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CIRCULAR ECONOMY OPPORTUNITY MAP

Ghana Plastics Value Chain

SEPTEMBER, 2025

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Authors

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About This Report

This report explores waste-to-wealth opportunities within Ghana's plastics sector, highlighting pathways for value creation from plastic waste. The sections move from contextual analysis and material flows to business opportunities, enabling conditions, and implementation considerations.

Contents

Glossary

Acronyms and Abbreviations

Acronym	Meaning
CE	Circular Economy
EPR	Extended Producer Responsibility
MFA	Material Flow Analysis
LCA	Life Cycle Assessment
GHG	Greenhouse Gas
KPI	Key Performance Indicator
PPP	Public-Private Partnership
SME	Small and Medium-sized Enterprise
SUP	Single-Use Plastics
PET	Polyethylene Terephthalate
HDPE	High-Density Polyethylene
LDPE	Low-Density Polyethylene
LLDPE	Linear Low-Density Polyethylene
PP	Polypropylene
PS	Polystyrene
MSW	Municipal Solid Waste
GPAP	Global Plastic Action Partnership
NPAP	National Plastic Action Partnership (Ghana)
UNIDO	United Nations Industrial Development Organisation
UNDP	United Nations Development Programme
EPA	Environmental Protection Authority (Ghana)
M&E	Monitoring and Evaluation
DRIC	Directorate of Research, Innovation and Consultancy (University of Cape Coast)
WEF	World Economic Forum
AfCFTA	African Continental Free Trade Area
SIA	Social Impact Assessment
MCI	Material Circularity Indicator
VOC	Volatile Organic Compounds
PPE	Personal Protective Equipment
FGD	Focus Group Discussion
SCOR	Supply Chain Operations Reference Model
MEST	Ministry of Environment, Science & Technology (Ghana)
SMEP	Sustainable Manufacturing and Environmental Pollution Programme
UNEP	United Nations Environment Programme
PRO	Producer Responsibility Organisation

Definition of concepts

Concept	Definition
Bio-based Plastics	Plastics made wholly or partly from renewable biological resources, such as plants, rather than fossil fuels.
Chemical Recycling	Advanced recycling technologies that break down plastics into their chemical components, allowing them to be reused as new feedstock for producing high-quality plastics.
Circular Economy (CE)	An economic system aimed at minimising waste and making the most of resources by reusing, repairing, refurbishing, and recycling existing materials and products.
Circular Economy Business Models	Business models designed around principles of reuse, repair, remanufacturing, and recycling to extend the life of products and materials.
Circular Material Use Rate (CMUR)	An indicator measuring the share of material inputs in an economy that come from recycled waste materials rather than virgin materials.
Concept	Definition
Design for Disassembly	The practice of designing products so that they can be easily taken apart for repair, remanufacturing, or recycling at the end of their useful life.
Downcycling	A recycling process where recovered materials are converted into new materials or products of lower quality and reduced functionality compared to the original.
Eco-Design	The practice of designing products with special consideration for the environmental impacts of the product during its whole lifecycle, including end-of-life recovery.
Environmental Leakage	The unintended loss of waste materials, especially plastics, into the natural environment, including rivers, oceans, and landscapes.
Extended Producer Responsibility (EPR)	An environmental policy approach that holds producers responsible for the entire lifecycle of their products, especially for take-back, recycling, and final disposal.
Green Entrepreneurship	Business ventures that prioritise environmental sustainability, resource efficiency, and social impact, including innovations in recycling, reuse, and eco-design.
Green Jobs	Employment that contributes to preserving or restoring the environment, including roles in recycling, renewable energy, sustainable agriculture, and eco-innovation.
Inclusive Recycling	An approach to recycling that deliberately integrates informal waste collectors and vulnerable groups into the formal value chain to ensure equitable benefits.

Concept	Definition
Industrial Symbiosis	A system where the waste or by-products of one industry become the raw materials for another, promoting efficient resource use and reducing waste.
Informal Sector	Economic activities carried out by individuals or enterprises that are not regulated by the state and often operate outside formal waste management systems.
Informal Waste Collectors' Cooperatives	Organised groups of waste pickers who collaborate to improve their bargaining power, access to markets, working conditions, and legal recognition.
Life Cycle Assessment (LCA)	A systematic method for evaluating the environmental impacts of a product or service throughout its entire life cycle, from raw material extraction to final disposal.
Material Circularity Indicator (MCI)	A measure developed to quantify how restorative the material flows of a product or company are, considering recycled content and end-of-life recycling potential.
Material Recovery Facility (MRF)	A specialised plant that receives, separates, and prepares recyclable materials for marketing to end-user manufacturers.
Mechanical Recycling	A process that involves the physical transformation of plastic waste (through shredding, washing, and remelting) into secondary raw materials without changing the chemical structure.
Microplastics	Tiny plastic particles, usually smaller than 5 millimetres, resulting from the breakdown of larger plastics or manufactured as microbeads, posing environmental and health risks.
Municipal Solid Waste (MSW)	Waste generated from residential, commercial, institutional, and industrial sources managed primarily by municipal authorities, including plastics, organics, metals, and glass.
Plastic Credits	Market-based instruments that certify the removal or recycling of a specific amount of plastic waste, often used by companies to offset their plastic footprint.
Plastic Leakage	The release of plastic waste into the environment, particularly into rivers, drains, and oceans, due to inadequate waste collection and management systems.
Plastic Pollution Hotspots	Locations where plastic waste accumulates heavily due to human activities, poor waste management, or natural factors like rainfall and flooding.
Plastic Value Chain	The entire lifecycle of plastic materials, encompassing production, distribution, consumption, waste generation, collection, sorting, recycling, and final disposal.

Concept	Definition
Plastic Waste Hotspots	Geographic areas or sectors where large volumes of plastic waste generation and environmental leakage are concentrated.
Plastic Waste-to-Value Solutions	Innovative processes and business models that convert plastic waste into economically valuable products, such as fuels, construction materials, or new plastic products.
Plastic-to-Construction Innovations	Technologies and business models that convert plastic waste into construction materials such as bricks, tiles, and paving stones.
Polluter Pays Principle (PPP)	An environmental policy principle that assigns the cost of pollution prevention and control measures to the entities responsible for generating pollution.
Post-Consumer Plastics	Plastics that have been used and discarded by consumers, as opposed to manufacturing scrap, requiring collection and recycling efforts.
Post-Industrial Plastics	Plastic waste generated by industrial and manufacturing processes, typically cleaner and more homogenous than post-consumer plastics.
Pre-Consumer Waste	Waste material generated during the manufacturing process that has not yet reached a consumer, often easier to recycle due to lower contamination.
Recyclates	Secondary raw materials obtained through the recycling of waste products, used to replace virgin materials in manufacturing.
Reverse Logistics	The process of moving products or materials backward through the supply chain for reuse, recycling, or safe disposal instead of end-of-life abandonment.
Sachet Water	Packaged drinking water sold in sealed plastic sachets, widely consumed in Ghana but also contributing significantly to plastic waste streams.
Sankey Diagram	A type of flow diagram that visualises the flow of materials or energy across a system, often used in material flow analyses to show losses, recycling, and leakages.
Secondary Markets	Markets that trade in recycled, reused, or refurbished goods and materials rather than primary (virgin) products.
Secondary Raw Materials	Materials recovered through recycling processes that can replace virgin resources in manufacturing new products.

Concept	Definition
Single-Use Plastics (SUPs)	Plastic products designed for one-time use before being discarded, such as plastic bags, sachet water packaging, straws, and cutlery, often linked to high environmental impact.
Social Impact Assessment (SIA)	A process of analysing, monitoring, and managing the intended and unintended social consequences, both positive and negative, of planned projects or policies.
Sustainable Consumption and Production (SCP)	A holistic approach aimed at promoting resource and energy efficiency, sustainable infrastructure, and providing access to basic services, green jobs, and a better quality of life.
Virgin Resin	Newly manufactured plastic polymers produced from petrochemical feedstock, without any recycled content, typically used in the initial production of plastic products.
Waste Segregation at Source	The practice of separating different types of waste (e.g., plastics, organics, metals) at the point of generation to improve recycling and recovery rates.
Waste-to-Energy (WTE)	The process of generating energy in the form of electricity or heat from the treatment of waste materials, including non-recyclable plastics.

