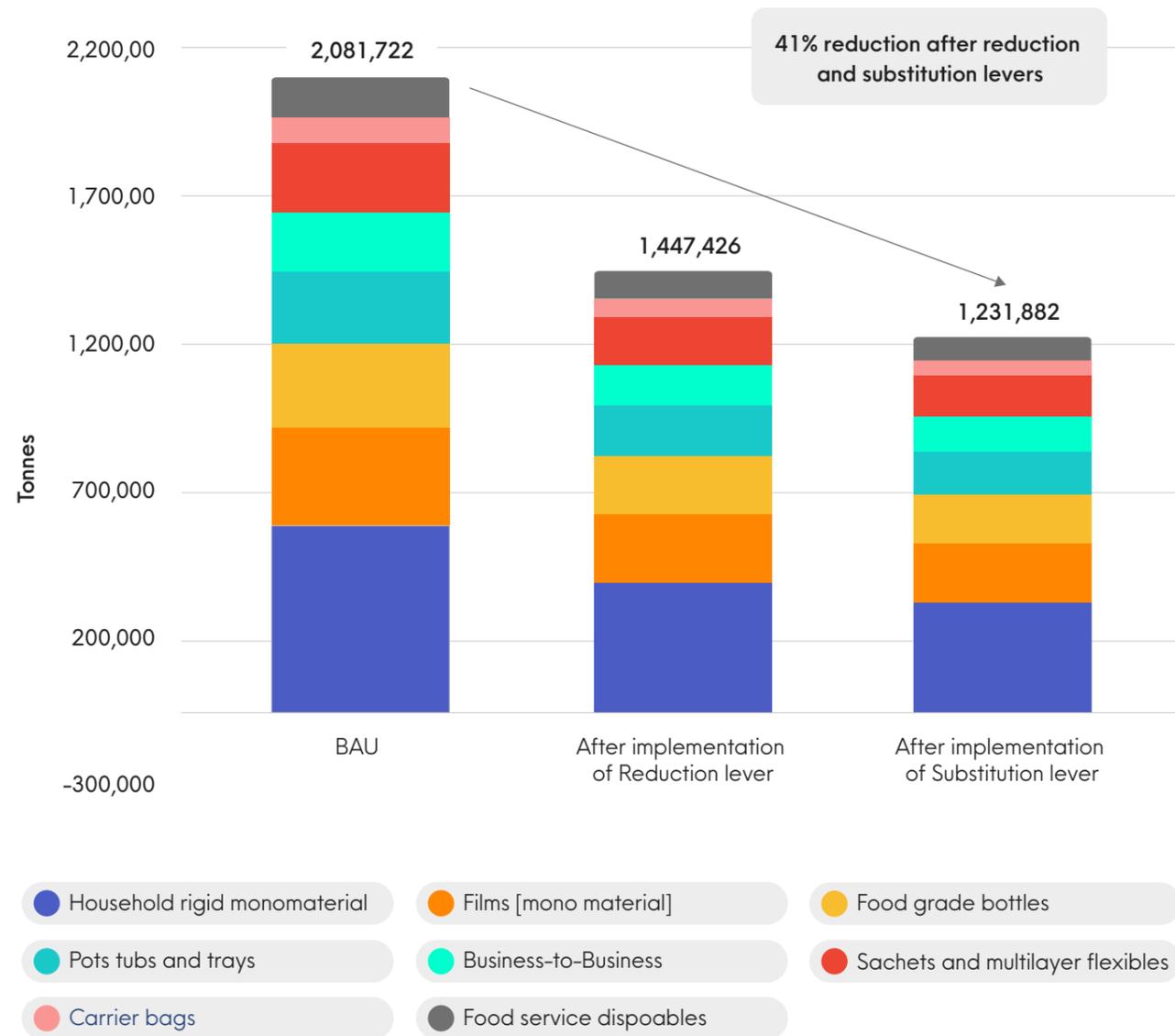
alternatives for food-grade sachets are already available on the global market, mainly in Europe.³⁴

• **Pots, tubs, and trays** (10% of total plastic waste generated before interventions) include tubs for ice cream, yoghurt and instant snack pots. Paper and coated paper alternatives already exist for some popular international ice-cream brands, and such technology can be adopted for the remaining market input goods.³⁵

• **Food service disposables** (5% of total plastic waste generated before interventions). Plastic food service disposables, such as cutlery and plates, can be replaced with paper, or industry-grade and non-disposable options considered. Sustained campaigns on the effects of plastics on the environment need to be undertaken to convince food vendors of the need to switch to alternatives that have minimal social and environmental impacts.

• **Carrier bags** (3% of total plastic waste generated before interventions). Paper alternatives to plastic bags already exist and can be further adopted to eliminate single-use plastic bags. Redesigned plastic bags with a longer life span are available.³⁶ Additionally, consumers can be encouraged to carry reusable bags, for example, those made from cotton bags, with them.

Figure 16: Amount of plastic generated in 2040 for the key product applications post-reduction (realistic scenario)



Intervention 2:

Redesign plastics for recycling

Ghana has a high proportion of rigid mono-materials in its total plastics consumption – estimated to be 63%. Flexible mono-materials and multilayer materials make up 20% and 17%, respectively. In selecting specifications, emphasis is placed on interventions other than redesign, which projections suggest can reduce about 5% of the total plastics consumed. Expert Panel discussions and the many views on solutions offered by stakeholders focused more on reduction, substitution and recycling (Figure 17).

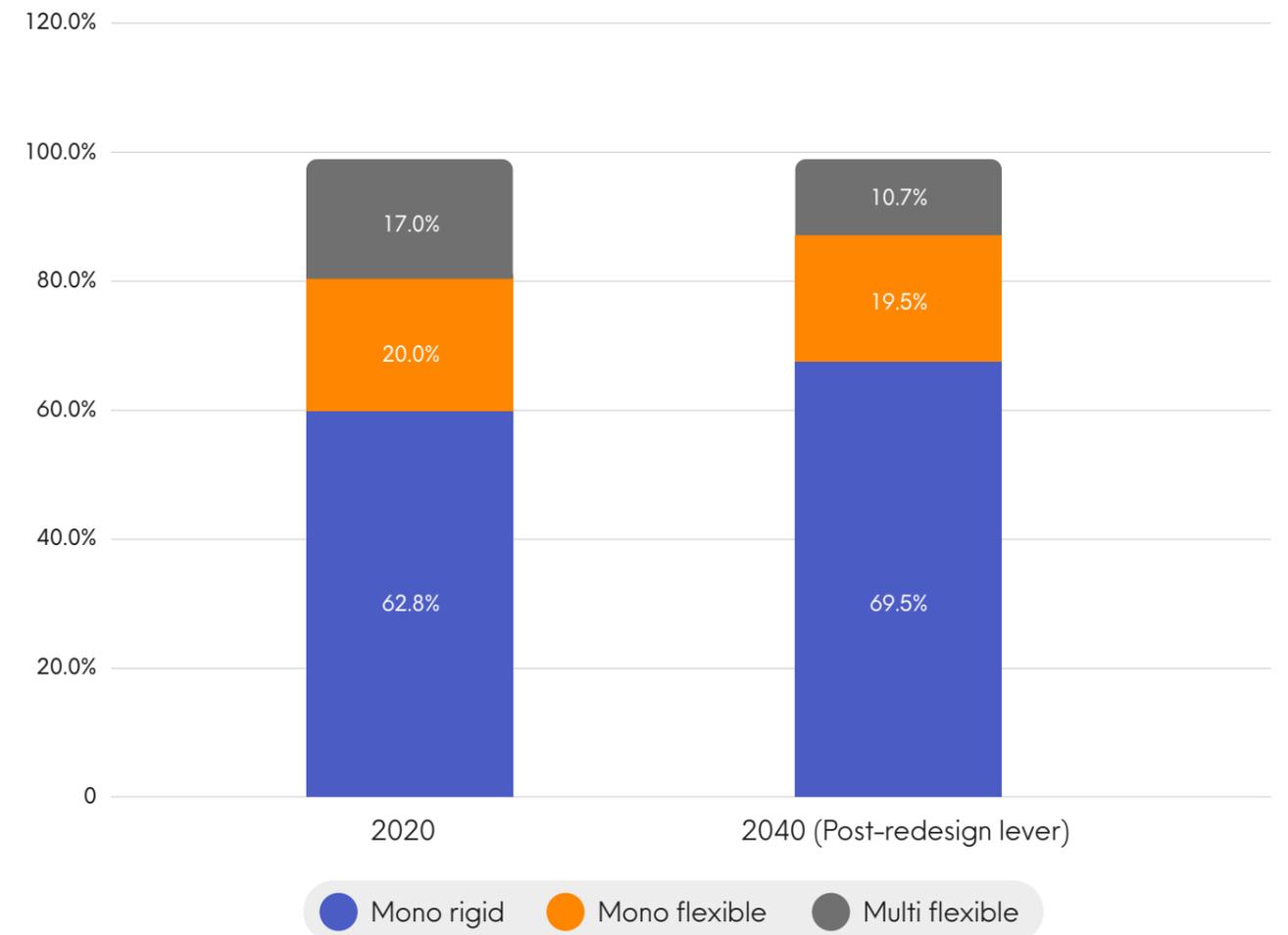
The opportunities for Ghana in this area are:

• **Switch 38% of multi-material^{vii} flexibles, particularly sachets and multilayer packaging, to mono-material flexibles by 2030.** Multi-material products are particularly difficult to recycle and can only undergo open-loop mechanical recycling, which produces lower-value products than closed-loop mechanical recycling. Innovations in the industry have, however, indicated

that mono-material alternatives can meet the required properties to replace multi-material flexibles as soon as 2040.³⁷

• **Switch 5% of multi-material rigid household goods to mono-material rigids by 2040.**³⁸ The replacement of multi-material household goods with mono-material alternatives has less foreseeable potential than that of multi-material flexibles due to the unique performance properties required for household goods.

Figure 17: Plastic composition after redesign intervention (realistic scenario)



^{vii} Multi-material is a multi-layered combination of flexible and rigid plastics. Examples include sanitary products and beverage containers with a flexible advertising sleeve.

Intervention 3:

Scale up collection

In 2020, Ghana's plastic waste collection rate was 49% with 51% of plastic waste uncollected. Out of the total collected, about 9.5% is properly managed through recycling and 14.3% disposal at engineered landfills, with the remaining 23% disposed at unsanitary dump sites. Of the 52% mismanaged plastic waste, 17% is openly burned, 26% indiscriminately dumped on land (i.e. littering and illegal dumping) and an estimated 9% of total plastic waste generated is leaked into waterways through direct discard, terrestrial dumping leakage and dumpsite leakage.

Under the **realistic scenario**, scaling up collection increases MSW coverage to 100% in mega and medium archetypes and 70% and 50% in rural and remote archetypes by 2040. This represents an increase in national collection coverage of 77%, from 49% in 2020

to 85% by 2040 (Figure 18). As a result, the annual collection volume will increase from 0.41 million tonnes in 2020 to 1.23 million tonnes in 2040, an additional 0.8 million tonnes being collected annually.

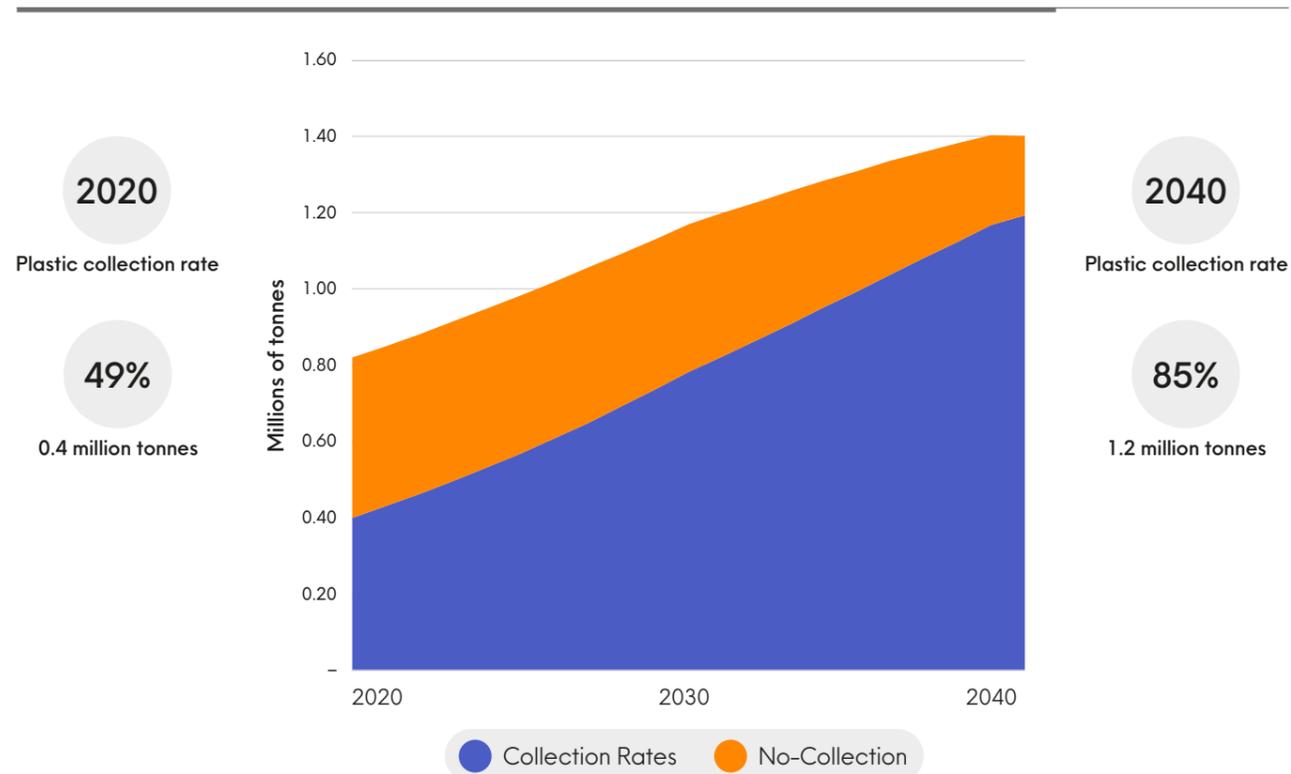
The increase from 81% and 55% for mega and medium archetypes, respectively, to 100% in 2040 is realistic given households' proximity to recycling facilities and controlled dumpsites. This enhances the business case for more collection as waste can be easily transported to recycling facilities. Current collection rates of 28% and 18% for rural and remote archetypes are projected to reach 70% and 50% by 2040 under the **realistic scenario**. People living in these archetypes are further away from recycling facilities and their interaction with plastics is not as great as those living in mega and medium

archetypes. Therefore, collection in these areas is purely targeted at reducing leakage into waterways.

Under the **ambitious scenario**, national collection coverage of 85% is achieved ten years earlier, by 2030. Mega and medium archetypes will reach 100% by 2030, while rural and remote areas will achieve a collection rate of 70% and 65%, respectively, by the same time. By 2040, all archetypes will reach a collection rate of 100% and plastic waste leakage will be zero. Under the realistic scenario, leakage will fall to 3%.

All efforts to scale up collection must prioritize resource recovery, as defined by the waste hierarchy. Separation of plastic waste from other household waste at source is critical to enabling effective and economically viable recycling.

Figure 18: Plastic waste collection coverage from 2020 to 2040



Intervention 4:

Increase recycling

The current recycling rate for plastics is estimated to be 10%³⁹ of all plastic waste generated. The **realistic scenario** projects a recycling rate of 32% by 2040, driven largely by redesigned plastics and increased collection coverage (Figure 19). It also anticipates that policy initiatives to deliberately create a market for recycled products will also drive demand and construct market linkages that attract private capital.

Under the **realistic scenario**, 0.45 million tonnes of plastic will be recycled per year by 2040. This represents 32% of total plastic waste generated per year. Increasing the volume of plastic recycling from 0.08 million to 0.45 million tonnes per year will require additional capacity of 0.37 million tonnes. That means at least 13 additional facilities (assuming each has a processing capacity of 30,000 tonnes) need to be built over the next 20 years.

Under the **ambitious scenario**, 0.52 million tonnes of plastic will be recycled by 2040. This represents 45% of total plastic waste generated per year. Increasing the volume of plastic recycling from 0.08 million to 0.52 million per year

will require additional capacity of 0.44 million tonnes. That means at least 16 additional facilities (assuming each has a processing capacity of 30,000 tonnes) need to be built over the next 20 years.

To achieve the realistic scenario, the following key challenges need to be addressed:

Lack of segregation: Currently, at all levels of waste generation in Ghana, plastic waste is not segregated from other types of solid waste. Therefore, at dumpsites, it is disposed of mixed in with everything else. Sorting waste is essential, and recovered plastics need to be washed thoroughly before they can go through the recycling process. As this burden falls on collectors and recyclers, it elevates the cost of recycling and acts as a disincentive for businesses to go into recycling.

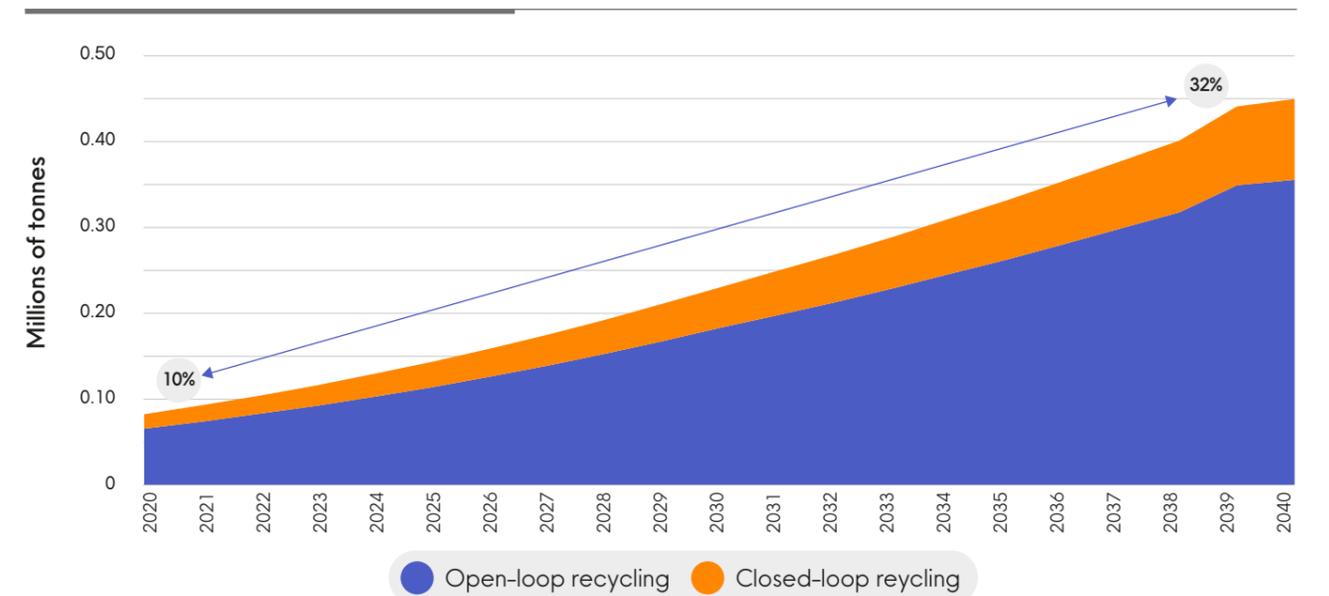
Lack of policy on recycling: Ghana has no policies to help regulate recycling – no policy on the chemical composition of imported plastics and no policy on the minimum composition of recyclates in plastic products. This means any type of plastic can be imported, whether or

not it is recyclable. Equipping border officials with the capacity to implement the Basel Convention Prior Informed Consent (PIC) procedure and to expedite trade is an important aspect. With no mechanism to ascertain the chemical composition of plastics, it is also extremely difficult, often impossible, to understand how they can be broken down into different materials for reuse.

Absence of a market for recyclates: There is no relationship between recyclers and manufacturers enabling the latter to off-take a proportion of recycled material. With the rate of recycling projected to increase to 32%, it is vital to deliberately create a market for recycled plastics through targeted policies that mandate manufacturing companies to use a minimum quantity of recycled materials in their products.

Lack of financial incentives: Ghana has an environmental tax and also taxes on virgin materials.⁴⁰ But these are not used to support recyclers. There are also no EPR schemes where funds could be mobilized from producers and used to subsidize recycling of plastics that are costly to process.

Figure 19: Recycling rate and types



Build and expand safe disposal capacity



In managing plastic waste, there should be no emphasis on building safe disposal sites to make sure we have zero waste. Build and expand safe disposal capacity should not be part of the most critical things to look at. When you eliminate disposal as an option, you force industries to be innovative, i.e., putting out recyclable products.

[View from Expert Panel discussion](#)

The above sentiment was expressed by a panelist during the Expert Panel discussions. The suggestion is that rather than considering how to increase disposal, stakeholders should focus on scaling up collection and recycling. Ghana still depends heavily on landfills and dumps for its waste disposal. Landfill operations often amount to un-engineered, open-pit waste dumping with no leachate control, limited application of cover material and open access for scavenging animals, rodents and other disease vectors.⁴¹

The key proposal is to stop plastic leakage by expanding safe disposal so that dumpsites can be eliminated and the availability of engineered landfills increases. Under the **realistic scenario**, Ghana needs an extra 8.0 million tonnes of landfill capacity and about 3.2 million tonnes of additional controlled dumpsites from 2021 to 2040.

Under the **ambitious scenario**, the country requires an extra 8.0 million tonnes of capacity and about 3.4 million tonnes of additional controlled

dumpsites. Assuming a capacity of 1 million tonnes per site, under both scenarios that means building eight landfill sites and four controlled dumpsites to prevent leakage.

Controlled dumpsites are a contentious issue, so it may be necessary to build smaller sites with smaller capacity. These sites are like to remain especially valuable in rural and remote communities where building new engineered landfill sites may be difficult to justify.

Costs and benefits of the system change scenario

Financial costs

Table 4 presents the breakdown of capital investment required to realize the SCS by 2040. Under the realistic scenario, total CapEx is estimated to be \$3.0 billion. This rises to \$3.3 billion under the ambitious scenario. The costing covers both plastic and non-plastic waste. Non-plastic waste includes all municipal solid waste other than plastic, both organic and inorganic.

Table 4: Estimate of capital expenditure for system change scenario interventions

	Collect	Transfer	Sorting	Recycling	Disposal	Total
Realistic scenario (\$bn)						
Plastic	0.04	0.05	0.16	0.76	0.22	1.23
Non-plastic	0.13	0.27	0.06	–	1.34	1.79
Total	0.17	0.32	0.22	0.76	1.56	3.02
Ambitious scenario (\$bn)						
Plastic	0.04	0.05	0.23	0.85	0.21	1.38
Non-plastic	0.14	0.27	0.13	–	1.41	1.95
Total	0.18	0.33	0.35	0.85	1.62	3.33

Under the **realistic scenario**, a total OpEx of \$5.1 billion is required to realize the SCS by 2040. Again, this is for all waste, including non-plastics. Of that amount, 57% is allocated to non-plastic waste management from collection (\$1.34 billion), sorting (\$0.08 billion), transfer (\$0.79 billion) and disposal (\$0.65 billion). Recycling costs have been estimated for plastic only as the processing of non-plastic materials demands widely differing approaches. Plastics recycling is estimated to

require \$1.12 billion of investment to achieve the recycling target of 32% in 2040 (as shown in Figure 20).

These figures represent government-run collection, sorting and disposal of both plastics and non-plastics. They include incentives to the informal and private sector to elevate the value of post-use plastics and increase collection rates. It is anticipated that investment into recycling facilities will be driven primarily by private capital

and supplemented by government support from levies and taxes. The creation of a market for recycled products is expected to be a catalyst for encouraging investment into recycling facilities.

Under the ambitious scenario, operating costs increase by about \$1.0 billion over the realistic estimate. Non-plastic operating costs will constitute 51% of the total operating expenses (Figure 21).

Figure 20: Total operating expenses from 2021 to 2040 (realistic scenario)

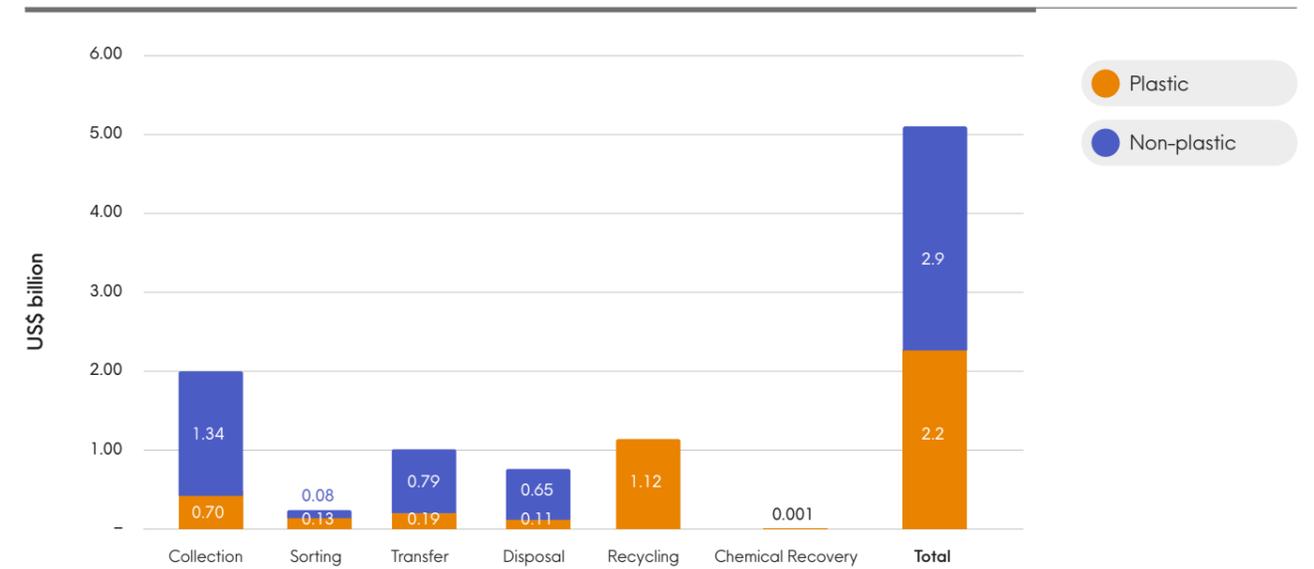
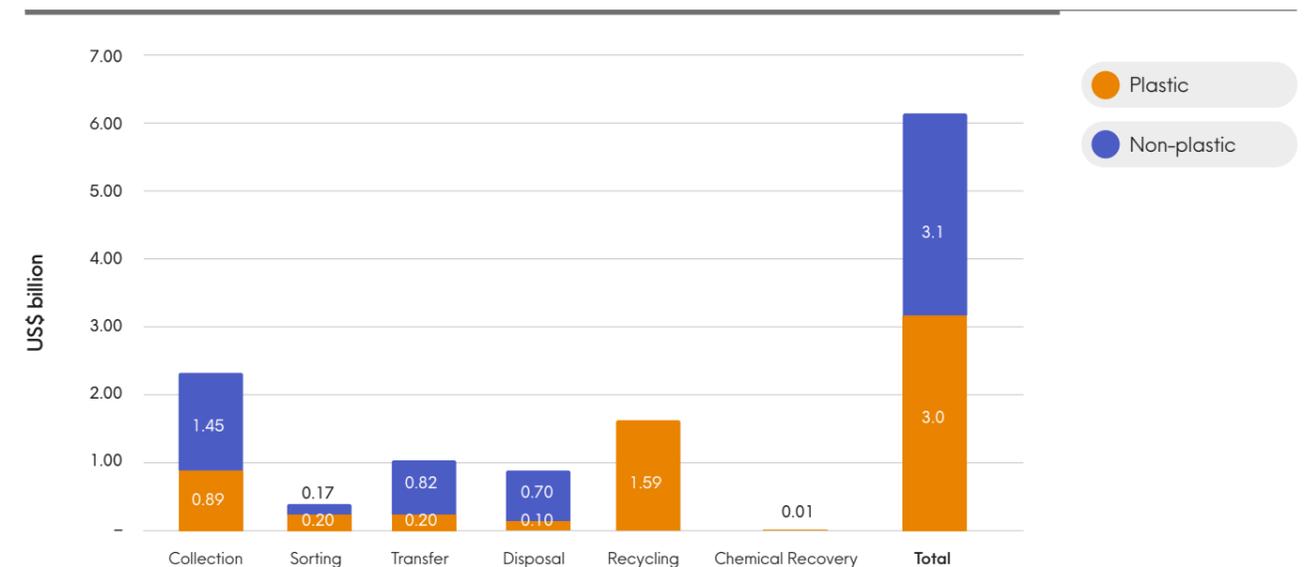


Figure 21: Total operating expenses from 2021 to 2040 (ambitious scenario)



2040

By 2040, Ghana aims to achieve the ambitious target of zero leakage of plastics into ocean to protect marine life.

17%

Open burning constitutes 17% of mismanaged plastic waste.

Box 2: Status of SDGs in Ghana

- Ghana has been at the forefront of the implementation of programmes to achieve the SDGs by 2030. The President of Ghana, Nana Akufo-Addo, was appointed by the Secretary-General of the United Nations, António Guterres, to serve as Co-chair of the SDG Advocates for two consecutive terms of two years until December 2020. Ghana has made achieving the SDGs a priority, developing an institutional framework for the implementation of SDG-relevant programmes and projects. The country has integrated SDG budgeting into its national budgeting process and has developed a mechanism to track funding allocated to its efforts.
- Ghana voluntarily prepares a national report on the progress it is making towards achieving the Goals. Based on the Voluntary National Review (VNR) prepared by the Government of Ghana in 2019, Ghana is making slow progress, with moderate improvements recorded for some critical Goals among stagnation for others. Out of the 17 Goals, Ghana is moderately improving in nine and stagnating in seven (Figure 21).^{viii}

^{viii} Figure was developed by KPMG as part of the technical assessment to support the Country Financing Roadmap being prepared by the World Economic Forum

Environmental and social benefits of SCS

Achieving the targets set under the SCS generates both environmental and social benefits for Ghana. Firstly, achieving the ambitious target of zero leakage by 2040 will protect marine life and enable the country to make progress towards achieving Sustainable Development Goal 14 – Life Below Water. At present, the country’s beaches are littered with plastic, making the coastline unattractive for tourist activities. Reduced leakage of plastics into the marine ecosystem will preserve seafood – a vital source of food and nutrition for Ghanaians.

Secondly, open burning constitutes 17% of mismanaged plastic waste. Assuming business as usual, over 0.4 million tonnes of plastic will be burned annually by 2040. If the SCS is implemented, plastics burning will cease, preventing toxic fumes from affecting the atmosphere. Ending burning will also reduce ground-level ozone, the impacts of climate change and pulmonary diseases.