1

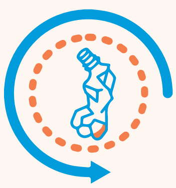
Executive Summary

1.0 Executive Summary

Plastic consumption in Ghana has grown significantly due to rapid urbanisation, industrial expansion, and changing consumer behaviours, with an estimated 1.1 million tonnes of plastic entering the domestic market annually. However, only a fraction of this plastic is recovered or recycled, with a recycling rate of approximately 12% and significant volumes mismanaged through open dumping, burning, or leakage into natural ecosystems. Despite the environmental and socio-economic costs associated with the current linear plastics economy, a compelling opportunity exists for Ghana to transition towards a more sustainable, inclusive, and profitable circular plastics economy.

This study maps Ghana's plastic value chain from input supply, manufacturing, distribution, and consumption, to waste generation, collection, sorting, recycling, and final disposal. It highlights key leakage points and systemic inefficiencies, but more importantly, identifies scalable opportunities for circular interventions. The opportunity landscape is rich and diverse, spanning material innovation, technological adoption, market development, and policy reform.

One of the most promising opportunities lies in scaling decentralised Material Recovery Facilities (MRFs) to bridge the gap between waste collection and recycling. Establishing localised sorting hubs in cities like Accra, Kumasi, and Tamale would enhance the quality and volume of recyclables available for processing while creating thousands of green jobs, particularly for women persons with disabilities and the youth.



Plastic consumption in **Ghana** has grown significantly due to rapid urbanisation, industrial expansion, and changing consumer behaviours, with an estimated **1.1 million tonnes of plastic** entering the domestic market annually.

The study also identifies significant potential in plastic-to-construction innovations, where plastics are converted into building materials such as bricks, tiles, and paving blocks. Such ventures not only offer a productive end-use for hard-to-recycle plastics but also address Ghana's growing need for affordable housing and resilient infrastructure.

Another vital area of opportunity is digitally enabled circularity. Platforms that track plastic flows using blockchain, mobile apps for connecting waste pickers with recyclers, and AI-driven material quality assessments can greatly improve transparency, efficiency, and fair pricing along the value chain. These digital solutions can formalise informal actors, enhance traceability, and support data-driven policy interventions.

The growing awareness and technical capabilities around design for disassembly also provide a pathway to mainstream circular product innovation. By promoting modular product designs that facilitate repair, reuse, and material recovery, manufacturers can reduce the lifecycle impacts of plastics and create new business models based on service and maintenance. The informal sector remains a crucial, though underleveraged, asset in Ghana's plastics economy. By formalising waste picker cooperatives, providing training, and improving access to health and financial services, the country can significantly enhance plastic recovery rates while delivering major social inclusion benefits.
Critical enablers for unlocking these opportunities include strengthening the enforcement of Extended Producer Responsibility (EPR) schemes, incentivising the use of recycled materials through tax benefits and green financing, mandating source segregation at the household level, and supporting public-private partnerships for infrastructure investment. Moreover, targeted public education campaigns and the integration of circular economy principles into national development strategies will be essential for sustaining long-term impact.

In conclusion, while Ghana's plastic waste challenges are considerable, the opportunities for turning waste into wealth are greater. With coordinated action across government, private sector, informal actors, and development partners, the country can transform its plastics value chain into a vibrant engine for green economic growth, social equity, and environmental sustainability.

This study maps Ghana's plastic value chain from input supply, manufacturing, distribution, and consumption, to waste generation, collection, sorting, recycling, and final disposal.

2

Background and Context

2.0 Background and Context

Plastics have become a basic component of global industrial production and modern life, providing material solutions across sectors such as packaging, automotive, construction, textiles, healthcare, and consumer goods. Global annual plastic production now exceeds 380 million metric tonnes and is projected to triple to 1.3 billion by 2050 if current trends persist (Chaudhary & Garg, 2024; GPAP, 2021). Packaging alone accounts for nearly 40% per annum of global production (Jambeck & Walker-Franklin, 2023; NPAP, 2021). While plastics offer versatility and cost efficiency, they are also a primary driver of environmental degradation due to their persistence, widespread use in single-use applications, and poor end-of-life management.

Global annual plastic production now exceeds **380 million metric tonnes** and is projected to triple to **1.3 billion** by **2050** if current trends persist

Ghana, like many developing countries, has witnessed a dramatic increase in plastic consumption driven by rapid urbanisation, industrial expansion, and a growing population. Plastics are mostly used in the packaging of consumer goods, accounting for about 70% of plastic inputs and with over 1.1 million tonnes entering the Ghanaian domestic market annually through both importation and local production (GPAP, 2021; NPAP, 2021).

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Despite their economic usefulness, the widespread reliance on disposable plastics, coupled with inadequate infrastructure for waste management, has led to severe environmental consequences, including blocked drains, marine pollution, public health risks and social justice and climate change issues.

The global and national plastics sectors are now navigating a paradigm shift influenced by increased policy momentum towards sustainability and circularity (Bauer et al., 2022). Emerging international trends such as Extended Producer Responsibility (EPR), the integration of biodegradable materials, and innovations in digital tracking systems are reshaping how plastic value chains are conceptualised and managed (Lybæk & Kjær, 2024; NPAP, 2021). Ghana has, therefore, begun aligning with these shifts, supported by initiatives such as the Ghana National Plastic Action Partnership (NPAP), which highlights policy, innovation, and trade as key enablers of a circular transition (GPAP, 2021; NPAP, 2021). Nevertheless, systemic constraints remain. Ghana's plastics ecosystem is characterised by a high dependence on imported virgin plastic, limited domestic recycling capacity, and an under-regulated informal waste collection sector. Recycling rates remain low, estimated at just 10%, and only about 12% of plastic waste is recovered, while the rest is mostly mismanaged through open dumping, burning, or unregulated landfilling (GPAP, 2021; UNIDO, 2024). This presents a critical need for structured interventions and policy coherence to steer the sector toward sustainability.

Opportunity mapping has emerged as a strategic tool for identifying interventions across the plastics value chain. By highlighting inefficiencies and the potential for innovation, opportunity mapping helps governments, investors, and development actors prioritise areas with high environmental and socio-economic returns (Carpenter et al., 2022; GPAP, 2021). It also plays a vital role in strengthening the evidence base for circular strategies, particularly in developing inclusive and scalable solutions that benefit vulnerable populations, especially women, youth, and informal waste collectors. In Ghana, where the informal sector remains the backbone of plastic waste recovery, targeted opportunity mapping can enhance investments in small-scale recycling, product redesign, and green entrepreneurship, helping to build a resilient and equitable circular economy (GPAP, 2021; NPAP, 2021; UNIDO, 2024).

The plastic waste landscape in Ghana reflects a complex interaction of volumes, waste types, market behaviours, and policy gaps. The country generates approximately 0.84 million tonnes of municipal plastic waste annually, growing at an estimated 5.4% per year (NPAP, 2021). Among the dominant plastic types are PET, LDPE, HDPE, PP, and PS, used largely for packaging, household items, and beverage containers. Current collection coverage is only 49%, with over 66% of plastic waste inefficiently managed including: open dumping (26%), burning (17%), and unregulated landfills (23%) (GPAP, 2021; NPAP, 2021; UNIDO, 2024). Material contamination, lack of segregation at source, and insufficient infrastructure severely limit efficient recovery. The informal sector, comprising thousands of waste pickers and aggregators, plays a critical but under-recognised role in plastic waste management, often operating under poor working conditions and with limited access to formal markets or safety nets (Hidalgo-Crespo et al., 2023; NPAP, 2021).