The leakage of plastics into the ocean is already impacting the economic livelihoods of fishing communities along the Ghanaian

coastline. Preventing leakage not only indirectly helps re-establish critically compromised fish stocks, but it also limits the clogging outboard motors and the breaking of fishing nets.⁴²

Finally, investment in the waste management value chain will have a direct economic impact that boosts gross domestic product and employment. The implementation of these interventions will drive an increase in both direct and indirect employment in waste collection, recycling and disposal.

Ghana is stagnating in terms of Goal 14 – Life Below Water, which incorporates the quality of water bodies and marine life. The VNR identified significant challenges, such as access to reliable and timely data across sectors and at all levels, and limited capacity to monitor and evaluate progress towards the SDGs.

With about ten years left to attain the Goals, it is critical that effective interventions are put in place to drive progress. Ghana is the first African country to be preparing a financing roadmap that aims to identify challenges and opportunities that can unlock capital to finance SDG-related programmes and projects.

Figure 22: SDG progress shown by the Voluntary National Report⁴³



Source: Voluntary National Review (VNR) Report on the Implementation of the 2030 Agenda for Sustainable Development, 2019, KPMG Analysis

Chapter 5: Enabling conditions and necessary actions by stakeholders



Expected outcomes of implementing the action roadmap

At the launch of NPAP Ghana in October 2019, President Nana Addo Dankwa Akufo-Addo pledged to achieve zero plastic leakage into Ghana's ocean and waterways: "Ghana, after this process, will make best efforts to be a model for other countries in the region and on the continent on issues related to plastic management." Clearly, for this outcome to materialize, some fundamental issues need to be addressed. Political will alone cannot achieve systemic transformation.

With the rollout of the action roadmap, the proposed interventions will lead to several intermediate outcomes. Perhaps the most important is to build consensus around the selected intervention areas, encouraging partners to work together. As the Akan proverb, "Praye, se woyi baako a na ebu; wokabomu a emmu" (literally: One strand of a broomstick breaks easily; when put together they do not break) indicates, the NPAP partners can make the most difference together.

The implementation framework for the action roadmap will enable other possible interventions to be considered. As the interventions are rolled out, they are likely to evolve

as additional challenges inhibiting the proper management of plastic waste are identified and existing and future opportunities are spotted and leveraged. New actions that could have a profound impact may also be revealed. All of this will be underpinned by an ongoing process of convening stakeholder communities, generating new insights and matching high-potential solutions with financial resources.

In the sections below, the interventions are discussed within the context of the six impact areas: enable policy, unlock financing, transform behaviour, enable innovation, harmonize metrics, and promote inclusion. Where evidence is available, gaps and barriers have been identified – such as limited data and a lack of Ghana-specific research. Consideration has also been given to the carbon footprint of each intervention and any conflict with current actions.

Every partner responding to these calls for action needs to undertake necessary social accountability due diligence to mitigate risks and unintended consequences, particularly on marginalized groups and the environment.



Ghana, after this process, will make best efforts to be a model for other countries in the region and on the continent on issues related to plastic management.

Nana Addo Dankwa Akufo-Addo
President of the republic of Ghana



Action towards reduction and substitution

The reduction and substitution of plastics in the everyday lives of Ghanaians must be market-driven – there must be a clear economic benefit to the use of plastic alternatives. The role of industry is key, and manufacturer buy-in is vital in this intervention area. A concern repeated by several stakeholders during the development of the action roadmap was the perception that products using recycled material are inferior to those made with virgin plastic. To change these perceptions and encourage the successful reduction and substitution of plastics, many of the policies and incentives that have resulted in the creation of an established virgin plastic value chain must be overhauled. The policy-, economic- and innovation-focused actions required to create the enabling conditions for success are:

Inform Policy

Policy and legalisation are needed to create an enabling environment that disincentivizes the use of plastics in product applications that are shown to be high-polluting (such as single-use packaging) and encourages the use of alternative materials – especially with regard to plastics used in the food packaging industry which are difficult to recycle and manage, as well as products and applications that already have suitable alternatives. Items of concern include styrofoam containers used for take-away meals and their associated plastic cutlery. Measures to reduce caterers' use of cling film through the introduction of reusable containers can be encouraged by appropriate incentives and laws. Many of these measures have been presented in Ghana's National Plastic Management Policy, revised in March 2020.

To reduce the detrimental effects of plastic bag litter, several African countries have recently enacted legislation banning single-use plastic bags. A legal ban on thin film plastics has been attempted in Ghana before, but the laws were withdrawn within a year. Indeed, applying legal or policy frameworks to ban single-use plastics in Africa is often complex: enforcement can be poor, legislation often meets resistance and there is a lack of competitively priced alternatives⁴⁴. Many of the issues faced by Ghana upon introducing the single-use plastics ban were posed by the general public due to a lack of effective awareness-raising prior to the ban. In this action roadmap, it is proposed that rather than implementing a complete ban, single-use plastic bags should become chargeable in shops and supermarkets, with long-lasting, environmentally friendly alternatives made available for purchase too.

COVID-19 has necessitated the use of PPE, some of which is designed to be single use. This includes disposable masks, gloves, gowns and eyewear, as well as bed liners, curtains, catheters and syringes. Plastic waste can be reduced by implementing modified guidelines and protocols, such as creating clean rooms, using cloth alternatives wherever possible and following strict protocols for medical waste disposal.

HDPE and PET bottles are relatively low-hanging fruit when it comes to reducing and substituting plastic. PET recycling is only recently developing, so there is an opportunity to set up systems of best practice from the outset. To be effective, there must be policies and standards governing the reuse and recycling of PET bottles

that assure the quality of recycled PET materials back into the value chain. Standards set by the Ghana Standards Authority should be based on current ISO and ASTM standards for PET and recycling (ISO 12418 -2; ISO 15270: 2008; ASTM D5814 -18) and the ISO 59000 series on circular economy.

Policy interventions should be led predominantly by central Government and District Assemblies (using By-Laws) with support from CSOs and industry.

Unlock financing

Two major actions have the potential to unlock significant financing. The first is the removal of any subsidies on virgin materials, including for factories in the Free Zone enclaves⁴⁵, alongside an increase on taxes on the importation of virgin materials. The aim would be to make non-virgin material more attractive to industries as a means of reducing production costs. The revenue from increased taxes on virgin materials could also support some of the other actions proposed in the roadmap. The second action is to invest in the research of plastic alternatives, such as organic-based materials, as this could generate substantial financial gains for industry if the alternatives are shown to be commercially viable. These actions are to be led by central Government and academia with support from District Assemblies and development partners.

Transform behaviour and enable innovation

Throughout the preparation of the roadmap, successfully transforming behaviours and attitudes was seen as an essential keystone if Ghana is to reach its goal of zero plastic



waste in the marine environment. Many strategies have been employed globally which have been effective in promoting the reduction and substitution of plastics. In the Ghanaian context, however, the initial challenge is to determine what the public finds acceptable so that the most effective solutions are prioritized for upscaling.

Awareness creation and public education campaigns are needed to help the public perceive new delivery modes such as packaging-free delivery or reduced packaging, as acceptable options. Encouraging the use of refillable bottles and automated drinking-water delivery systems at lorry parks, taxi ranks and public buildings could significantly reduce the number of water sachets and PET bottles. Ensuring the safety and integrity of these water systems will be paramount, and this will require strong leadership of regulators and reliance on technology and innovation to enable real-time monitoring and reporting. In the past, carbonated beverages were sold in glass bottles and were returned to distributors through a take-back service – a system still employed by breweries for beer bottles.

Waste segregation is a behaviour that must catch on in Ghana. Effective downstream waste segregation could radically decrease the costs associated with plastic management. Current stakeholders in the waste

value chain need the enforcement of existing waste management laws to support them. At the same time, there must be incentives available for compliant households that carry out good waste segregation.

The baseline study carried out by NPAP Ghana indicates increasing demand for plastics of all types in the future. Further work is needed to unpack the root causes. Is it hygiene driven? Is it perception of what constitutes an improved lifestyle? By gaining a better understanding, the action roadmap could target interventions to reverse the trend.

Promote inclusivity

EPR schemes must be inclusive and intentionally support informal sector workers. Interventions must be designed to include diverse demographics and prioritize marginalized communities. Messaging aiming to promote actions that reduce plastic pollution should be tailored to meet the unique communication needs of women as both consumers and household managers. The roles of women and the informal sector must be supported and enhanced as part of efforts to expand source separation at the community and household levels.

Intersectional gender and diversity mainstreaming and guidance is necessary for the oil, gas and plastics

industries. This should cover all areas of operation, including recruiting targets and approaches to recruitment, human resources policies, and flexible working. Structural barriers, visible diverse role models, and opportunities for career advancement, mentoring and training should also be highlighted.

Harmonize metrics

Adoption of publicly accessible, integrated data tracking and reporting systems to monitor plastic and waste flows in real-time is needed to enable planning, investment, monitoring and enforcement of regulations. Priority must be given to ensuring the financial sustainability of any such mechanisms.

Conducting annual surveys will provide insight into upstream production and importation, capturing polymer types and product applications, as well as industry trends towards, interest in, capacity for and barriers against switching to more sustainable production practices. Such a survey should be conducted using technology for real-time data collection and analysis, and the results should be made publicly available for planning and policy formation. This activity could be supported through an ERP scheme.

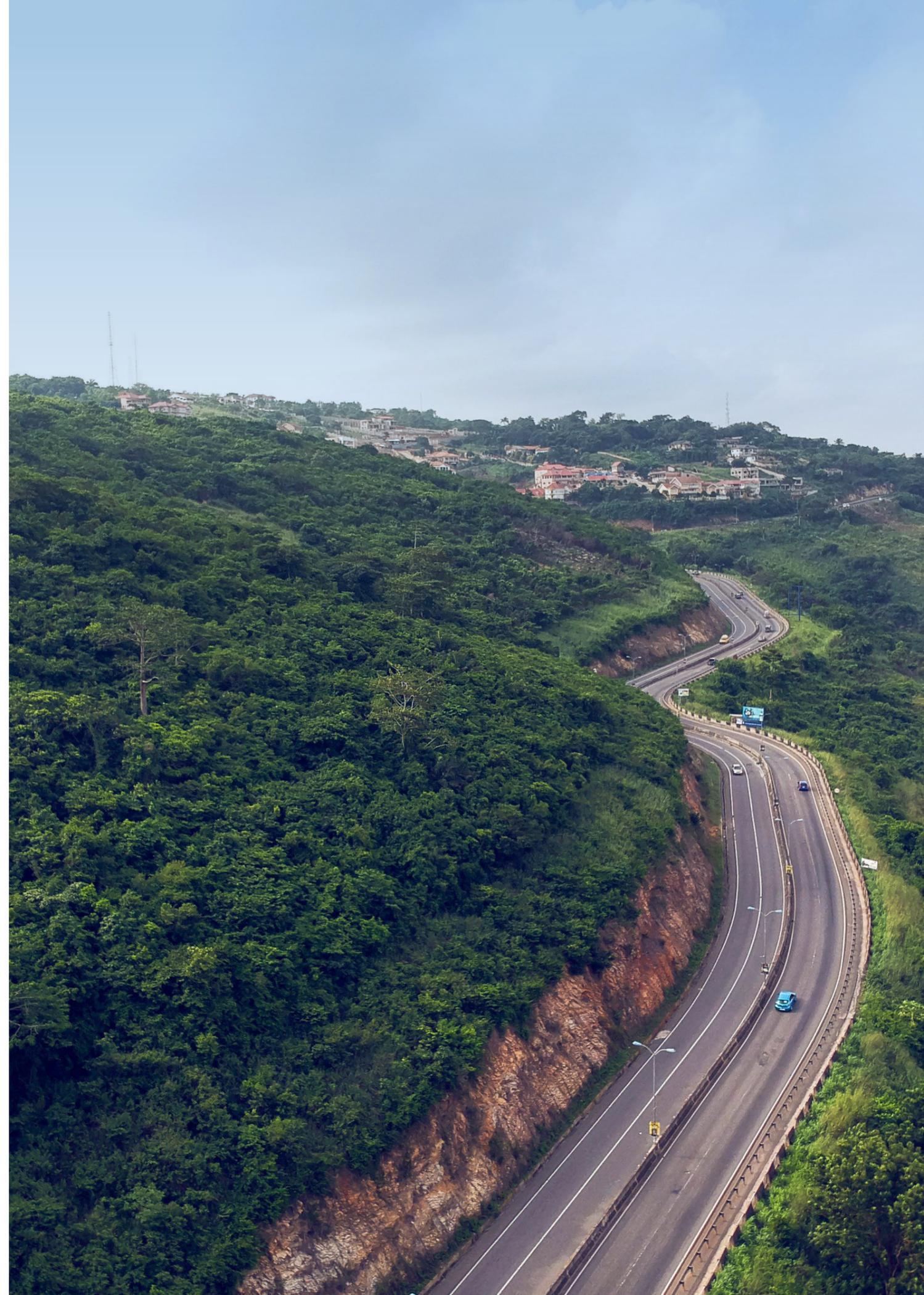
Table 5 below summarizes the narrative above and highlights the actions key stakeholders must take, as well as their associated timelines.

Table 5: Actions required to be implemented under intervention one:
Reduce and substitute – reduce the amount of plastic usage by 40%

Proposed action	Key stakeholders and role								by 2025	by 2030	by 2040
	L = Lead S = Supporting										
	1	2	3	4	5	6	7	8			
1.1 Gradually phase out the use of problematic polymer types and product applications that do not have viable recovery and recycling solutions locally	L	S		S	S						●
1.2 Operationalize the Plastic Levy / Environmental Tax (Act 863)	L	S	S		S				●	●	
1.3 Implement policy on charges for single-use plastic bags at shops and supermarkets	L	S			S		S				●
1.4 Discourage the importation of plastics that cannot be processed or recycled in Ghana	L			S	S						●
1.5 Support new delivery models: packaging-free deliveries, refills and take-back services by encouraging and enabling innovation and entrepreneurs	S		S		L	S	S	S	●	●	
1.6 Unlock catalytic financing for high-impact business models and high-risk innovations	S		S		L				●	●	
1.7 Investigate and monitor behaviours to militate against the increasing use of plastics			S	S		L			●	●	●
1.8 Revisit health practices, e.g., use of reusable PPE and sanitary products to reduce reliance on single-use plastic applications	L	S			S						●
1.9 Implement and enforce downstream waste segregation	S	L						S	●	●	
1.10 Adopt an inclusive producer responsibility (EPR) scheme that fairly compensates for the services of women and informal actors	S		S		L				●	●	
1.11 Create policy and standards for the reuse and recycling of plastics	L	S			S	S					●
1.12 Encourage downstream waste segregation behaviours by incentives	S	S		S			L		●		
1.13 Introduce public awareness campaigns with targeted messages for men, women, youth, children and marginalized communities for the reduction of plastic use	S			L			S	S	●		
1.14 Support local research into plastic alternatives, including provision of funding	S	S	S			L			●	●	●
1.15 Conduct research on production, consumption and demand trends to effectively target reduction solutions that are locally adaptive and socio-culturally appropriate	S					L				●	
1.16 Promote innovation challenges to adapt foreign business models (such as refill and reuse) to meet local market needs, including pricing, hygiene and customary practices	S				L	S				●	

● Enable Policy ● Unlock Financing ● Transform Behaviour ● Enable Innovation ● Harmonize Metrics ● Promote Inclusion

1 Central Government 2 District Assemblies 3 Development Partners 4 CSOs 5 Industry 6 Academia/Research Bodies 7 Households 8 Others



Action towards redesign

The roadmap frames redesign as the redesign of business models, of the way goods are packaged, and of which plastics are used in packaging. It also considers how redesign can reduce the amount of plastic used for each product. A good example of this is the 7% reduction of PET in water bottles achieved by redesigning bottles to keep them fit for purpose. For redesign to be effective, the total life cycle of products must be considered. For example, too much redesign of PET water bottle thickness may impact the economics of recycling the bottles.