The regulatory and institutional environment surrounding plastic management in Ghana is evolving, though enforcement remains weak and fragmented. Key institutions include the Ministry of Environment, Science, Technology and Innovation (MESTI), Environmental Protection Authority (EPA), MMDAs and private actors. Policy frameworks such as the National Plastics Management Policy, the NPAP Ghana Action Roadmap, and the Circular Economy Framework Project provide strategic direction for transition efforts. However, implementation is challenged by insufficient financing, weak enforcement, and limited data on plastic flows. For instance, while levies like the Sanitation and Pollution Levy (Act 1064, 2021) exist to finance environmental interventions, disbursement and utilization have not kept pace with the urgency of the issue.

Ghana's plastic value chain is also heavily shaped by global supply chains, with a significant share of inputs imported in the form of virgin polymers. Distribution and consumption are concentrated in low-cost, high-volume goods, particularly single-use packaging (Fiati, 2021; Scotland, 2019). Recycling and reuse efforts face multiple barriers, including low consumer awareness, lack of incentives for circular design, and minimal investment in recycling technologies. Nonetheless, a variety of circular economy opportunities exist. These range from PET processing for textiles and packaging, plastic-to-brick manufacturing for construction, and bio-based plastic production for food packaging to the expansion of EPR schemes that place responsibility on producers to manage the end-of-life of their products (GPAP, 2021; NPAP, 2021).

Strategic interventions and coherent policy implementation can unlock Ghana's potential to transition towards a circular plastics economy. The NPAP Roadmap outlines five core strategies i.e. reduction and substitution, redesign, enhanced recycling, improved collection, and safe disposal providing a solid foundation for action. Complementary analyses, such as the World Economic Forum's (WEF's) "Trade and Circular Economy" report, highlight the relevance of policy tools and trade-based incentives, including opportunities under the African Continental Free Trade Area (AfCFTA), to support domestic circular initiatives (GPAP, 2021). The Midterm Review of Ghana's Circular Economy Project (UNIDO, 2024) further reinforces the need for better coordination and targeted investment in circular innovation ecosystems.

2.1 Aim

This report aims to analyse the entire plastic value chain in Ghana and identify circular economy opportunities that address systemic inefficiencies and environmental risks.

2.3 Objectives

The objectives were to:

1. map value chain gaps and inefficiencies that lead to resource loss and pollution,
2. examine scalable circular economy opportunities in reuse, redesign, and valorisation,
3. analyse market and policy interventions that can strengthen enforcement, improve investment flows, and enhance livelihoods

2.4 Scope

This study focuses on the baseline assessment and opportunity mapping of the plastic value chain in Ghana, examining key segments where circular economy (CE) interventions can upscale existing businesses, drive waste reduction, material recovery, and develop new business models. The analysis encompasses the entire lifecycle of plastic materials, from importation, local production, distribution and consumption to waste collection, recycling, and disposal.

This study assessed how different actors—including manufacturers, waste collectors, recyclers, policymakers, and consumers—interact across these segments, with the aim of promoting circular solutions that enhance economic, environmental, and social benefits. Specifically, analysis of the plastic value chain along these key stages: input supply, production, consumption, waste generation, collection, recovery, recycling, and end-use was assessed.

3

Methodology

3.0 Methodology

3.1 Approach

This study employed a mixed-methods approach, combining both primary data collection and secondary data to map the circular economy (CE) opportunities within Ghana's plastics value chain. Recognizing the complexity of plastics flows (input supply, manufacturing, distribution, consumption, collection, sorting, recycling, disposal, and environmental leakage) and the interlinked social, economic, and environmental dimensions of waste management, the study was designed to bridge quantitative evidence with qualitative insights.

In addition to structured surveys and interviews, the study integrated field observations and rapid assessments of plastic waste inventories at key nodes of the value chain (informal collection hubs, dumpsites, sorting centers, recycling facilities) and community hotspots such as markets and waterways. The rapid assessments enabled validation of plastic types, waste flows, leakage points, and stakeholder practices that are often not fully captured in formal datasets. To systematically identify, validate, and prioritize circular opportunities, the study incorporated an opportunity mapping framework built around three pillars:

a. **Material Flow Analysis (MFA) and Life Cycle Assessment (LCA):** Critical leakage points, waste accumulation nodes, and inefficiencies were first mapped through MFA and LCA to identify where material interventions could yield the greatest environmental and economic benefits.

b. **Social Impact Gap Analysis:** Primary data collection was used to uncover vulnerabilities faced by informal sector actors, especially waste pickers and aggregators, whose livelihoods, health, and safety are closely tied to the current functioning of the plastics economy. Opportunity mapping specifically sought to align material recovery interventions with pathways for decent work creation, livelihood enhancement, and gender inclusion.

c. **Feasibility and Scaling Potential Assessment:** Identified opportunities were further evaluated against a multi-criteria feasibility framework, considering market demand, material availability, technology readiness, policy support, financial viability, and social impact potential. This ensured that proposed interventions were not only technically sound but also commercially viable and socially inclusive.

The mixed-methods design thus served a dual purpose: quantifying materials, resource and energy flows across the value chain while also uncovering the lived realities, systemic inefficiencies, governance constraints, and untapped opportunities experienced by key actors—including informal sector workers, municipal waste authorities, private recycling companies, plastic manufacturers, retailers, and community-based organizations. The study approach aligns with best practices in CE transition planning, as advocated by international agencies such as the Ellen MacArthur Foundation (2015), UNEP (2021), and the World Economic Forum (2020). It also responds to gaps identified in prior assessments, which often failed to integrate material, environmental, and social dimensions into a coherent decision-support system (Brunner & Rechberger, 2016; Wilson et al., 2012).

3.2 Data Collection

Data collection was structured across three layers:

a. Review of published and unpublished documents including policies, CE toolkits, and project evaluations;
b. Stakeholder consultations involving government agencies, private sector actors, informal workers, manufacturers and civil society representatives;
c. Field-based primary data collection through structured surveys, key informant interviews, focus group discussions, and site observations.

This triangulated strategy ensured that findings were evidence-based, context-specific, and policy-relevant, ultimately supporting an actionable roadmap for circular economy interventions tailored to Ghana's plastics sector.

3.2.1 Desk Review

As a foundational step, the methodology included a review of relevant documents to provide context, benchmarks, and methodological guidance. This review covered:

a. National frameworks such as Ghana's National Plastics Management Policy and Extended Producer Responsibility (EPR) guidelines (MESTI, 2020),
b. Global strategies and guidance from the Ellen MacArthur Foundation (2015), UNEP (2020; 2021), and the EU Circular Economy Action Plan (European Commission, 2020),
c. Peer-reviewed academic literature on material flow, life cycle thinking, and informal sector engagement (Brunner & Rechberger, 2016; Wilson et al., 2012), and
d. Project reports and implementation roadmaps from Ghana and comparator countries (e.g., NPAP Roadmap; SMEP Pilot; WEF, 2020).

3.2.2 Stakeholder Consultations

Stakeholder engagement was an integral component of the study's methodological design, ensuring the inclusivity, relevance, and practical applicability of the circular economy (CE) opportunity mapping. A participatory consultation model was adopted to incorporate diverse perspectives across the plastics value chain and to validate findings generated through primary and secondary data collection.

Consultations were conducted with the following stakeholder groups:

a. Government agencies, including the Ministry of Environment, Science, Technology (MEST), the Ministry of Local Government and Rural Development, and the Environmental Protection Authority (EPA) Ghana, who provided policy insights, regulatory perspectives, and technical inputs on national waste management strategies;
b. Private sector actors, comprising plastic manufacturers, recyclers, distributors, and aggregators, who shared operational data and practical considerations related to plastic production, recovery, and reuse;
c. Civil society organizations (CSOs) and non-governmental organizations (NGOs), particularly those with environmental, advocacy, and youth-focused mandates, who contributed insights on public engagement, behavioral change, and environmental justice;
d. Informal sector participants, particularly waste pickers, collectors, and small-scale recyclers, whose contributions were essential in understanding the realities of plastic recovery systems, labour dynamics, and the barriers to integration into formal CE models.