Inform policy

Currently, there is no policy or industry standard for PET bottles, colour additives or bottles. With several different types of plastic available, the composition of products can affect their recyclability. Industry can take a lead on this by developing an industry standard for Ghana that is acceptable to all, with the standard then becoming embedded in a policy document.

Unlock financing

There is huge potential in supporting research into redesigned, recycled plastic products that can free up money spent on raw materials. By redesigning packaging and the systems for managing it after use, recycling could be economically attractive for at least 50% of packaging produced.⁴⁶

It is important to prioritize solutions that are likely to find favour with investors. There is also a need to fund an intersectional gender analysis, so that the needs of, and impacts on, women and men, particularly those from marginalized and disproportionately affected communities, are taken into account.

Harmonize metrics

The roadmap stresses the use of common standards and quality standards, as well as the need to harmonize both the types of plastic imported and the scope of permitted additives. For standards to be implemented effectively, in-country analytical equipment and trained personnel are needed to effectively assess and report on plastics against best international practice.

Transform behaviour

Contemporary reliance on many high-polluting single-use products and packaging applications is relatively recent, having been the norm for less than 20 years. Previously, much of the packaging used for food and beverages was either reusable or organic, such as the practice of wrapping foods with leaves or drinking from a common cup from a water dispenser. Many of these practices were labeled unhygienic with the emergence of cheap single-

use plastics, and are now thought of as an essential component of the product. Efforts to promote redesign of packaging and product delivery services will need to address this cultural history head-on, while building confidence of consumers and retailers that alternative delivery models are safe and hygienic.

Promote inclusivity

There is insufficient diversity in the plastics industry, and the sector needs to broaden its inclusivity if it is to maximize its potential. As such, funding needs to be made available for STEM programmes aimed at a diverse population of girls and young women. This funding should include an annual female scholarship programme and create networks that provide training and assistance for diverse female entrepreneurs. Women must also be invited into the design process to ensure new product and packaging innovations meet their unique needs as consumers and retailers.

Redesign efforts need to identify and capitalize on existing consumer preferences and assess the effects of new business models on the livelihoods of women and informal sector workers.

Table 6 below summarizes the narrative above and highlights the actions key stakeholders must take, as well as their associated timelines.

Table 6: Actions required to be implemented under intervention two: Redesign - reduce the amount of plastic usage by 5%

Proposed action	Key stakeholders and role								by 2025	by 2030	by 2040
	L = Lead S = Supporting										
	1	2	3	4	5	6	7	8			
2.1 Utilize extended producer responsibility pricing mechanisms and other fiscal measures to promote the importation of plastic types that can be recycled at existing facilities	L			S	S					●	
2.2 Define problematic and unnecessary polymer types, product applications and chemical additives that should be reviewed for phasing out of use	S		S		L					●	
2.3 Encourage consumer adoption of new delivery models for packaging-free products, refill and takebacks services	S		S		L	S	S	S	●	●	
2.4 Host innovation challenges and otherwise incentivize and enable local innovators to develop locally appropriate models for refill and reuse models taking into consideration pricing, local customs, hygiene, convenience and top polluting single-use products				L						●	●
2.5 Design solutions to incorporate intersectional gender analysis, ensuring the needs of the marginalized and disproportionately affected communities are taken into account	S		S		L					●	●
2.6 Create policy and standards for reuse and refill models in food and beverage applications	S	S			L	S					●
2.7 Explore fiscal policies to incentivize the importation of technologies and know-how for delivery of new business models for reuse and refill	L			S	S						●
2.8 Support local research into the redesign of packaging systems	S	S	S				L			●	●
2.9 Encourage and incentivize innovation by supporting entrepreneurs and business models that contribute to the shift to a circular economy	L	S		S	S					●	●

● Enable Policy ● Unlock Financing ● Transform Behaviour ● Enable Innovation ● Harmonize Metrics ● Promote Inclusion

1 Central Government 2 District Assemblies 3 Development Partners 4 CSOs 5 Industry 6 Academia/Research Bodies 7 Households 8 Others



Actions towards increase of current recycling capacity

Simply by using existing technologies, about 82% of Ghana's plastics waste could be readily recovered and recycled into products that are in high demand throughout West Africa. A vibrant recycling industry in the country could recover nearly one million tonnes of plastics waste from the environment and landfills annually. This material could be recycled into basic-need products valued at GH¢2 billion per year, creating five million jobs across the economy.⁴⁷ As of May 2019, Ghana had 25 well-established plastic recycling SMEs with a combined capacity of 320 tonnes per day. These companies recycle mainly sachet water bags and sometimes import waste from Burkina Faso. Plastic waste collectors earn an estimated GH¢6 million from the activities of these waste companies every month.⁴⁸

Inform policy

Ghana's National Plastic Management Policy covers recycling and waste management in great detail. The strategic actions in the document are grouped under two focus areas:

- Establish collection, recovery, recycling and remanufacturing targets.
- Build capacity (logistics and infrastructure) for plastics collection, recovery, recycling and remanufacturing.

Specific actions include incentivizing the institutions and companies that are best at managing plastic waste sustainably through provisions in the Green Public Procurement Guidelines,

82%

Simply by using existing technologies, about 82% of Ghana's plastics waste could be readily recovered and recycled into products that are in high demand throughout West Africa.

320t

As of May 2019, Ghana had 25 well-established plastic recycling SMEs with a combined capacity of 320 tonnes per day.



tax incentives for the import of recycling equipment, the introduction of an EPR scheme, and the creation of a plastics certificate scheme. It is proving extremely difficult to acquire land for recycling plastic waste though, especially for women and young people due to long-standing cultural norms on land rights and inheritance, because of local public opposition. Policy interventions, along with compulsory purchasing and revised zoning guidelines, could help women and young people acquire land for recycling.

Unlock financing

The majority of financing proposals focus on Government funding for activities that would either directly develop more recycling capacity or create an enabling environment for others, especially women, young people and marginalized communities, to increase capacity. The industry is also expected to explore chemical recycling using waste-to-energy systems.

The need to unlock financing from a combination of public, private and developmental sources is of such importance and complexity that it necessitates a separate in-depth financing roadmap to accompany this action roadmap. The recommendations outlined here centre on general themes commonly expressed by stakeholders and experts across the value chain. They sketch the key interventions needed to create an enabling environment for investment and new business operations that is equally accessible to all demographics and encourages the participation of marginalized groups.

Transform behaviour

There needs to be a paradigm shift in the way recycling is perceived in Ghana. Currently, it is seen as an indication of poverty. However, the NPMP states: "Societal behavioural change starts with the youth; understanding this, a priority is to ensure that every Ghanaian child, every year learns more about why sustainable and integrated plastics management is important for the

environment and public health and learns practical strategies for sustainable plastics waste management." Industry is expected to lead a public education campaign about the benefits of recycling and also create a reward scheme, particularly targeting young people and women, that reduces the quantity of plastic going to landfill.

Harmonize metrics

The efficiency of the recycling process can be enhanced if the Ghana Standard Authority adopts quality standards for recycled materials. These standards should include mechanisms for tracking the processes applied to base materials, as well as a provision for testing the recyclability of imported plastics.

Promote inclusivity

Local waste pickers' associations and unions need a platform. Including these groups in meetings, Task Forces and guidance documents can help channel attention and commitment to specific topics in national policies on plastic waste management. The choice of local stakeholders and topics to include should be informed by the findings of global and national intersectional gender analyses, considering the diverse needs of men and women, particularly those from marginalized communities, as part of a transition to the formal, circular economy. Topics requiring attention include the type of work performed, safety considerations (including protection against gender-based violence), economic remuneration, working conditions and flexibility and security of employment.

If zero waste is to be achieved, all industry players need a shared mindset. To facilitate this, an industry-led internal training programme, organized by a group such as the Association of Ghanaian Industries (AGI), should be established.

Table 7 below summarizes the narrative above and highlights the actions key stakeholders must take, as well as their associated timelines.

Societal behavioural change starts with the youth; understanding this, a priority is to ensure that every Ghanaian child, every year learns more about why sustainable and integrated plastics management is important for the environment and public health.

NPMP

Table 7: Actions required to be implemented under intervention three:
Increase current recycling capacity – increase plastic recycling rate from 8% to 32%

Proposed action	Key stakeholders and role								by 2025	by 2030	by 2040
	L = Lead S = Supporting										
	1	2	3	4	5	6	7	8			
3.1 Launch an industry and end-user campaign to encourage appropriate recycling behaviour	S	S		S	L		S		●		
3.2 Set up industrial hubs for plastic waste recycling at the regional/district level with clear targets to ensure equal representation of beneficiaries, prioritizing traditionally marginalized groups, such as women and informal actors	S	L			S					●	
3.3 Develop local technology for supply-chain transparency and material quality assurance	L		S		S	S			●	●	
3.4 Adopt policy on land acquisition for plastic waste recycling facilities in accessible areas	S	L	S		S			S		●	
3.5 Create industry training programmes targeting the informal sector and women for a zero-waste mindset to achieve 100% recycling	S		S	S	S	L			●	●	
3.6 Build capacity to monitor imported plastics and ascertain their potential for recycling	S		S			L		S	●		
3.7 Provide funding for R&D and piloting of innovative recycling technologies	S		S		L	S				●	
3.8 Introduce legislation for domestic and industrial waste segregation and recycling targets	L	S	S	S	S		S		●	●	
3.9 Boost recycling by adding value to recycled materials through innovative products			S		L	S			●		
3.10 Promote use of recycled materials with fiscal incentives, such as use of the Plastic Levy and extended producer responsibility	L		S		S				●	●	
3.11 Provide funds for appropriate resources to develop end markets	L		S		S				●	●	
3.12 Create quality standards for recycled materials which should be monitored by GSA	L		S		S	S			●		
3.13 Develop local plastic separation technology for different types of plastic	S		S		S	L			●	●	
3.14 Create long-term financing instruments at industry-friendly interest rates for recycling	L		S		S				●		
3.15 Disseminate best practice and business models to recycling practitioners	S		S	L	S				●		

● Enable Policy
 ● Unlock Financing
 ● Transform Behaviour
 ● Enable Innovation
 ● Harmonize Metrics
 ● Promote Inclusion

1 Central Government
 2 District Assemblies
 3 Development Partners
 4 CSOs
 5 Industry
 6 Academia/Research Bodies
 7 Households
 8 Others



Actions towards increasing plastic waste collection

State-of-the-art models show that the greatest costs in a material recovery scheme come from collecting low-value, commingled waste, hauling it long distances and processing it in expensive, highly automated systems. This is very different from the current reality in Ghana. With over 85% of all Ghanaian jobs in the informal sector,⁴⁹ there is a great opportunity to enable a material recovery scheme that makes good use of both the formal and informal sectors.⁵⁰ Such a scheme would, however, require at-source waste segregation, mechanisms to facilitate parallel waste collection systems and a major shift in public attitudes.

Inform policy

A start point to increase plastic waste collection could be the creation of a multistakeholder platform. Here, all aspects of plastic waste policy could be discussed as part of a process of breaking down barriers, gaining consensus on systems and airing views on issues such as price points. The informal sector, which performs the majority of collections, is not organized. The current Department of Cooperatives guidelines do not recognize waste collecting as a sector that its officials can support at present. Given the importance of waste collection to so many people's livelihoods, that needs to change. Waste pickers, who operate on dumpsites collecting plastics for onward sale, work in appalling conditions, and many are without health insurance. The operators of Ghana's National Health Insurance Scheme need to make a concerted effort to enrol these workers on to the scheme.

Unlock financing

Central Government must take the lead in making finance available for on-the-ground programmes that increase the rate of plastic waste collection. This could include top-up payments from the Plastic Levy (Act 863), incentive-based support for financial institutions that are funding waste collection and use of public-private partnerships (PPPs) for critically needed infrastructure and service provision in hard-to-reach areas. Financial rewards for formal and informal collectors should include EPR schemes that fairly compensate the waste collection services of informal collectors and pickers.

Transform behaviour

Part of the difficulty of collecting waste is that the general public considers it too much effort to segregate it. By providing collection points and transfer stations within local communities, there is hope that the volume of plastic waste collected would increase. This additional provision would need to be supported by public education campaigns that change negative perceptions about waste collectors and collecting plastic.

Enable innovation

Plastic waste heaps are unsightly. One idea is to use current digital technology to inform collectors via smartphones and SMS messages about where plastic has been dumped.

Promote inclusivity

Support for community-based waste management solutions which have already been successfully scaled up,

particularly those initiated by local women's organizations, should be prioritized. Forms of support might include incorporating ideas for community-based solutions in national platform meetings, hosting targeted innovation challenges, assisting in connecting groups with policy-makers, business leaders and investors, and featuring community-based solutions in media channels. Historically, resources invested in supporting these solutions have generated a good return for stakeholders, both men and women.

Plastic waste collection has become a default source of income among many marginalized groups, such as women and the elderly. A critical aim of the action roadmap is to ensure that informal sector workers are not disadvantaged and, as such, form an integral part of the roadmap's implementation specific guidelines on behavioural change and gender mainstreaming are vital to address the challenges faced by women, youth and other marginalized groups.

Waste collectors, particularly those in the informal sector, should be prioritized for skills training and technological innovation. With appropriate training, these workers can become data collectors, recording information on types, locations and amounts of plastic. They can also be given opportunities to learn life skills, such as basic book-keeping, and how to boost income by selecting plastic for collection more strategically.

Table 8 below summarizes the narrative above and highlights the actions key stakeholders must take, as well as their associated timelines.

Table 8: Actions required to be implemented under intervention four: Increase plastic waste collection – achieve 85% collection coverage by 2040

Proposed action	Key stakeholders and role								by 2025	by 2030	by 2040
	L = Lead S = Supporting										
	1	2	3	4	5	6	7	8			
4.1 Map, engage and organize informal workers into associations and cooperatives to give voice and agency		S	S	L						●	
4.2 Incentivize companies that fund groups in the plastic waste collection sector	L		S	S	S					●	●
4.3 Build community buy-back centres that will serve as collection and sorting centres for households and itinerant pickers for economic gains		L		S			S	S		●	
4.4 Provide transfer stations at District Assemblies for temporary plastic waste storage		L	S	S						●	
4.5 Improve infrastructure for household waste segregation and incentivize citizen participation	L	S			S			S		●	●
4.6 Sustain behavioural campaigns that target diverse demographics	L	S	S	S	S	S				●	●
4.7 Support marginalized groups engaged in plastic waste collection with provision of PPE, tools, transport and improved infrastructure	L	S		S	S					●	
4.8 Improve the financial reward for collectors through taxes, levies and EPR schemes that fairly compensate services of informal collectors and pickers	L		S	S	S					●	●
4.9 Adopt tools for pricing transparency along supply-chain, protecting fair earnings for waste pickers	L				S			S		●	
4.10 Use technology, such as apps and SMS codes, to post information about plastic waste collection opportunities	S		S		L	S				●	●
4.11 Train women and informal plastic waste collectors as citizen scientists to contribute to plastic waste collection data	S	L		S		S				●	●
4.12 Design organizational capacity building training programmes and opportunities for women and informal plastic waste collectors		S	S	L		S				●	●
4.13 Roll out public education campaign to change perceptions of waste collectors	L		S	S		S				●	
4.14 Design guidelines for integrating informal collectors, improving their capacity to bid for waste collection contracts from the government	L	S		S						●	
4.15 Create a policy for health insurance for waste collectors and pickers, making community health and child welfare centres accessible to vulnerable persons. Register waste pickers on social protection schemes	L	S		S	S			S		●	
4.16 Establish enhanced measures for tracking and enforcement of local by-laws concerning indiscriminate disposal of industrial and domestic waste	L	S		S						●	
4.17 Invest in infrastructure, equipment and social mobilization programmes for trapping and collecting plastics in waterways	L	S		S							●

● Enable Policy ● Unlock Financing ● Transform Behaviour ● Enable Innovation ● Harmonize Metrics ● Promote Inclusion

1 Central Government 2 District Assemblies 3 Development Partners 4 CSOs 5 Industry 6 Academia/Research Bodies 7 Households 8 Others

Actions towards building and expanding safe disposal capacity

There is consensus that developing more dumpsites for plastics would be counter-productive and that this option should only be pursued as a last resort.

Inform policy

Several possible actions relating to policy issues for safe disposal have already been mentioned, the principal intervention being the enforcement of existing policies and laws on illegal waste disposal. Fly-tipping takes place at night with impunity and with no regard for health and safety by some operators of waste collection tricycles. The only way to correct this is through punitive fines for operators and the seizing of vehicles used for these illegal acts.

Unlock financing

It is critical that Government and the private sector work together to ensure that building and managing disposal

sites is an attractive proposition for businesses. In public-private partnerships, Governments assist the private sector by securing sites and providing subsidies, as well as by offering viability gap funding or payment guarantees. The private sector brings investments, innovation and operational efficiencies.

The lifespan of safe disposal sites is severely compromised by the large volume of compostable material that also arrives at the dumpsite. If this volume could be reduced, it would not only extend the operational life of a site but also reduce the urgency to build additional capacity and expand existing facilities.

Transform behaviour

Many of the practices that take place at disposal sites have little regard for the health and safety of workers. Inadequate training is provided, if any

is provided at all, about the risks and hazards that exist at disposal sites. This lack of consideration for human safety must be rectified as a priority, along with restricting entry into disposal sites by children and adults with babies.

Enable innovation

Recent studies have shown that landfills can contribute significantly to microplastics in the environment⁵¹. This can be because the site is not lined, leading to absorption into groundwater, or because of leachates and general runoff. It is expensive to line a landfill site, so cheaper, locally available lining materials are needed to contain micro- and nano-plastics and prevent outflow into the sea.

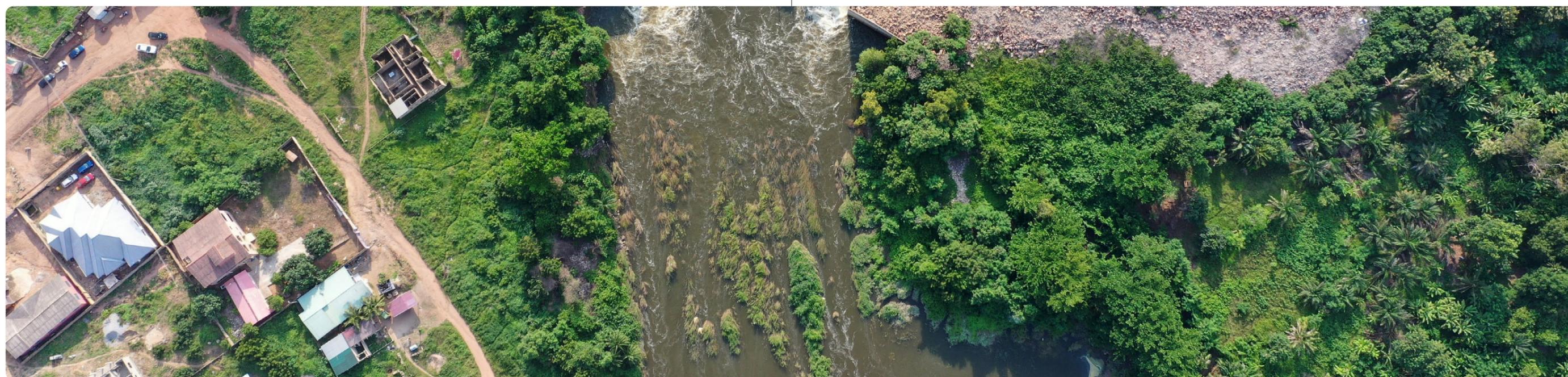
Table 9 below summarizes the narrative above and highlights the actions key stakeholders must take, as well as their associated timelines.

Table 9: Actions required to be implemented under intervention five: Build and expand safe disposal capacity – increase disposal capacity to handle 100% of waste

Proposed action	Key stakeholders and role								by 2025	by 2030	by 2040
	L = Lead S = Supporting										
	1	2	3	4	5	6	7	8			
5.1 Implement policy to acquire sites for safe waste disposal	L	S	S	S	S				S	●	
5.2 Carry out research on locally available materials that can be used to line disposal sites	S		S	S		L				●	
5.3 Develop policies and incentives for the use of safe disposal sites	L	S		S				S		●	
5.4 Finance infrastructure and processes to reduce disposal waste volumes	S				L	S	S			●	
5.5 Educate citizens on upstream consumer choices and waste management practices to minimize waste disposal volumes	S	S			L		S			●	
5.6 Enforce existing laws on unsafe waste disposal (fly-tipping and open burning)	L	S		S	S		S	S		●	
5.7 Design and organize occupational health and safety training for waste pickers, and provide health and safety facilities at waste treatment sites	S	S		S	L	S				●	
5.8 Investigate methods of trapping plastics from dumpsite leachate and runoff	S	S	S	S		L				●	

● Enable Policy
 ● Unlock Financing
 ● Transform Behaviour
 ● Enable Innovation
 ● Harmonize Metrics
 ● Promote Inclusion

1 Central Government
 2 District Assemblies
 3 Development Partners
 4 CSOs
 5 Industry
 6 Academia/Research Bodies
 7 Households
 8 Others



Critical accelerators needed for systems change

Transforming the plastics sector requires change to be both systemic and systematic. As with any complex problem, securing some key starting points can make a huge difference in the long run. Ghana already has high-level political support from the President. It is vital to translate that support into the day-to-day life choices Ghanaians make. The top four accelerators have been prioritized based on the number of interventions they relate to (see Table 10):

a) Implement the existing National Plastics Management Policy

The National Plastics Management Policy (NPMP), revised in March 2020, is built on four focal areas that when combined will establish a comprehensive system for managing plastics and contribute positively to natural capital, environmental protection and socio-economic development. The following strategic actions will collectively enable the achievement of the four focus areas of the NPMP: (1) Behavioural change; (2) Strategic planning and cross-sectoral collaboration; (3) Resource mobilization towards a circular economy; (4) Good governance, inclusivity and shared accountability.

This would require realigning the existing legal and institutional framework to support circular economy-based management of the plastics sector. The NPMP adopts the waste hierarchy, accepting that the greatest challenges created by plastics for the economy, environment and public health are incurred during the waste phase of the plastics lifecycle. At the core of this policy's principles are the internationally recognized priorities of waste reduction first, followed by reuse, recycle, recover energy and, lastly,

disposal. The harmony between the NPMP and the action roadmap is clear: actions such as the establishment of an EPR scheme, operationalization of the Environmental Tax Regime (Act 863) and promotion of local research and development (R&D) in plastic management are captured in both documents. The major issue for the NPMP has been its limited implementation. The action roadmap will help translate policy into action.

b) Create longer-term financing instruments for projects at industry-friendly interest rates.

The NPMP notes that financing is the major constraint inhibiting both the public and private sectors from achieving better plastics management. Existing financial models are inadequate, in part because of the state of the informal economy, which includes high rates of poverty compounded by rapid population growth, internal and external migration to dense urban centres and ever-growing quantities of mismanaged plastics. However, the main issue is that current financing instruments are unattractive to investors as interest rates are too high and funding periods too short-term. Creating what would be, in effect, a new sector of industry demands friendly investment opportunities upfront. Once those investments take root, the resulting economic activity will be stronger and financial models could then be diversified. In the meantime, it is reported that as of the end of 2019, about \$40,000,000 has accumulated in revenue from the 2013 Plastic Wastes Management Environmental Tax, (Act 863), some of which could be used to support investment.⁵²

c) Improve infrastructure by introducing household bins for plastic

waste, and incentivize downstream waste segregation.

Effective waste segregation needs two components: one is the will to segregate and the other is the means. Several attempts have been made in the past to encourage segregation. In 2015, for example, about 60 institutions participated in an EPA-led programme that targeted educational establishments and provided a number of schools and universities with colour-coded bins. Compliance with separation appeared to be low, and this was considered an attitudinal problem. A well-designed public education programme and supporting activities that reward appropriate behaviours by households are therefore essential. An example of existing activity that could be adapted is the UNDP-Ghana Waste Recovery Platform's Waste Recovery Innovation Challenge (WRIC). The challenge provides technical and financial resources to innovative business, research and advocacy projects to demonstrate, contribute knowledge to and raise awareness of opportunities for waste recovery in Ghana.

d) Create an empowering environment for the development of end markets.

With a reliable and profitable end market, a viable industry could be created, overcoming the poor business outcomes and lack of added value for recyclers which negatively impact the waste management system. The action roadmap states that current inadequate marketing and business strategies for recycling plastic products, insufficient planning within the plastics value chain and unattractive policy incentives for plastic management are significant disincentives to satisfactory waste management services.

Table 10: Summary of critical accelerators

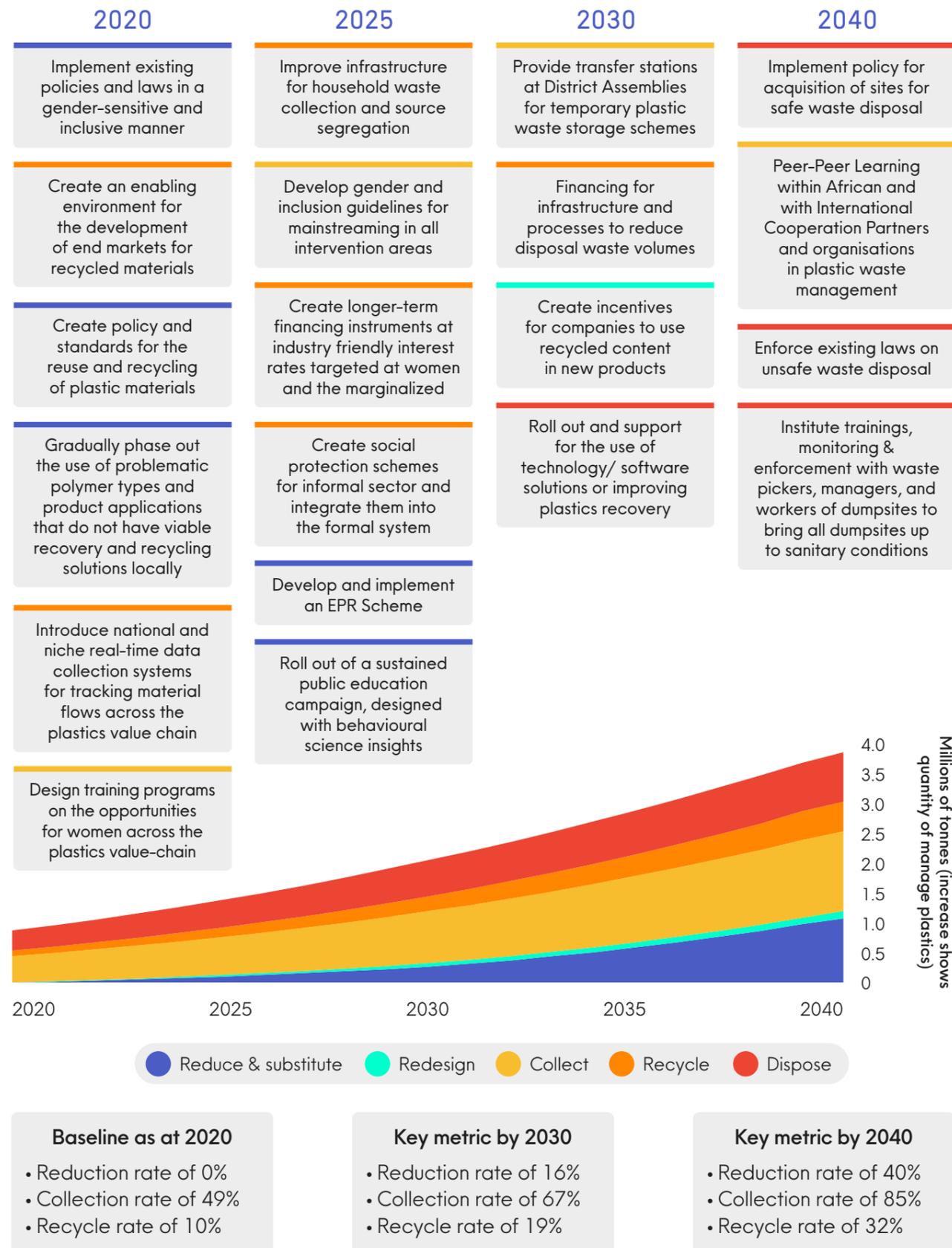
Accelerator	1	2	3	4	5
1 Implement the existing National Plastic Waste Management Policy, the Environmental Tax (Act 863), the Environmental Sanitation Policy and the National Environmental Sanitation Strategy and Action Plan in a gender-responsive and inclusive manner.		●	●	●	●
2 Create financial incentives for circular economy business models and new innovations with terms that are conducive to industry, particularly MSMEs, such as low interest rates and long payback periods. Financing schemes must be inclusive, addressing the unique needs of marginalized groups with a focus on creating an equal playing field throughout the value chain.	●	●	●	●	●
3 Create policy and standards for the reuse and recycling of plastic materials.	●	●	○	●	○
4 Create incentives for companies to use recycled content in new products (e.g., by setting targets, introducing tax breaks/waivers).	●	●	●	●	○
5 Develop and implement an EPR scheme to finance waste collection and recycling infrastructure, promote research and development for new materials, product delivery systems and recycling technologies, sustain behaviour-change campaigns, and encourage a shift towards products made from recycled content.	●	●	●	●	○
6 Introduce national and niche real-time data collection systems for tracking material flows across the plastics value chain.	●	●	●	●	●
7 Develop gender and inclusivity guidelines for mainstreaming in all intervention areas.	●	●	●	●	●
8 Gradually phase out the use of problematic polymer types and product applications that do not have viable recovery and recycling solutions locally.	●	○	○		
9 Roll out a sustained public education campaign, based on behavioural science, to promote desired plastics waste management behaviours. Foster inclusivity without stereotyping any group, communicating effectively to meet the needs of diverse demographics.	○	○	●	●	○
10 Create an enabling environment for the development of end markets for recycled materials (e.g. ensuring feedstocks, incentivizing recycled content and setting recycling targets).	○	○	○	●	○
11 Improve infrastructure for household waste collection and source segregation, incentivizing public participation and promoting the role of waste collectors, particularly marginalized groups, such as women and informal workers.			●	●	○
12 Provide transfer stations at District Assemblies for temporary plastic waste storage schemes.			●	●	
13 Set up industrial hubs for plastic waste recycling at regional and district levels with clear targets ensuring equal representation of beneficiaries and prioritizing traditionally marginalized groups, such as women and informal workers.			●	○	
14 Create social protection schemes for informal sector waste workers so that they are successfully integrated into the formal system.			●	○	●
15 Roll out and support the use of technology and software solutions for improving plastics recovery.				○	●
16 Provide financing for infrastructure and processes that reduce waste disposal volumes.	○	○		○	●
17 Institute training, meetings, monitoring, evaluation and enforcement for waste pickers, managers and workers of dumpsites to bring all dumpsites up to standard sanitary conditions.				○	●
18 Implement policy for the acquisition of sites for safe waste disposal.					●
19 Design training programmes exploring the opportunities for women across the plastics value chain, prioritizing the most marginalized groups, such as informal sector workers.	○	○	○	○	○
20 Initiate peer-to-peer learning within African and international cooperation partners, as well as with organizations that have a specific focus on plastic waste management.	○	○	○	○	○

1 Reduce and substitute 2 Redesign plastic items 3 Increase recycling 4 Increase waste collection 5 Expand safe disposal

● Direct influence ○ Indirect influence

Figure 23: Mapping key accelerators to five interventions

The chart below maps key accelerators by time and specific intervention:



Further recommendations

Looking to the future

The need for an action roadmap is predicated on a growing understanding that plastics which end up in waterways and the marine environment have a catastrophic effect on ecosystems and pose a major threat to the system of life. Achieving the recommendations of this roadmap will involve replicating best practice from around the world. Ghana should, therefore, embrace peer-to-peer learning, and test ideas it acquires for implementation in the short, medium and long term.