3.2.3 Primary Data Sources

Primary data were collected to capture current practices, stakeholder experiences, and localised insights across the plastics value chain. The study employed structured surveys, interviews, and focus group discussions (FGDs) with key stakeholder groups, summarised as follows:

a. Formal Private Sector: Structured surveys were administered to a purposive sample of 70 private-sector entities, including 19 plastic manufacturers and 34 distributors/ retailers. These surveys collected data on material flows, production efficiencies, waste generation practices, recycling content usage, and barriers to circularity adoption.

b. Policy Makers and Institutional Stakeholders: Surveys were also conducted with 76 policy makers and regulatory actors at national and municipal levels. This included representatives from environmental ministries, metropolitan and municipal assemblies (MMDAs), regulatory agencies, and public waste management authorities. These engagements explored the policy landscape, governance gaps, and institutional measures shaping plastic waste management, recycling, and circular economy initiatives.

c. Informal Sector Actors: Interviews and FGDs were carried out with 300 informal sector participants, primarily waste pickers, aggregators, itinerant buyers, and small-scale recyclers. These sessions provided critical insights into livelihood patterns, collection and sorting behaviours, occupational safety challenges, and perceptions of opportunities under a circular economy transition.

d. Field observations and rapid assessment of inventory were conducted at selected plastic production sites, waste collection hubs, sorting facilities, and disposal sites. Observational data helped validate self-reported practices and offered visual documentation of operational conditions across the value chain.

Triangulating data from these diverse stakeholder groups helps to generate a grounded, multi-dimensional understanding of the plastics value chain—encompassing both formal and informal systems—and identify leverage points for scalable and inclusive circular economy interventions.

3.2.4 Secondary Data Sources

Secondary sources were reviewed to supplement primary findings, establish baselines, and enable comparative analysis. These included:

a. Customs data on plastic imports obtained from the Customs Division of the Ghana Revenue Authority (GRA, 2022), providing information on the volume and types of virgin plastic materials and finished plastic products entering the country.
b. Project reports and implementation roadmaps, such as those produced by National Plastics Action Partnership (NPAP), UNDP Ghana Accelerator Lab. (2023). Auditor-General. (2023), Ghana Plastic Manufacturers Association. (2022), the International Union for Conservation of Nature (IUCN, 2021) and the World Economic Forum (WEF, 2020), which documented prior CE initiatives and policy recommendations within the Ghanaian context.
c. Academic and technical literature accessed through databases and CE

knowledge platforms, which informed the methodological framework and supported the triangulation of field data.

3.3 Fieldwork Procedures

The primary data collection phase was underpinned by a structured and ethically grounded fieldwork protocol to ensure data quality, contextual sensitivity, and participant protection. The fieldwork was carried out by trained enumerators who operated under close supervision and adhered to standardised procedures throughout the study area.

3.3.1 Pre-Testing of Instruments

All data collection instruments—including structured questionnaires, semi-structured interview guides, and observation templates—were pre-tested in the Sekondi-Takoradi Metropolitan Area (STMA) in Ghana's Western Region. Takoradi was chosen for its strategic location within the country's industrial and coastal corridor, its socio-economic diversity, and its representation of both formal and informal actors in the plastics value chain. Key refinements to the tools were made following the pre-test, addressing issues such as unclear terminology, question sequencing, and skip logic errors in digital formats.

3.3.2 Expert Validation and External Review

In addition to field-based piloting, the instruments were subjected to expert validation. Specialists in circular economy, environmental governance, and waste management reviewed the tools to assess content validity, construct relevance, and alignment with the study's objectives. This internal validation process ensured that the instruments captured core CE concepts and aligned with best practices in environmental and socio-economic research.

Furthermore, the research tools were shared with the United Nations Industrial Development Organisation (UNIDO) and an independent consultant commissioned for stakeholder mapping in the plastics sector. These external reviewers provided critical feedback on instrument scope, stakeholder categorisation, and alignment with national and regional CE strategies. Revisions were made accordingly to enhance precision, policy relevance, and practical applicability of the instruments across stakeholder groups.

Enumerator Training and Deployment

All field personnel participated in a comprehensive training program delivered over a two-day period. Training modules focused on:

a. Research ethics and respondent rights, including the principles of voluntary participation, informed consent, and confidentiality;
b. Digital data collection techniques, using KoboToolbox for real-time input, geo-tagging, and timestamping;
c. Gender and social sensitivity and cultural competency, ensuring respectful engagement across diverse communities;
d. Occupational safety protocols, particularly for enumerators working in waste handling zones, informal dumpsites, or recycling facilities.

Enumerators were also trained to recognize non-verbal cues, manage difficult interviews, and document field observations systematically. A field manual was provided for consistency and standardization of procedures.

3.3.4 Supervision and Quality Assurance

Fieldwork was conducted under the direct supervision of regional coordinators and a central monitoring team based at the Directorate of Research, Innovation and Consultancy (DRIC), University of Cape Coast. Data validation procedures included random spot-checks, daily field briefings, and real-time review of submissions via the KoboToolbox dashboard. Any inconsistencies or errors identified during this review process were flagged for immediate rectification by field staff.

3.3.5 Ethical Considerations

The study adhered to fundamental ethical research principles, including voluntary participation, informed consent, confidentiality, and respectful engagement with all respondents and institutions involved.

Prior to data collection, informed consent was obtained from all individual participants. Respondents were fully briefed on the purpose of the study, the nature of their involvement, and their right to withdraw from the process at any stage without penalty. This information was conveyed in writing and, where necessary, orally in the local language to ensure clarity and comprehension, particularly for respondents with limited literacy.

For in-depth interviews and focus group discussions (FGDs), explicit consent was also sought to record audio proceedings, ensuring accuracy in transcription and analysis. Participants were assured that recordings would be used solely for the purposes of research and securely stored. Furthermore, consent was obtained for taking photographs in selected field locations for reporting and documentation, with only images permitted by participants being retained.

In the case of secondary data obtained from institutions, formal letters of request were submitted, accompanied by clear statements of consent for data usage. These letters outlined the intended use of institutional data, assured data confidentiality, and complied with internal protocols set by data-providing agencies. Data accessed through this process such as import statistics, emissions reports, or municipal waste figures was used strictly for the scope of this research and cited appropriately.

Throughout the study, all personal and institutional data were handled with strict confidentiality. Information shared was anonymized in reporting and stored securely to protect the privacy and integrity of all parties involved.

3.4 Data Analysis

The analysis of data collected for this study will follow a structured, multi-layered approach aligned with the Circular Systems Assessment Framework. Quantitative and qualitative techniques will be employed to process and interpret data on material flows, environmental performance, and social inclusion across Ghana's plastics value chain.

3.4.1 Quantitative Analysis

Quantitative data generated from structured surveys will be analysed using descriptive statistical methods to summarise trends in production inputs, waste recovery, labour distribution, and material inefficiencies. Descriptive statistics such as frequencies, percentages, and means will be used to examine patterns across respondent groups and value chain stages.

Material Flow Analysis (MFA) was conducted to model the physical movement of plastic materials, from raw material inputs to final disposal. MFA diagrams will be generated using the Sankey diagram to visualise flow efficiencies, process losses, and leakage points across the system. This facilitated the identification of linear bottlenecks and opportunities for circularity (Brunner & Rechberger, 2016).

Life Cycle Assessment (LCA) was employed to estimate the environmental footprint of plastics across each stage of the value chain. This includes analysis of greenhouse gas (GHG) emissions, energy use, and water consumption per tonne of plastic product. The LCA systematically tracks the environmental impact of the plastics circular economy over the entire life cycle of any plastic product, material, process, or measurable activity[1]. At its best performance, the LCA can provide valuable baseline data and insights for decision-making in sustainability initiatives. This is possible because the LCA is able to highlight areas of improvement, compare efficiency across similar value chains, and is flexible to changing external factors[2]. The LCA framework used in this exercise tracks environmental impact along greenhouse gas (GHG) emissions, energy use, and water consumption per tonne of plastic product. Emission and energy values were benchmarked against the ecoinvent v3.11 database[3], and adjusted to reflect Ghana-specific conditions, particularly electricity generation intensity, using a conversion factor of 0.47 kg CO_2/kWh (EPA Ghana, 2021; Wernet et al., 2016). The values used in the LCA were derived from 1) survey data collections, 2) data from plastics recycling firms, 3) working papers on the plastics circular economy, 4) plastics sector study, 5) National Plastics Management Policy document, Ghana National Plastic Action Partnership (GNPAP), and 6) import and export in plastics value chain. The same data sources apply to the MFA.