If it takes a village to raise a child, it certainly requires a nation to achieve zero leakage of plastic into the sea. The actions presented in the roadmap are underpinned by an understanding that:

- There is no silver bullet; multiple interventions over time are needed for success.
 - The actions applied in any location or situation must be flexible and context-driven.
 - Interventions need to be coordinated across the country.
 - Strong collaboration must exist between all stakeholders and an alliance is only as strong as its weakest link.
 - Principles of inclusivity and diversity must be at the heart of all actions.
 - Marginalized groups should not be impoverished by any action.
- Ultimately, the action roadmap should create awareness among the Ghanaian public of the value of

a circular economy approach and the importance of both their lifestyle choices and the universal safety of all.

The following are recommendations for further study and analysis:

- Production and consumption trends, including the uses, main products, leading industry players, market dynamics, percentages reused and barriers to switching to alternative materials and reuse systems.
- Types of plastics and additives used for food packaging.
- Types, quantities and distribution of composite materials on the Ghanaian market and their capacity to be recovered.
- Viability analysis of upstream action plans to reduce, substitute and redesign product delivery systems as appropriate for the Ghanaian market to substantially reduce future plastic waste generation and virgin material demand.
- Willingness of informal sector players in the plastic waste segment to be integrated into the formal stream.
- Behavioural studies to understand how plastic waste is treated across demographics, informing appropriate educational campaigns to be developed for transforming behaviour.
- Lifecycle costs, including the unintended consequences of proposed actions.
- Economic analysis of the cost of plastic pollution as an equivalent of

the GDP for each of the scenarios to aid in advocacy actions.

- Cost-benefit analysis to quantify and characterize the economic, environmental and socio-cultural benefits – as well as any potentially harmful impacts – of all proposed interventions prior to adoption.
- Guidelines on the promotion of inclusivity and gender mainstreaming
- Viability of adoption of publicly accessible, integrated data tracking and reporting systems to monitor plastic and waste flows in real-time, thus enabling planning, investment, monitoring and enforcement of regulations. Priority must be given to ensuring the financial sustainability of any such mechanisms.
- Expansion of scope to include sources of plastic waste beyond municipal solid waste and from sectors not captured in the baseline analysis, including those from electronics, vehicle, medical and construction industries, among others.

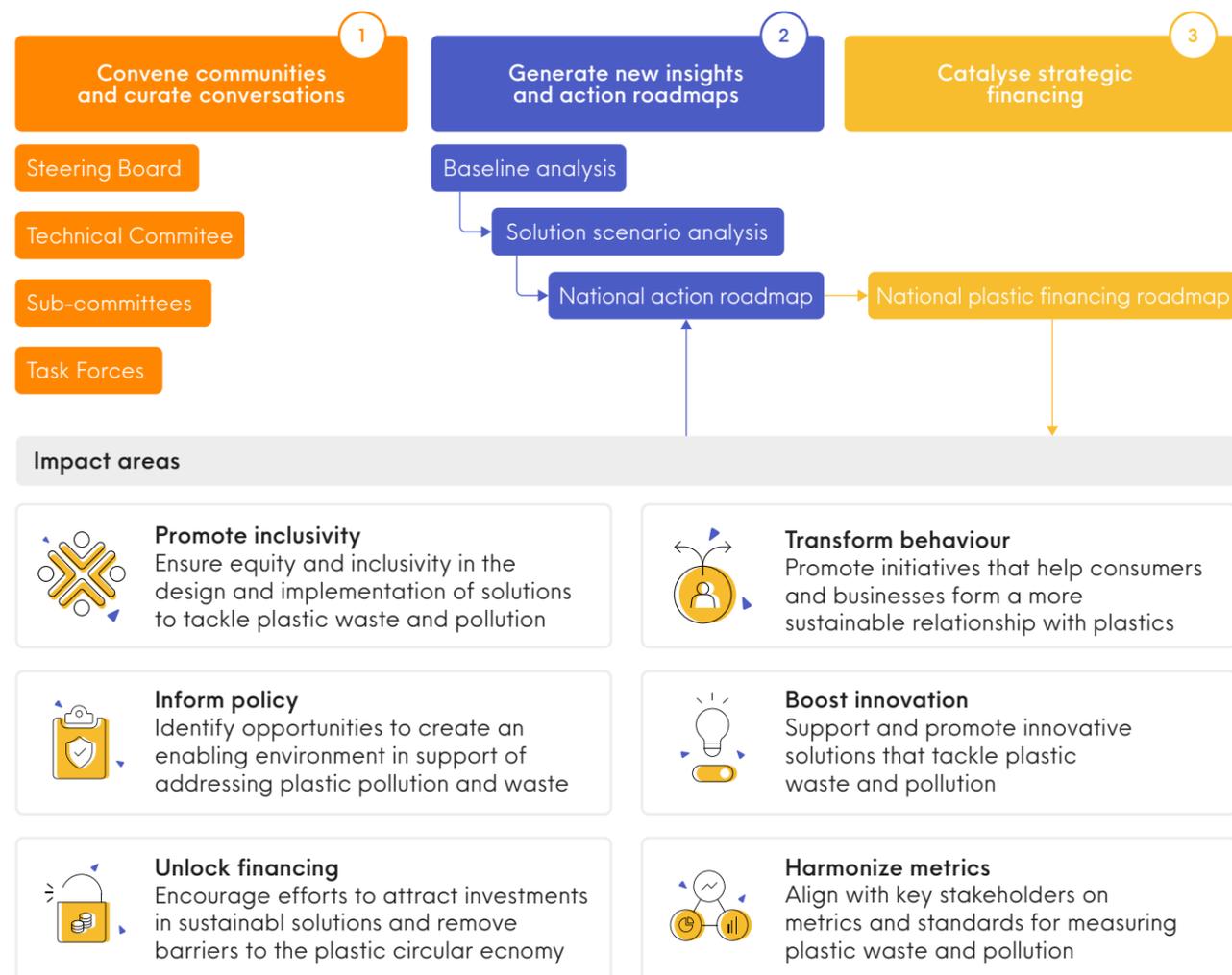
Implementation of the roadmap

This action roadmap, approved by the Steering Board of NPAP Ghana, will become the strategic document guiding concerted, multistakeholder action to rapidly realize a circular economy for plastics in Ghana. A Task Force for each of the six impact areas will be established and charged with defining an implementation framework for the

actions proposed in the roadmap. Each Task Force will be mandated to develop specific activities within clear time constraints: short term by 2025, medium term by 2030 and long term by 2040. They will also determine the metrics used to measure progress towards achieving the objectives set out in this document (Figure 23).

The members of NPAP Ghana hold themselves accountable for timely responses to the recommendations of this action roadmap which fall within their mandate. The NPAP Secretariat will continue to convene partners and curate action-oriented conversations to support timely progress, transparency and shared responsibility.

Figure 24: Implementation framework for the action roadmap





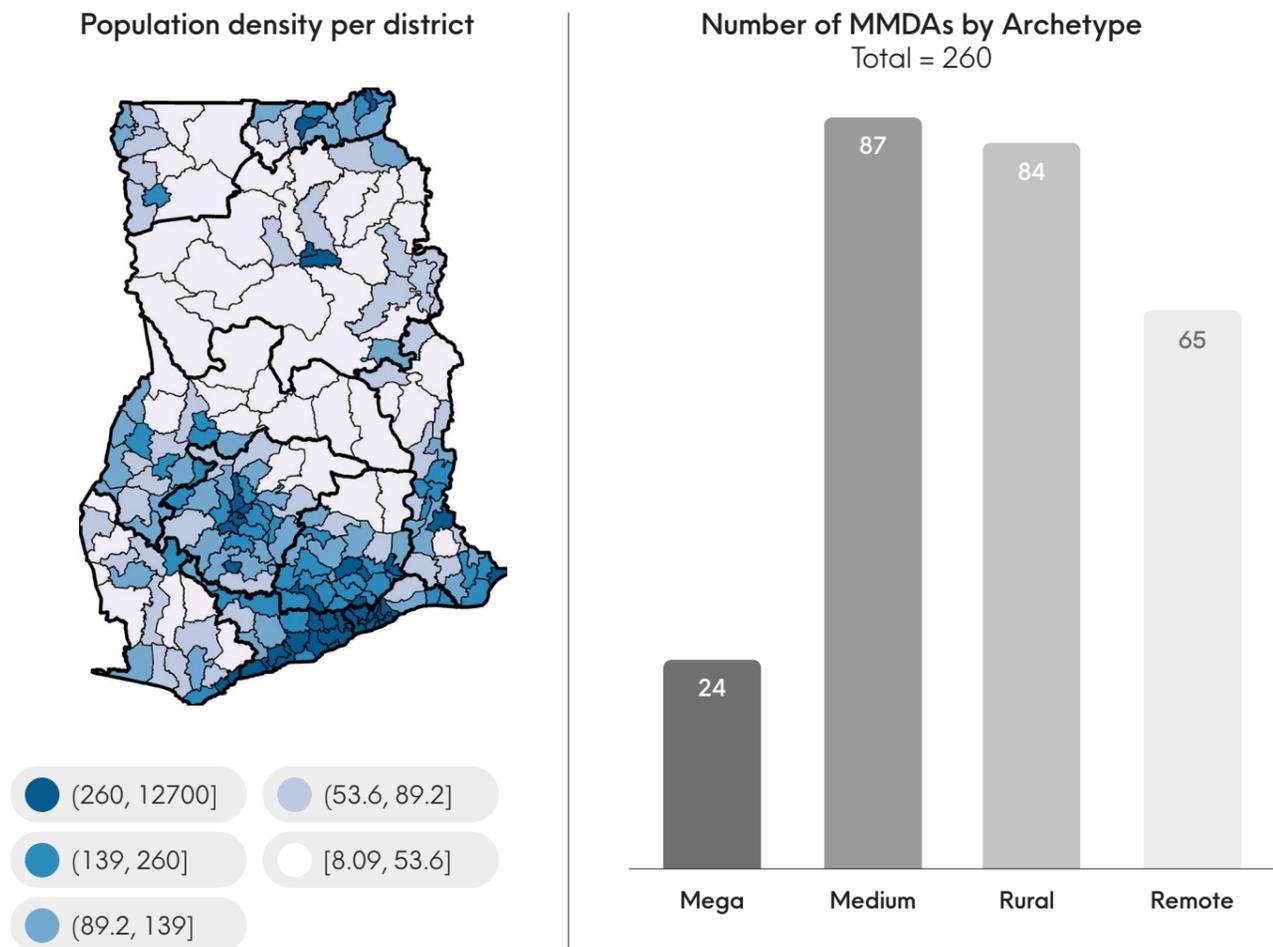
Archetype classification

Figure 25: Archetype classification



Source: GPAP Indonesia Knowledge Transfer Document (adapted by MAPLE)

Figure 26: Archetypes in Ghana



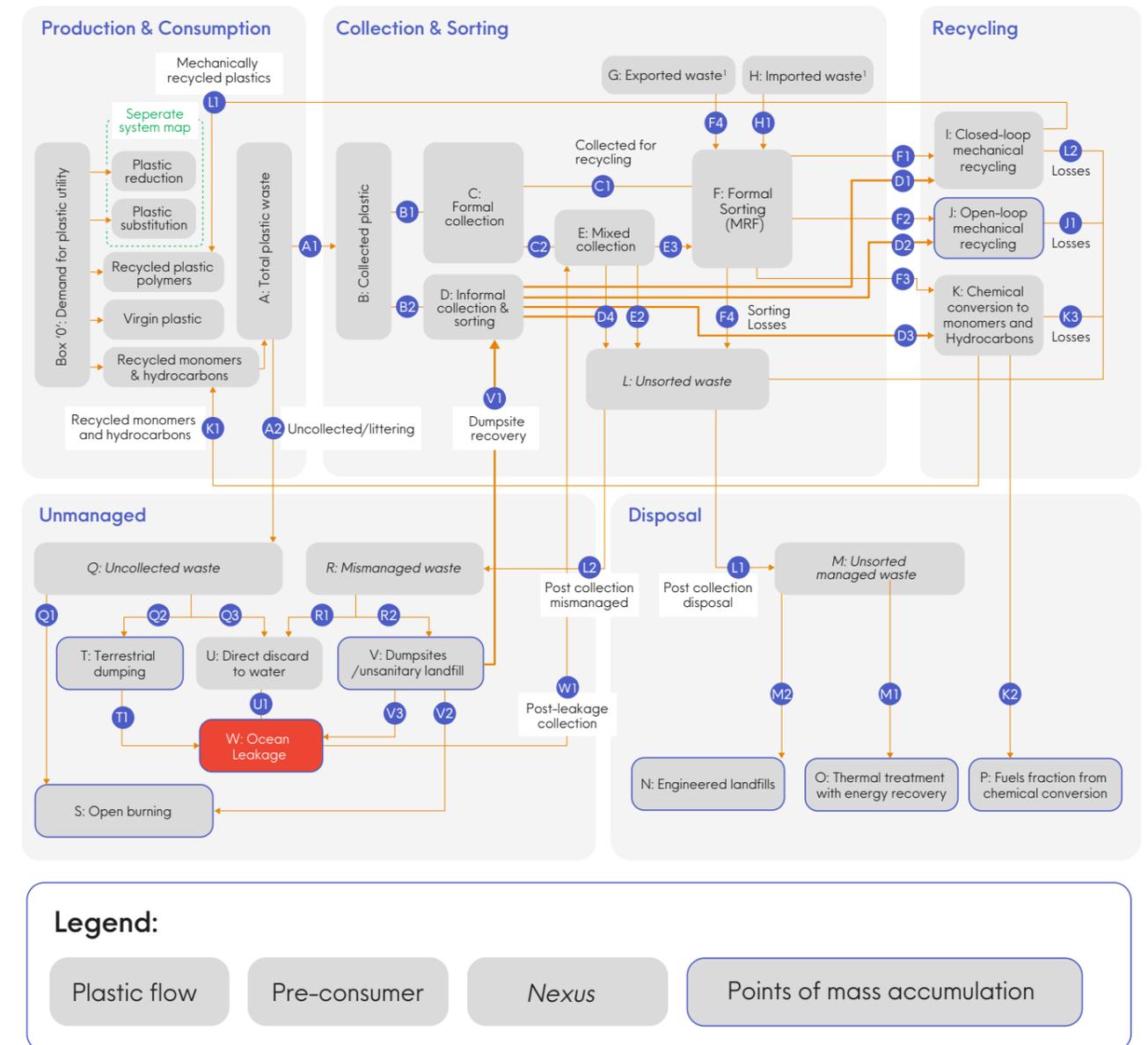
Sources: Graph: MAPLE Analysis; Source of Map: Osei FB, Stein A, Nyadanu SD (2018) Spatial and temporal heterogeneities of district-level typhoid morbidities in Ghana.

Key data sources

Input Data	Source of Data
Population	Ghana Statistical Service 2010 and 2020 projections
Population density	https://www.citypopulation.de/en/ghana/admin
Demographic characteristics	Ghana Statistical Service 2010 and 2020 projections
Gender Poverty indices	GSS 2010 Population and Housing Census Analytical Reports
Rural-Urban Divide	GSS Poverty Map
Ghana Statistical Service 2010 and 2020 projections	Miezah et al 2015 Oduro et al 2019 World Bank 2018
% of plastic in waste generated	Miezah et al 2015
Collection coverage rate per archetype	Baseline report

Approach to baseline study

Figure 27: Overview of the NPAP model



Methodology for reduction and substitution

Reduction methodology summary

To test for the potential to reduce plastics, the analysis leveraged the model that was developed by SystemIQ for the preparation of the NPAP Indonesia action roadmap. In the absence of data specifically for Ghana, the data points in the Indonesia model were used as proxies and the plastic composition proportions were used as inputs for the model.

To estimate the potential to reduce plastic consumption, all plastics were divided into 15 product applications with 26 subcategories. The applicability of each reduction lever was assessed for each subcategory based on existing businesses, policies, available technologies, environmental trade-offs and consumer trends. Each plastic subcategory and reduction lever was scored against four criteria:

- Technology – Is a solution available today?
- Performance – does the intervention satisfy performance and health requirements?

- Convenience – Is the intervention acceptable for lifestyle and convenience?

- Affordability – are the cost implications of the alternative acceptable?

The lowest score provided the limiting factor and thus determined the maximum foreseeable serviceable market by 2040. For further information on the methodology, please see the Breaking the Plastic Wave report and the NPAP Indonesia analysis.

Substitution methodology

The Indonesia model developed by SystemIQ was used to estimate the substitution potential. The substitute intervention is applied only to the plastic in each of the 15 plastic subcategories that remains after the three reduction levers have first been applied. Substitutions were made only with materials expected to be less likely to leak into the environment in 2040, focusing on substituting non-recyclable items such as mono-material flexible plastics and multilayer

plastics, which have high leakage rates, with more recyclable items that have minimal economic and environmental trade-offs.

To calculate the substitution achievable by 2040, three substitution levers were analysed: 1) paper; 2) coated paper with a maximum of 5% plastic coating (by weight, a rate which is acceptable to recyclers); and 3) certified and appropriate compostable materials (including compostable plastic and non-plastic materials). For the avoidance of doubt, coated paper excludes laminated materials such as aseptics, beverage cartons and coffee cups, for which the lamination weight or double-sided application mean they are only recyclable in specialist recycling facilities. The compostable substitutes considered are those that are compostable via industrial or home composting without leaving any toxicity or non-organic remnants in the soil. For that reason, oxo-biodegradable compostable alternatives have not been considered, as they break down into microplastics which pose an even greater threat to land and marine environments.

Analysis of results of baseline validation

Table 11: Number of sampled households interviewed

Archetype	Locality	Population*	No. of respondents
	Adenta (Accra)		(390)
Municipality/City	Low income (Maamomo)	78,215	174
	Middle income (Ghentanna)		199
	High income (East Legon)		17
District/town	Aburi	9,390	187
Rural community/village	Attakrom-Amanfrom	965	82
	Total		659

* Source: Ghana 2014

Profile of respondents

Table 12 below reveals that more than half (54%) of the respondents were female and 46% were male. 201 respondents, representing 32%, fell in the 20 to 29 age cohort which made up the largest group by age. They were followed in size by the 30 to 39 cohort and the 40 to 60 cohort with frequencies of 165 (26.3%) and 159 (25.3), respectively. The time and day of the survey may have accounted for the relatively higher percentage of the 20 to 29 age cohort as they are more likely not to be economically engaged and therefore encountered at home.

Types of plastic products

A broad range of plastic products and packaging are used by respondents. The products are categorized as follows:

- PET (bottles for water, beverages, medicines, etc.)
- HDPE (plastic liquid container)
- LDPE (plastic grocery bags)
- PP (plastic buckets, plastic chairs, etc.)
- PS (plastic food boxes, cutlery, disposable cups)

The most commonly used plastic products in all the archetypes are the various types of polythene bags (97.48%), followed by plastic buckets/bins/barrels (73.36%) and plastic containers for liquid products (71.0%). The rural community is the biggest user of plastic furniture (66.2%).

Plastic waste generation

Sachet and bottled water consumption

The survey attempted to determine the quantity and volume of sachet and bottled water consumed by respondents per day. This could be used as a proxy of LDPE waste generation. The analysed data indicated that an average of 7.29 sachets of water is consumed per person in a day across the defined archetypes (Table 14), which is equivalent to 3.5litrs per person per day. Thus, each person generates seven empty water sachets in a day. This translates into a per capita water sachets generation rate of 0.032kg/person/day. The higher average figure of 7.59 for the municipality could be explained by the relatively warmer conditions in Accra during the time of the survey.

Table 12: Number of sampled households interviewed

Sex and Age	Archetypes						Total frequency and percentage	
	Municipality		Town		Rural Community		Freq.	%
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Sex								
Male	187	28.4	74	11.2	42	6.3	303	46.0
Female	203	30.9	113	17.1	40	5.8	356	54.0
Total	390	59.2	187	28.4	82	12.4	659	100.0
Age								
Below 20	41	6.5	16	2.5	11	1.8	68	10.8
20 – 29	127	20.2	48	7.6	26	4.1	201	32.0
30 – 39	96	15.3	46	7.3	23	3.7	165	26.3
40 – 60	87	13.9	53	8.4	19	3.0	159	25.3
60+	18	2.6	18	2.9	1	0.2	35	5.6
Total	367	58.5	181	28.8	80	12.7	628*	100.0

* Missing values were recorded for the age cohorts as some respondents were sensitive about their ages and reluctant to provide answers. Field Survey, February 2021

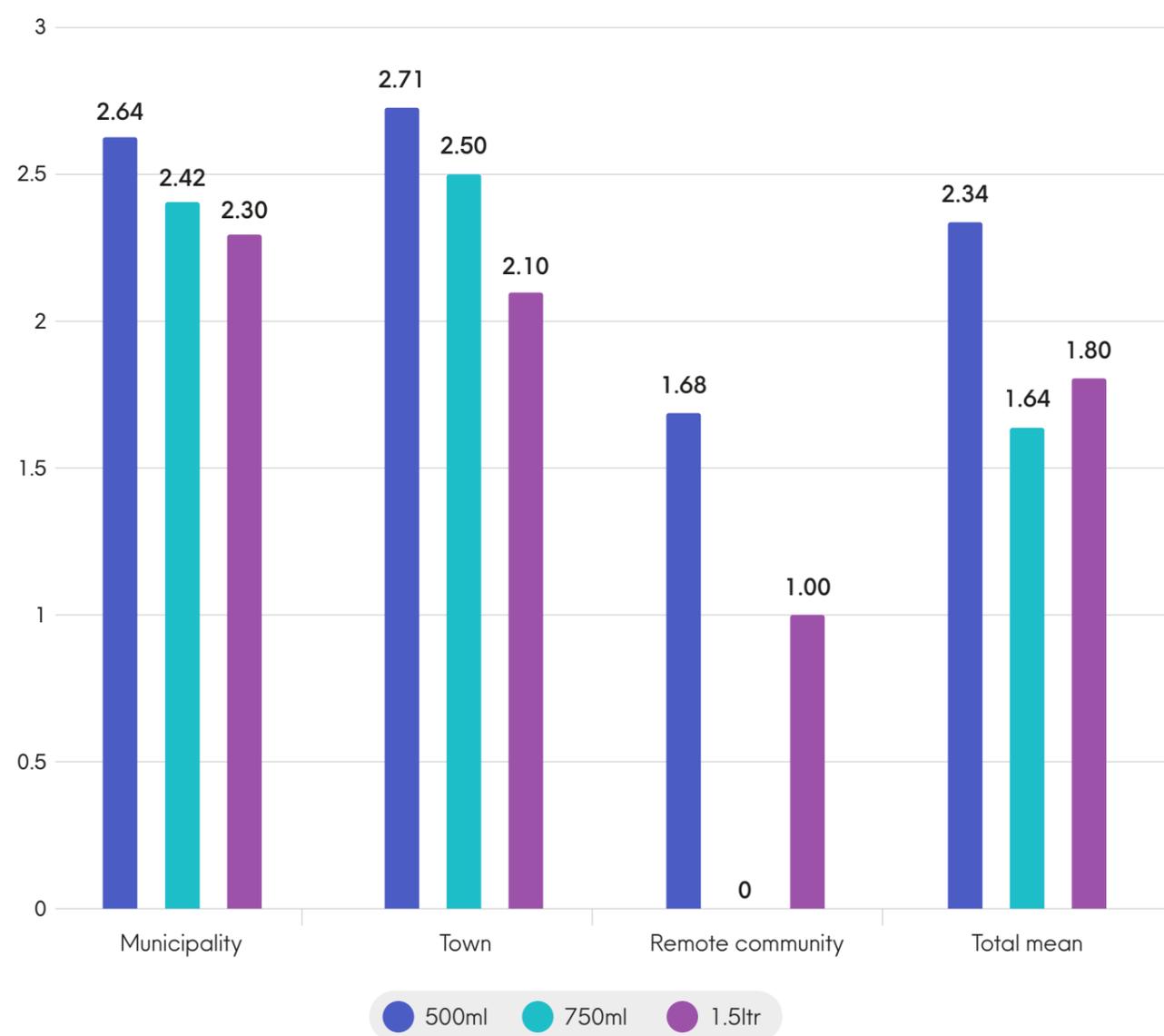
Table 13: Sachet water consumption

Archetype	Maximum	Minimum	Mean
Municipality	30	1	7.59 > 7.29
Town	20	1	6.51 < 7.29
Rural community	15	4	7.19 < 7.29
Total	30	1	7.29

Source: Field Survey (February 2021)

Figure 28: Bottled water consumption by archetype

Figure 28 shows that the average number of bottled water consumed by a person in a day is 2.34, 1.64, and 1.8 for the 500ml, 750ml, and 1.5ltrs bottles, respectively. Bottled water consumption in the rural community is relatively low.



Source: Field Survey (February 2021)

Use of plastic bags during shopping

The use of polythene bags is a common practice in Ghana. The survey, therefore, attempted to determine the number of polythene bags brought home from weekend shopping within the archetypes. Table 15 indicates that an average of 4.9 polythene bags are brought home from weekend shopping across the defined archetypes. There is higher usage of polythene bags in the

municipality (5.1) than in the town (4.3) and village (3.7). Based on the estimated weight of 0.011315kg for an average-sized carrier bag, the per capita carrier bag usage over the weekend is 0.006kg, 0.005kg, and 0.004kg for the municipal, town and rural communities, respectively.

Gender and plastic bag use

The use of polythene bags among females is higher since they take on most of the household weekend shopping. Females bring home an

average of 5.65 polythene bags as compared to 3.99 for males (Table 15). The female's average is above the total average across the archetypes (4.9).

Trends in plastic bag use

Over 96% of respondents in all archetypes considered the use of polythene bags to be increasing. The major reason they assigned to this is easy availability, wherever and whenever required. The stacked Table 16 shows the views expressed by the respondents.

Table 14: Polythene bags brought home from weekend shopping

Archetype	Maximum	Minimum	Mean	Rate of bag usage/week (kg)*
Municipality	30	1	5.1 > 4.9	0.006
Town	15	1	4.3 < 4.9	0.005
Rural community	12	1	3.7 < 4.9	0.004
Total	30	1	4.9	

Source: Field Survey (February 2021)

*The weight of the average size carrier bag is estimated to be 0.011315kg

Table 15: Gender dimension of polythene bag brought home from weekend shopping

Gender	Maximum	Minimum	Mean
Male	21	1	3.99
Female	30	1	5.65

Source: Field Survey (February 2021)

Table 16: Reasons for the trends in plastic bag usage

Gender	Municipality	Town	Rural Community	Average %
Increasing	97.1	98.4	93.8	96.3
Decreasing	2.9	1.6	6.2	3.7
Reasons for increase in utilization				
Cheapness	26.1	27.5	29.3	27.6
Durability	12.1	13.7	17.7	14.5
Availability	47.1	46.9	40.2	44.7
Lack of alternatives	14.4	11.9	12.8	13.0
Absence of regulation	0.1	0.0	0.0	0.03
Portable	0.1	0.0	0.0	0.03

Source: Field Survey (February 2021)

Table 17: Plastic waste disposal methods by archetypes (%)

Method of disposal	LDPE			PET			PP and HDPE		
	M	T	RC	M	T	RC	M	T	RC
Open dumping	8.37	26.7	38.0	7.83	23.5	48.7	6.6	13.5	32.4
Burying	1.6	1.1	2.5	1.7	0.6	2.6	0.6	0.6	2.8
Burning	44.4	45.5	79.7	35.9	37.0	61.8	22.6	12.9	42.3
Waste collector/ company	81.6	66.8	31.6	81.7	63.0	28.9	72.4	50.3	28.2
Informal collectors	0.7	0.5	0.0	1.7	5.6	1.3	-	-	-
Sell/exchange (scrap dealers)	-	-	-	-	-	-	10.1	34.4	15.5
Reuse	0.0	3.7	11.4	8.0	6.8	5.3	12.3	18.4	19.7

Source: Field Survey (February 2021)

Disposal of plastic waste

Disposal methods include open dumping, burying, burning, collection by waste management companies and informal waste collectors, and sale and exchange of plastic material. Tables 17 and 18 indicate the modes of disposal used for selected categories of plastic waste by archetype. Burning is the most popular disposal method for LDPE in rural communities (79.9%). The respondents explained that they use it to set fire to biomass fuel. Burning is also employed in towns and municipalities (45.5% and 44.4%, respectively). Equally important is that the respondents indicated that waste is channeled to waste collection companies in the town (66.8%) and municipality (81.6%). For PET, waste collection companies are the major methods of disposal in the municipality (81.7%) and the town (63%).

The most common method of disposal for PP (which includes plastic containers and broken chairs) and HDPE is through waste collection (50.3%), followed by burning (25.9%). Burying (1.3%) is the least popular disposal method. The higher collection percentages for these materials can be explained by the potential financial gains of giving them to informal collectors who sell them to recyclers. Reuse of PP and HDPE waste is higher in rural communities (19.7%). The municipality has a higher percentage (72.4%) of collection for these plastics, well above the average of 50.3%. Generally, open dumping and burning are relatively more prevalent for all types of plastic waste in the rural community, compared to the municipality and town, apparently because of the absence of waste collection. Sale/exchange for money and new products is a dominant method for disposing of PP and HDPE within the town, 34.4% which is above the total average of 20%.

Knowledge of problems and environmental impact of plastic waste

Nearly all the respondents (96.3%) indicated that they are aware of problems associated with the use of polythene bags (LDPE) (Tables 19 and 20). They cited blockage of drains (28.4), deterioration of the beauty of the environment (27.6) and human health problems (25.7) as the key challenges. Equally, 92.4% appreciated the adverse impact of plastic waste on the environment. TV and radio are the primary sources of this information and knowledge. The test of relationship, using the Pearson's chi-squared test [Table 21], yielded a positive relationship (p-value 0.132) between education and knowledge on the environmental impact of plastic waste.