3.4.2 Social Impact Assessment

To assess inclusion, safety, and labour equity, social impact metrics was developed from survey responses and focus group discussions. Quantitative indicators such as gender representation, youth participation, and occupational health risks (e.g., access to personal protective equipment) were generated. These indicators were benchmarked against national labour force and public health statistics to evaluate the relative vulnerability and informality of stakeholders within the plastics economy (Ghana Statistical Service [GSS], 2022). This integrated approach ensured that findings reflect both the technical and human dimensions of the plastics value chain and provide a robust basis for identifying scalable circular economy interventions.

3.4.3 Data Visualisation and Integration

To support the effective communication and dissemination of findings, a custom toolkit developed by the consultant served as the central platform for data integration and visualisation. All quantitative data collected from fieldwork and secondary sources were entered into this pre-processed into the appropriate format for analysis. The python-based LCA and

1 https://www.rit.edu/sustainabilityinstitute/blog/what-life-cycle-assessment-lca#:~:text=One%20of%20the%20most%20common,process%2C%20or%20other%20measurable%20activity.

2 https://www.ellenmacarthurfoundation.org/life-cycle-assessment-for-the-circular-economy

3 https://ecoinvent.org/

MFA toolkit was used to generate visual outputs and support interactive analysis. Sankey diagrams were utilised within this system to visualise material flow across the plastics value chain, depicting production inputs, recovery rates, and leakage points. These diagrams effectively illustrated the structure and efficiency of material loops and highlighted areas for intervention (Brunner & Rechberger, 2016).

Bar charts and pie charts were used to summarise environmental impact indicators from the life cycle assessment (LCA), including emissions and energy use by value chain stage. Similarly, these charts illustrate results from the social impact assessment (SIA), such as employment composition by gender and age, access to personal protective equipment, and healthcare. This visualisation strategy ensured that the study's findings could be communicated in a compelling, evidence-based manner, supporting knowledge transfer and stakeholder engagement throughout the CE opportunity mapping process.

4

Value Chain Mapping and Baseline Assessment

4. Value Chain Mapping and Baseline Assessment

4.1 Value Chain Material Flow Mapping and Baseline MFA

This study adopts a life-cycle material flow structure consistent with MFA standards (Brunner & Rechberger, 2004), circular economy frameworks (Ellen MacArthur Foundation, 2013), and the SCOR operational model (APICS, 2017), capturing key transformation and end-of-life stages in line with UNEP's waste management hierarchy. In addition to the data sources, this section represents all the assumptions made in the construction and collection of data format, and system boundaries for LCA and MFA to provide a picture of the baseline situation of the plastics value chain in Ghana.

- **Value Chain Stages:** The plastics value chain in Ghana spans eight stages from raw material input to final disposal. These include: Input Supply (primarily virgin resin import), Manufacturing/Production (converting resin into plastic products), Distribution/Retail (packaging and selling products), Consumption/Use (the consumer use phase, often very short for single-use plastics), Collection (post-use waste collection by municipal or informal systems), Sorting/Pre-Processing (segregating and aggregating recyclable plastics), Recycling/Recovery (reprocessing waste into secondary material), and Disposal (landfilling, dumping, or leaking into the environment).

Input Supply: This stage captures all plastic materials entering the Ghanaian economy, either as raw materials for new plastic production or finished goods.

- **Input Supply:**

This stage captures all plastic materials entering the Ghanaian economy, either as raw materials for new plastic production or finished goods. Main Categories of Input Supply include: Virgin Polymer Imports – Resin pellets (e.g., PE, PP, PET) used by local converters, finished Plastic Product Imports – Bottles, packaging, bags, etc., ready for use or sale and recycled plastic feedstock (Local) – Very small share reused in manufacturing (~11%). Ghana does not produce virgin plastic domestically – all resins are imported, mainly from China and India (The Plastics Industry in Ghana, 2022).

Table 1: Baseline Statistics-Input supply

Input Type	Estimated Volume (tonnes/year)	% of Total Input	Reference
Virgin Resin Imports	~262,000	~49%	Ghana Plastic Country Brief
• PE (Polyethylene: HDPE, LDPE)	~135,000		
• PP (Polypropylene)	~15,000		
• PET (Polyethylene Terephthalate)	~55,000		
Finished Plastic Product Imports	~233,000	~44%	NPAP & Plastic Industry Reports
Recycled Plastic (Local)	~45,000	~8%	UNDP, NPAP estimates (based on 9.5% recycling rate of ~840,000 tonnes waste)

Nearly 100% of Ghana's plastic feedstock is virgin polymer (e.g. imported pellets) with negligible recycled content. This means the value chain starts with high embedded impacts in materials. Recycled plastics account for less than 10% of inputs to production. Statistics from a field survey confirm that out of 53 manufacturing firms surveyed, 47 indicated they rely mostly on virgin plastics as the main source of primary raw material (Some local initiatives produce recycled pellets, but on a very small scale.).

Manufacturing: This stage involves the conversion of raw materials (resins or recyclates) into semi-finished or finished plastic products such as bottles, household items, containers, films, packaging, pipes, etc.

- **Manufacturing:**

This stage involves the conversion of raw materials (resins or recyclates) into semi-finished or finished plastic products such as bottles, household items, containers, films, packaging, pipes, etc. Plastic converters (film manufacturers, bottle makers, etc.) use these resins to make products. Surveyed firms reported small but notable production losses – e.g. one manufacturer noted "Bad roll" scraps as waste. We estimate ~5% of input material becomes process scrap/off-cuts. Most large manufacturers lack on-site recycling, so scrap is either sold to recyclers or discarded. Thus, ~50 kg of waste per tonne can be generated at this stage (often reused informally or sent to waste streams).

Ghana's plastics manufacturing sector is composed of approximately 70 registered formal companies (Plastic Manufacturing Sector Report, 2022), with the majority operating within the Greater Accra, Ashanti, and Western Regions. These manufacturers primarily rely on imported virgin plastic resins—mainly polyethene (PE), polypropylene (PP), and polyethylene terephthalate (PET), because as Ghana does not produce virgin polymers domestically. The sector's installed production capacity is estimated at around 26,000 to 35,000 tonnes per year, with most companies focusing on producing packaging materials, including plastic films, sachets, bottles, and rigid containers for household and commercial use.

Although the country has a growing informal recycling sector, the integration of recyclates into manufacturing remains limited, contributing only about 5–10% of the feedstock mix for small-scale manufacturers. Large-scale producers are particularly dependent on virgin materials due to consistency and quality requirements. A significant portion of plastic products manufactured in Ghana is exported. According to industry estimates, up to 80% of output from large manufacturers is exported to countries within the West African sub-region, including Burkina Faso, Niger, Mali, and Côte d'Ivoire. These exports mostly comprise finished goods such as water storage containers, packaging films, and household plastic items.

The sector is regulated by institutions such as the Ghana Standards Authority, Ministry of Trade and Industry (MoTI) and supported by industry bodies like the Ghana Plastic Manufacturers Association (GPMA) and the Association of Ghana Industries (AGI). However, challenges persist, including limited integration of recycled plastics, inconsistent supply chains, price volatility due to foreign exchange exposure, and stiff competition from imported finished plastics, particularly from Asia. Overall, while Ghana's plastics manufacturing base shows strong regional trade potential and domestic relevance, it remains heavily dependent on imports and faces critical challenges in advancing circular production models.