Table 18: Plastic waste disposal methods combined for all archetype (%)

Method of disposal	Total average		
	LDPE	PET	PP and HDPE
Open dumping	24.4	26.7	17.5
Burying	1.7	1.6	1.3
Burning	56.5	44.9	25.9
Waste collector/ company	60.0	57.9	50.3
Informal collectors	0.4	2.9	-
Sell/exchange (scrap dealers)	-	-	20.0
Reuse	5.0	6.7	16.8

Source: Field Survey (February 2021)

Table 19: Problems associated with plastic bag waste

	Municipality	Town	Rural Community	Average %
Yes	97.1	98.4	93.8	96.3
No	2.9	1.6	6.2	3.7
Not sure/uncertain	2.9	1.6	6.2	3.7
Problems				
Animal death	97.1	98.4	93.8	96.3
Human health problems	2.9	1.6	6.2	3.7
Blockage of sewage (drain) systems	2.9	1.6	6.2	3.7
Deterioration of natural beauty of environment	2.9	1.6	6.2	3.7
Affects agricultural land	2.9	1.6	6.2	3.7

Source: Field Survey (February 2021)

Table 20: Knowledge on the environmental impact of plastic waste and source of information

	Municipality	Town	Rural Community	Average %
Yes	94.2	90.6	92.4	92.4
No	5.8	9.4	7.6	7.6
Source of information				
TV/radio	45.3	50.8	61.7	52.6
Neighbours/friends	13.8	16.7	16.0	15.5
Professionals	10.1	7.1	6.4	7.8
Published materials	6.9	2.1	2.1	3.7
Social media	15.4	7.5	1.1	8.0
Personal observation	8.5	15.8	12.8	12.4

Source: Field Survey (February 2021)

Table 21: Relationship between level of education and knowledge of environmental impacts

	Chi-squared tests		
	Value	df	Asymp. Sig. (2-sided)
Pearson's chi-square	5.608 ^a	3	.132
Burying	6.078 ^a	3	.108
Burning	.397	1	.528
Waste collector/company	594		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.00.

H₀: There is no relationship between the level of education and knowledge on the environmental impact of plastic waste.

Source: Field Survey (February 2021)

The chi-squared test performs a hypothesis test to determine whether or not to reject the idea that knowledge of the environmental impact of plastic waste is dependent on education level. Since the p-value of 0.132 is greater than 5% (0.05) level of significance, it therefore rejects the hypothesis of a relationship between the level of education and knowledge on the environmental impact of plastic waste.

Perceptions about banning plastic bags

Table 22 shows household perceptions about banning plastic bag usage and the agency or organization responsible for taking action. Over 71% of respondents are of the view that polythene bag usage should be discontinued. With regard to who is

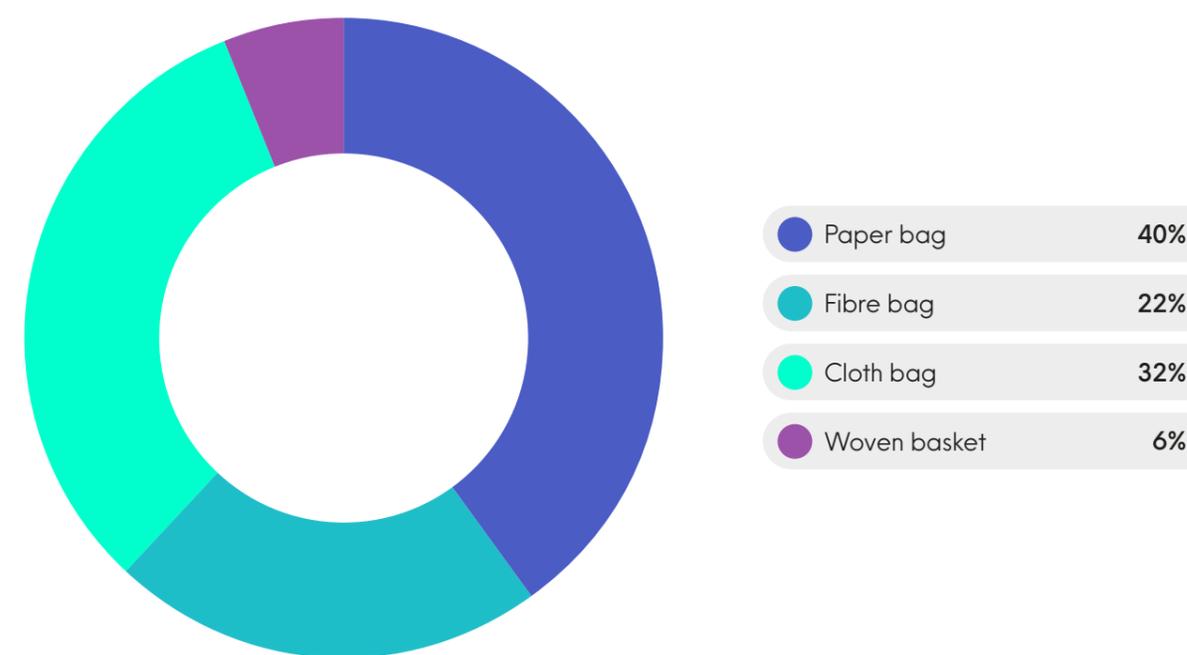
responsible for ensuring this happens, the responses varied, with 41.5% indicating the government. With respect to alternatives to plastic bags, paper bags are the most preferred alternative (38.8%), followed by cloth bags (31.6%) and fibre bags (24%) [Figure 29].

Table 22: Perceptions on banning plastic bags, responsible authority and preferred alternatives

	Municipality	Town	Rural Community	Average %
Should be continued	32.8	22.3	30.3	28.5
Should be discontinued	67.2	77.7	69.7	71.5
Responsibility				
Municipal assembly	16.4	13.5	15.2	15.0
NGOs	10.2	8.1	7.1	8.5
Government	35.9	45.2	43.4	41.5
Environmental agencies	13.4	10.8	14.1	12.8
The community	23.6	21.2	18.2	21.0
Manufacturers/producers	0.5	1.2	2.0	1.2
Preferred alternative				
Paper bags	38.2	42.6	7.6	7.6
Fibre bags	23.3	21.1	92.4	92.4
Cloth bags	34.5	28.7	31.6	31.6
Woven baskets	4.0	7.6	5.1	5.6

Source: Field Survey (February 2021)

Figure 29: Preferred alternative to polythene bags



Source: Field survey, February 2021

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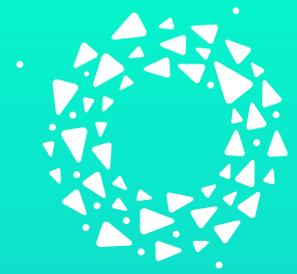
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Endnotes

1. Ghana NPAP Model
2. <https://www.weforum.org/our-impact/waste-to-wages-technology-is-a-game-changer-in-ghana-s-fight-against-plastic-pollution>
3. Breaking the Plastic Wave Report
4. World Bank. 2020. Ghana Country Environmental Analysis. World Bank, Washington, DC. © World Bank. <https://openknowledge.worldbank.org/handle/10986/33726> License: CC BY 3.0 IGO.
5. <https://www.graphic.com.gh/features/features/accra-fishermen-now-landing-big-catches-of-plastics.html#:~:text=Today%2C%20fishermen%20in%20three%20fishing,drains%20that%20serve%20as%20pathways.>
6. https://www.thegef.org/sites/default/files/web-documents/10401_MFA_PIF.pdf
7. <https://www.worldbank.org/en/topic/urbandevelopment/brief/solid-waste-management>
8. Pankaj, V.P.. (2015). Sustainable model of plastic waste management. International Journal of ChemTech Research. 7. 440-458.
9. Putri, A., Fujimori, T. & Takaoka, M. (2018). Plastic waste management in Jakarta, Indonesia: evaluation of material flow and recycling scheme. Journal of Material Cycles and Waste Management. 20. 10.1007/s10163-018-0753-2.
10. Miezah, K., Obiri-Danso, K., Kádár, Z., Fei-Baffoe, B., and Mensah, Y. B. (2015), Municipal solid waste characterization and quantification as a measure towards effective waste management in Ghana
11. World Bank. 2020. Ghana Country Environmental Analysis. World Bank, Washington, DC. © World Bank. <https://openknowledge.worldbank.org/handle/10986/33726> License: CC BY 3.0 IGO
12. <https://www.gh.undp.org/content/ghana/en/home/presscenter/pressreleases/2019/behavioural-change-is-critical-in-addressing-plastic-menace.html>
13. <https://www.downtoearth.org.in/news/waste/covid-19-here-is-what-you-should-do-to-safely-dispose-your-used-mask-71006>
14. National Plastic Action Partnership: Baseline Results for Ghana (GH NPAP), 2nd Expert Panel Workshop, September 2020
15. The Pew Charitable Trusts and SYSTEMIQ, "Breaking the Plastic Wave" (2020), https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave_report.PDF
16. Borgen Magazine: From Plastic to Profit: Solutions to Plastic Pollution in Ghana, <https://www.borgenmagazine.com/plastic-pollution-in-ghana/>
17. Ghana NPAP System Model
18. Ghana NPAP System Model
19. UNEP, 2018. Single-use plastics has reached the world's deepest ocean trench, <https://www.unep.org/news-and-stories/story/single-use-plastic-has-reached-worlds-deepest-ocean-trench>
20. Impact of Marine Debris: Entanglement of Marine Life in Marine Debris Including a Comprehensive List of Species with Entanglement and Ingestion Records, https://www.researchgate.net/profile/David-Laist/publication/235768493_Impacts_of_Marine_Debris_Entanglement_of_Marine_Life_in_Marine_Debris_Including_a_Comprehensive_List_of_Species_with_Entanglement_and_Ingestion_Records/links/02bfe5136037d75c73000000/Impacts-of-Marine-Debris-Entanglement-of-Marine-Life-in-Marine-Debris-Including-a-Comprehensive-List-of-Species-with-Entanglement-and-Ingestion-Records.pdf
21. African Transformers: Poor plastic waste management in Accra Ghana https://mapthesystem.sbs.ox.ac.uk/sites/default/files/mapthesystem/documents/media/written_submission_ahesi_university.pdf
22. Global Agricultural Information Network: Fish and Seafood Report, 2019 http://agriexchange.apeda.gov.in/MarketReport/Reports/Fish_and_Seafood_Report_Accra_Ghana_3-8-2019.pdf
23. Lartey 2015: The effects of plastic pollution on inshore marine fishing activities: insights from Elmina coastline in the KEEA Municipality, <http://ugspace.ug.edu.gh/bitstream/handle/123456789/8784/The%20Effects%20of%20Plastic%20Pollution%20on%20Inshore%20Marine%20Fishing%20Activities%20Insights%20from%20Elmina%20Coastline%20in%20the%20Kee%20Municipality%20-%202015.pdf?sequence=1>
24. <https://www.graphic.com.gh/daily-graphic-editorials/we-can-solve-plastic-waste-problem.html> <https://www.ghanabusinessnews.com/2019/10/10/ghana-partners-norway-to-deal-with-plastics-marine-litter/> <http://www.ipsnews.net/2018/12/ghanas-contribution-plastic-waste-can-reduced-right-investment/>
25. Lissah et al, 2021 Managing urban solid waste in Ghana: Perspectives and experiences of municipal waste company managers and supervisors in an urban municipality. <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0248392>
26. Netherlands Enterprise Agency, Market Survey Waste and Circular Economy in Ghana <https://www.rvo.nl/sites/default/files/2019/08/Ghana-Market-Survey-Waste-Circular-Economy.pdf>
27. Promoting inclusivity Baseline study, GH-NPAP
28. <https://globalplasticaction.org/wp-content/uploads/NPAP-Ghana-Gender-Baseline-May-2021.pdf>
29. Forbes. (2015). Top 10 things everyone should know about women consumers. Available at: <https://www.forbes.com/sites/bridgetbrennan/2015/01/21/top-10-things-everyone-should-know-aboutwomen-consumers/#626fcff6a8b>.
30. Miezah, K., Obiri-Danso, K., Kádár, Z., Fei-Baffoe, B., and Mensah, Y. B. (2015), Municipal solid waste characterization and quantification as a measure towards effective waste management in Ghana
31. The Pew Charitable Trusts and SYSTEMIQ, "Breaking the Plastic Wave" (2020), https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave_report.PDF
32. World Bank, What a waste
33. The Pew Charitable Trusts and SYSTEMIQ, "Breaking the Plastic Wave" (2020), https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave_report.PDF
34. Radically Reducing Plastic Leakage In Vietnam: Action Roadmap, National Plastic Action Partnership, Vietnam
35. Radically Reducing Plastic Leakage In Vietnam: Action Roadmap, National Plastic Action Partnership, Vietnam
36. <http://trashybags.org/alliance2012.htm>
37. The Pew Charitable Trusts and SYSTEMIQ, "Breaking the Plastic Wave" (2020), https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave_report.PDF
38. The Pew Charitable Trusts and SYSTEMIQ, "Breaking the Plastic Wave" (2020), https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave_report.PDF
39. GH-NPAP Scenario Model
40. Netherlands Enterprise Agency, Market Survey Waste and Circular Economy in Ghana <https://www.rvo.nl/sites/default/files/2019/08/Ghana-Market-Survey-Waste-Circular-Economy.pdf>
41. Netherlands Enterprise Agency, Market Survey Waste and Circular Economy in Ghana <https://www.rvo.nl/sites/default/files/2019/08/Ghana-Market-Survey-Waste-Circular-Economy.pdf>
42. Lartey, T. The Effects of Plastic Pollution on Inshore Marine Fishing activities: Insights from Elmina Coastline in the KEEA Municipality, <http://ugspace.ug.edu.gh/bitstream/handle/123456789/8784/The%20Effects%20of%20Plastic%20Pollution%20on%20Inshore%20Marine%20Fishing%20Activities%20Insights%20from%20Elmina%20Coastline%20in%20the%20Kee%20Municipality%20-%202015.pdf?sequence=1#:~:text=The%20study%20revealed%20that%20plastic,fishermen%20in%20the%20Elmina%20coastline.>
43. Nyathi, B., and Togo, C. A. (2020) Overview of Legal and Policy Framework Approaches for Plastic Bag Waste Management in African Countries. Journal of Environmental and Public Health. Volume 2020, Article ID 8892773, <https://doi.org/10.1155/2020/8892773>
44. The Ghana Free Zones Authority offers 100% exemption from payment of direct and indirect duties and levies on all imports for production and exports from free zones.
45. https://www.ellenmacarthurfoundation.org/assets/downloads/New-Plastics-Economy_Catalysing-Action_13-1-17.pdf
46. MESTI. (2021, February). Revised National Plastics Management Policy. Retrieved March 26, 2021, from <https://mesti.gov.gh/>: https://mesti.gov.gh/wp-content/uploads/2021/02/Revised-National-Plastics-Management-Policy_-FINAL.pdf
47. Holland Circular Hotspot. (2019). Market Survey Waste and Accra: Netherlands Enterprise Agency.
48. Ministry of Trade and Industry – MoTI (2019) National micro Small and Medium enterprises policy. Accra, Ghana. [https://www.bcp.gov.gh/acc/consultation/docs/DRAFT_MSME-FINAL_26.02.2019\(1\).pdf](https://www.bcp.gov.gh/acc/consultation/docs/DRAFT_MSME-FINAL_26.02.2019(1).pdf)
49. Ministry of Environment, Science, Technology and Innovation (2020) National Plastics Management Policy. https://mesti.gov.gh/wp-content/uploads/2021/02/Revised-National-Plastics-Management-Policy_-FINAL.pdf
50. Harmita Golwala, Xueyao Zhang, Syeed Md Iskander, Adam L. Smith, Solid waste: An overlooked source of microplastics to the environment, Science of The Total Environment, Volume 769, 2021, 144581, ISSN 0048-9697, <https://doi.org/10.1016/j.scitotenv.2020.144581>.
51. https://www.thegef.org/sites/default/files/web-documents/10401_MFA_PIF.pdf



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