Table 2: Baseline flow statistics of inputs supply

Input Material Source	Approx. Quantity (Tonnes/Year)	Notes	References
Virgin resin from imports	262,000	Main feedstock	Ghana Plastic Country Brief (UNEP/ UNDP Ghana, 2020)
Local recyclates/granules	~45,000	Low integration	
Total Input to Manufacturing	~307,000	Blended use	
Output Destination	Quantity (Tonnes/Year)	Notes	
To local distribution/retail	~152,000	For domestic sale (packaging, bags, etc.)	
To export (West Africa)	~100,000+	Dominated by large players	
Internal rejects/waste	~10,000–15,000 est.	Sent to informal recyclers or discarded	

Most domestic plastic production in Ghana is geared toward meeting local packaging demands and supplying products for regional export, particularly within West Africa. The sector remains heavily reliant on virgin resins, which dominate material inputs, while the use of recyclates or reprocessed granules is limited and often unstable. Although production waste is generally unrecorded in official data, it is believed to flow primarily into informal recycling channels or landfill sites.

However, findings from a recent industry survey reveal important insights into waste management practices among manufacturers. Out of 53 firms surveyed, 52 confirmed generating production waste, indicating that such waste is nearly universal across the sector. Among these, 31 firms reported reusing the waste internally, while 33 indicated selling it to recycling companies. These responses suggest that approximately 90% of production waste is either reused within the same facility or directed to external recyclers. Despite this promising level of material retention, the sector still lacks the infrastructure and policy support needed to efficiently reintegrate recyclates into mainstream production processes.

Distribution/Retail: This stage captures the movement of finished plastic goods—whether produced locally or imported—into the domestic market for consumer access.

- **Distribution/Retail:**

This stage captures the movement of finished plastic goods—whether produced locally or imported—into the domestic market for consumer access. It includes wholesalers, direct-to-consumer supply, and depots managed by large manufacturers. Finished plastic products (packaging, consumer goods) move through wholesalers and retailers. This stage adds minimal direct waste or emissions aside from transport fuel use and some secondary packaging. (Some transport packaging like stretch wrap or damaged goods (~5 kg/ton) may be discarded here, contributing slightly to waste.) Overall, material flows largely pass through to consumers. Table 2 shows that material flows from manufacturing, import, through to distribution/retail.

Ghana's plastic manufacturing sector operates primarily through a direct distribution model, wherein most producers supply finished plastic products directly to final consumers or retailers via on-site sales outlets and dedicated distribution depots. This system bypasses intermediary wholesalers and facilitates closer relationships with end users (GCB Strategy & Research Dept, 2022). The sector's geographic distribution infrastructure is concentrated in key urban centers—Accra, Kumasi, and Takoradi—which function as strategic hubs for nationwide movement of plastic products. These cities host most manufacturing depots and serve as redistribution points for products destined for smaller towns and rural markets (GCB Strategy & Research Dept., 2022).

Informal retail channels play a significant role in plastic distribution, particularly in the sale of low-cost plastic packaging, shopping bags, sachets, and household containers. These items are predominantly sold by market vendors and small-scale traders across open markets, roadside stalls, and informal retail zones. The widespread presence of these channels contributes to high plastic consumption rates but complicates efforts to track post-use plastic flows (UNDP Ghana AccLab, 2023). Additionally, a substantial portion of locally manufactured and imported plastic products is consumed by institutional and commercial bulk users, including construction firms, mining companies, telecommunication operators, and agribusinesses. These sectors rely heavily on plastic products such as pipes, containers, and packaging materials for their operations, making them critical demand drivers within the domestic plastic economy (GCB Strategy & Research Dept., 2022).

Table 3- Flow of plastic distribution

Source	Destination	Estimated Flow (Tonnes/Year)	Notes	Source
Local Manufacturers → Distributors/ Retail	Domestic market (Ghana)	~152,000	Includes films, containers, packaging, etc.	Ghana Plastic Manufacturers Association. (2022)
Imports → Distributors/ Retail	Domestic market	~233,000	Includes products from China, India, Europe	The plastics industry in Ghana (2022)
Total Distribution Volume		~385,000	Over half goes into household and commercial consumption	

- **Consumption/Use:**

Plastic consumption in Ghana spans a wide range of activities across household, commercial, industrial, and institutional domains. At the household level, plastic products are deeply embedded in everyday life. Common uses include plastic packaging for food and beverage, groceries, shopping bags, sachet water packaging, and a variety of household containers such as basins, buckets, and storage boxes. The affordability, durability, and lightweight nature of plastics make them the material of choice for many domestic needs (UNDP Ghana Act lab plastic, 2023). In the commercial sector, plastics play a vital role in food services, particularly for takeaway packaging and disposable utensils. They are also extensively used in retail packaging, ensuring the safe and attractive presentation of products, and in industrial packaging, protecting materials during transportation and storage. Additionally, plastics are critical components in construction activities, especially for piping, insulation, and water storage solutions.

Common uses include plastic packaging for food and beverage, groceries, shopping bags, sachet water packaging, and a variety of household containers such as basins, buckets, and storage boxes.

The industrial and institutional sectors equally depend on plastics for specialised applications. Mining operations utilise heavy-duty plastic components for material handling and storage, while agricultural enterprises employ plastic mulch films to enhance crop yields and reduce water loss. In telecommunications, plastics are essential for insulating cables and equipment.

The healthcare sector also relies heavily on plastics, particularly for medical disposables such as syringes, IV bags, and personal protective equipment (PPE). Players in the informal sector, who are recognised for their critical role in plastic waste collection, confirmed the major material hotspots identified in our survey. Respondents were asked to identify the major material hotspots for plastic waste generation. Markets and commercial areas ranked highest, with 180 out of 300 respondents citing them as significant hotspots. This was followed by residential areas, identified by 140 respondents, and then industrial areas, which received comparatively fewer mentions. These findings align with the types of plastics commonly used within these consumer categories. Markets and commercial centres typically rely heavily on single-use plastics, such as shopping bags, food wrappers, and sachet water pouches, for packaging and daily transactions, contributing to their prominence as critical nodes of plastic waste generation.

The lifespan of single-use plastics, such as carrier bags, sachet water pouches, and food wrappers, is extremely short, often limited to minutes or a few hours of use. As a result, the frequency at which these items enter the post-consumer waste stream is significantly higher compared to durable plastic products. This rapid turnover of single-use plastics contributes disproportionately to Ghana's growing plastic waste challenge, as highlighted in national action plans and environmental audits. Ghana National Plastic Action Roadmap (2021) emphasized that single-use items account for a high volume of daily waste input into Ghana's solid waste system. Similarly, UNDP AccLab Ghana (2023) noted the pervasive use of single-use plastics, particularly sachet water bags and shopping bags, with short functional lifespans leading to immediate waste generation. For each 1 tonne of plastic entering use, essentially 1 tonne will exit as waste (with a time lag that is often just days or weeks for packaging). The use stage itself consumes little to no energy or water related to the plastic (aside from any washing or heating by the consumer which is outside the product system). The key flow here is the generation of post-consumer plastic waste – roughly 1,000 kg per 1,000 kg of product, eventually requiring management.

Table 4-Consumption Flow Summary

From	To	Estimated Flow (Tonnes)	Source
Distribution	Household/Commercial/ Industrial Consumption	~385,000	NPAP Ghana Action Roadmap (2021) + Plastics Industry Report (2022)
Consumption	Collection/Leakage	~400,000 (post-use plastics generated annually)	

Plastics entering the consumption stage in **Ghana** originate primarily from two sources: locally manufactured **products** and **finished goods.**

Plastics entering the consumption stage in Ghana originate primarily from two sources: locally manufactured products and imported finished goods. An estimated **152,000 tonnes** of plastic products produced domestically flow into the domestic retail and commercial markets annually, while approximately **233,000 tonnes** of imported plastic goods, ranging from packaging materials to household containers, are consumed nationwide. Together, these sources result in a total estimated consumption volume of **385,000 tonnes** per year. After use, plastics transition into the post-consumer phase, where they either enter the collection system (both formal and informal) or leak into the environment through littering, open dumping, or uncontrolled disposal. Recent national studies, including the Ghana National Plastic Action Partnership (NPAP) Roadmap and the Performance Audit Report on Plastic Waste Disposal, reveal that Ghana generates between **840,000 to 1.1 million tonnes** of plastic waste annually. This figure exceeds the immediate consumption estimates, suggesting significant stockpiling of plastics within households and businesses, delayed disposal practices, and potentially underreported imports or informal production flows. These dynamics complicate efforts to accurately account for plastic flows and emphasise the need for robust data systems and targeted interventions to manage post-consumer plastic waste effectively.

Ghana generates between **840,000 to 1.1 million tonnes** of plastic waste annually.

Of this, approximately **50% to 60%** is collected by a combination of formal waste management services and informal sector actors (waste pickers and aggregators).

- **Collection:**

Ghana generates between 840,000 to 1.1 million tonnes of plastic waste annually (NPAP, 2021; Auditor-General, 2023). Of this, approximately 50% to 60% is collected by a combination of formal waste management services and informal sector actors (waste pickers and aggregators). However, collection does not necessarily imply recycling. Ghana's waste collection systems capture only a portion of the plastic waste. Collected plastics follow multiple pathways: while **9% to 12%** of the total plastic waste eventually reaches recycling facilities (UNDP Ghana, 2023; World Economic Forum, 2021; Performance Audit Report, 2023), a substantial share is diverted to landfills, subjected to open burning, informally downcycled into lower-value products, or lost through environmental leakage into rivers, drains, and coastal ecosystems (NPAP, 2021; World Economic Forum, 2021).

Total collection (including that sent to landfills/dumps) is higher, but still insufficient because significant volumes remain uncollected. Studies indicate that about 45–52% of plastic waste is not collected by any service and thus often leaks into the environment (mepprogramme.org/iucn.nl). The informal sector—including waste pickers, itinerant buyers, and small-scale aggregators—plays a pivotal role in Ghana's plastic waste collection. Estimates suggest that between 3,000 and 5,000 informal waste pickers operate in Accra alone, managing approximately 50% of the city's daily waste without formal recognition or compensation. Nationwide, these workers are instrumental in recovering plastics from streets, dumpsites, and neighbourhoods, often serving as the primary collectors in areas underserved by formal waste management systems. Their contributions not only mitigate environmental pollution but also provide livelihoods for marginalised populations. However, the lack of formal integration and support structures limits their efficiency and exposes them to health and safety risks (weforum.org). In our survey of 300 informal actors, many described gathering plastic from "dumpsites, public places and water bodies" and from neighbouring households.

Studies indicate that about **45–52%** of plastic waste is not collected by any service and thus often leaks into the environment

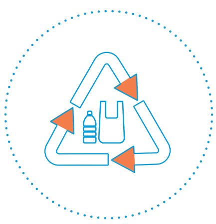
They typically collect by hand or with tricycles, receiving little external support. Overall, we estimate that out of 1 tonne of plastic waste generated, roughly **0.5 tonne** is collected (either by formal services or informal workers) while **0.5 tonne** remains uncollected and free to leak. Collected plastic waste in Ghana is often mixed with organic and non-recyclable materials, which significantly reduces its quality and recyclability. As a result, only a limited fraction of the total collected plastic waste is effectively routed to recycling streams, with the remainder either rejected during sorting, diverted to landfills, or lost through open dumping and burning. The remainder is transported to open dumps, landfills or incineration sites (or even openly burnt during "disposal"). Table 5 provides the total waste collected by both formal and informal systems.

Table 5: Waste generation and collection

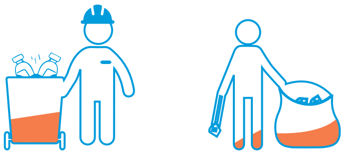
Source	Estimated Flow (Tonnes/Year)	Notes	References
Total Plastic Waste Generated	~840,000-1,100,000	Variations in these figures reflect both differences in methodology and the increasing plastic consumption	NPAP, (2021) & UNDP Ghana, (2023)
Total Collected Plastics	~450,000	~50-60% of generated waste	NPAP, (2021) & UNDP Ghana, (2023)
• Formal Sector Collection	~294,000	About 35% of generated plastics	NPAP, (2021) & UNDP Ghana, (2023), Auditor-General Report (2023)
• Informal Sector Collection	~92,000	About 11% recovery from informal waste pickers	NPAP, (2021) & UNDP Ghana, (2023)
• Dumpsite Recovery	~25,000	About 3% estimated recovery through scavenging at landfills/dumps sites	UNDP Ghana (2023); Accra Plastic Pilot (2022)
• Collected and processed for recycling	~82,000	About 20% of total collection reaches recycling	(NPAP Ghana, 2021; UNDP Ghana, 2023)
Uncollected / Leaked Plastics	~440,000	51% mismanaged plastics	NPAP, (2021) & UNDP Ghana, (2023)

Out of the approximately 450,000 tonnes of plastic waste collected annually in Ghana, only about 82,000 tonnes or roughly 20% are collected and processed for recycling (NPAP Ghana, 2021; UNDP Ghana, 2023). Most plastics collected by the formal sector are directed towards general waste streams, including landfill and open dumping, with minimal segregation for recycling. In contrast, informal sector actors focus predominantly on collecting high-value plastics for resale to recyclers, although sorting inefficiencies and contamination still limit the recycling potential.

Out of the approximately **450,000 tonnes** of **plastic waste** collected annually in **Ghana,** only about **82,000 tonnes** or roughly **20%** are collected and processed for recycling



Plastic waste collection in Ghana is characterised by a dual system that combines both formal and informal actors.

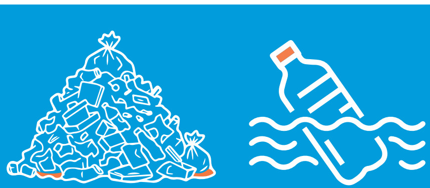


The formal sector, comprising municipal authorities and private waste contractors, operates alongside a vibrant but often overlooked informal sector made up of waste pickers and small-scale aggregators. These informal actors play a dominant role in salvaging recyclable plastics, although they often do so with little formal recognition, regulation, or support (Accra plastic pilot, 2022). A critical limitation of the current system is the low level of source segregation by the waste generators, so most plastics are collected mixed with other waste streams, leading to material contamination that significantly reduces recycling potential (UNDP Ghana MEST Policy recommendation). Moreover, collection rates vary considerably by location: urban centres like Accra and Kumasi exhibit relatively higher collection coverage, while rural and peri-urban areas experience minimal to no organised collection services . Despite these efforts, several challenges persist. Coverage remains low, with only about 50% of generated plastic waste collected nationwide (NPAP, Ghana Action RM). Insufficient segregation at the source continues to undermine material quality and recycling outcomes.

This was further confirmed during the survey, where respondents reported high levels of material rejection at collection and sorting points due to contamination. Out of the 300 informal sector players surveyed, 255 respondents (85%) reported generating additional waste during the collection process. This secondary waste generation was largely attributed to the fact that plastics collected or received are frequently mixed with other types of solid waste, including organic matter, contaminated packaging, and non-recyclable materials. Such contamination not only renders a portion of the plastics unsuitable for recycling but also increases the time, effort, and cost associated with sorting and cleaning, thereby imposing significant operational burdens on informal collectors. Respondents estimated that between 5% and 10% of the materials handled in each collection cycle are ultimately discarded as unusable waste due to contamination. This highlights a critical inefficiency within the current collection system, stemming from the lack of source segregation and limited access to clean sorting environments.

Besides inadequate collection systems, a significant portion of plastic waste in Ghana is either openly burned or leaks into the environment through uncontrolled pathways. Open burning was a notable practice among the informal sectors. Open burning remains a common disposal method, especially in peri-urban and rural areas where municipal services are limited. This practice releases toxic emissions, including dioxins and furans, which pose severe health and environmental risks, such as respiratory illnesses and long-term exposure to carcinogens (Anokye et al, 2024). Respondents were further asked how the plastic waste generated from their activities was managed. The options provided included sending waste to a landfill, burning, open dumping, selling to other players, and leaving the waste unmanaged. Among these, sending waste to a landfill emerged as the most common practice, reported by 46% of valid responses. This was followed by burning (39%), selling to other actors in the value chain (26%), leaving the waste unattended (24%), and dumping in open spaces (17%). These findings were further corroborated through field observations, where evidence of open burning, such as ash residues and active burn sites, was documented across several operational zones. Although landfilling appears to be the dominant formal practice, burning remains a widespread informal method, especially in areas lacking access to proper disposal services.

Many respondents acknowledged that while they rely on burning, they are often reluctant to admit it openly due to its illegality and environmental risks, including the release of harmful toxins. The normalisation of such informal and environmentally harmful disposal methods highlights persistent gaps in access to affordable, regulated waste management options, especially for actors operating at the margins of the formal system. In addition to air pollution, plastic leakage into water bodies has become a widespread and visible challenge.



It is **estimated** that approximately **9.5%** of all **plastic waste** generated in **Ghana**, equivalent to **80,000 tonnes per year**, leaks directly into **water bodies,** including **rivers, lagoons, streams,** and **coastal waters.**

It is estimated that approximately 9.5% of all plastic waste generated in Ghana, equivalent to 80,000 tonnes per year, leaks directly into water bodies, including rivers, lagoons, streams, and coastal waters. The main drivers include deliberate dumping into waterways, improper disposal near drains and stormwater systems, and unmanaged urban runoff during the rainy season. A striking example is Cape Coast's Fosu Lagoon, located near Siwdu, a zone known for vehicle repair workshops, scrap yards, and artisanal activities. The lagoon has been repeatedly identified as a plastic pollution hotspot, where significant volumes of plastic waste accumulate due to nearby economic activities and inadequate waste disposal infrastructure (Baffour-Awuah, 2014).

The **Korle Lagoon** has long been one of the most **polluted water bodies** in **Ghana.** It receives l**arge volumes of plastic**

and **other solid waste** through the **Odaw River** and **multiple stormwater drains** from surrounding **neighbourhoods.**

In Accra, Ghana's capital, the situation is more dire. The Korle Lagoon has long been one of the most polluted water bodies in Ghana. It receives large volumes of plastic and other solid waste through the Odaw River and multiple stormwater drains from surrounding neighbourhoods. The Korle Lagoon Ecological Restoration Project was even initiated in the early 2000s due to the lagoon's severe pollution. Today, plastics continue to be a major component of waste entering the lagoon, exacerbated by urban flooding and poor solid waste management practices (World Bank, 2020; UNDP Ghana, 2023). These represent just a few of the many critical leakage points for plastic waste across the country.

- **Sorting & Pre-Processing:**

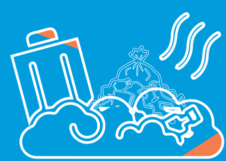
In Ghana, the sorting, pre-processing and aggregation stages involve the manual or semi-mechanised separation, cleaning, and preparation of collected plastic waste for transportation to designated offtakers, recyclers and middlemen (agents). This stage is particularly critical due to the country's low levels of source segregation and high rates of waste contamination, which significantly reduce the quality and recyclability of collected plastics. The effectiveness of sorting operations ultimately determines whether more or fewer plastics are diverted from landfills, open dumping, and environmental leakage, or are instead lost from the value chain due to material rejection or infrastructural limitations. In the absence of widespread infrastructure such as Material Recovery Facilities (MRFs) or decentralised sorting hubs and collection centres most sorting activities are undertaken by informal waste workers and small-scale aggregators operating in unregulated conditions, often without proper safety equipment or mechanisation. Table 5 shows the material flows at this stage.

Table 5: Sorting and pre-processing flows

From	To	Estimated Flow (Tonnes)	References
Collection	Sorting	~250,000	NPAP Ghana Action Roadmap (2021); UNDP Ghana Plastic Reports (2023)
Sorting	Recycling	~82,000	World Economic Forum (2021); NPAP Ghana Action Roadmap (2021)
Sorting	Rejected/Disposed	~170,000	Performance Audit Report on Plastic Waste Disposal (2023); UNDP Ghana (2023)

Out of the approximately **450,000 tonnes** of plastic waste collected annually in **Ghana**, only about **250,000 tonnes,** representing roughly **55%** of the collected volume, proceed to sorting and pre-processing facilities.

The remaining plastics are diverted along other pathways, including direct landfilling, open burning, and secondary leakage during aggregation and transportation.



Out of the approximately **450,000 tonnes** of plastic waste collected annually in Ghana, only about **250,000 tonnes**, representing roughly **55%** of the collected volume, proceed to sorting and pre-processing facilities (NPAP, 2021; UNDP Ghana, 2023). The remaining plastics are diverted along other pathways, including direct landfilling, open burning, and secondary leakage during aggregation and transportation. This significant drop between collection and sorting shows another source of inefficiencies in waste handling systems, as a substantial portion of collected plastics remain in mixed waste streams or are improperly managed before they can be separated for potential recycling or material recovery. Accordingly, for every 250,000 tonnes of collected plastic waste, only ~32% (~82,000 tonnes) is recycled. The remaining 68% (~170,000 tonnes) is lost from the recycling loop, either because it's too dirty, economically unattractive, or technically unrecyclable.

This high rejection rate (~68%) highlights the critical inefficiency at the sorting and pre-processing stage and underscores the importance of better source separation, improved infrastructure for washing/ sorting, and market development for lower-value plastics. At the baseline, plastic sorting remains highly informal and labour-intensive: Most sorting is done by individuals or small aggregators with minimal equipment. Plastics often arrive heavily contaminated due to a lack of source separation. Waste flows through multiple actors, increasing logistical costs and reducing value. Informal aggregators and a limited number of collection hubs focus primarily on extracting high-value plastics, such as PET bottles and HDPE containers, which can be resold to recyclers. In contrast, lower-value plastics, including thin films, multilayer sachets, and contaminated food wrappers, are typically left unsorted and eventually discarded.

Field data suggest that a substantial proportion of the collected plastic estimated at 30% or more is rejected during the sorting process due to heavy contamination or lack of market value. For instance, an informal aggregator in Tamale reported that dirty polyethylene bags are usually piled up at a recycling facility because they could not be processed. Given the manual nature of sorting, often using rudimentary tools and minimal protective equipment, operational capacity is severely limited. As a result, out of approximately 0.5 tonnes of plastic collected per tonne generated, only about 0.35 tonnes proceed as input into recycling, while ~0.15 tonnes are rejected as residue requiring disposal. This reflects both a bottleneck and an opportunity in Ghana's circular plastic economy, highlighting the urgent need for investment in building local technologies and simple sorting equipment, localised recovery infrastructure, and end-market development for a broader range of plastic types. This highlights the need for alternative solutions and stronger measures to disincentivise the continued use of single-use plastics and promote more sustainable material choices.

Waste generation at the sorting and pre-processing stage in Ghana is a significant but often underreported component of the overall plastic waste flow. This is largely due to the highly informal and labour-intensive nature of sorting activities, which are primarily carried out by individual waste pickers, small-scale aggregators, and informal collection hubs using rudimentary tools and minimal infrastructure. Most sorting occurs without access to mechanised equipment such as balers, shredders, or washing units, making the process inefficient and inconsistent. As a result, a substantial volume of the plastics handled during sorting, particularly those that are heavily soiled, food-contaminated, or made of low-value polymers like multilayer sachets or black plastics, are rejected and discarded. These rejected materials are often left behind at collection points, open dumps, or at the gates of recycling plants, contributing further to environmental leakage and disposal burdens.

Based on field observations and stakeholder interviews, it is estimated that between **25%** and **35%** of collected plastic waste is lost during the sorting stage

Based on field observations and stakeholder interviews, it is estimated that between 25% and 35% of collected plastic waste is lost during the sorting stage, primarily due to contamination and the lack of viable end-markets for certain plastic types. For example, an informal sorter in Tamale reported that "dirty polyethylene bags were left behind at the recycling plant" because they could not be accepted. This reject stream, also referred to as residual waste, adds pressure to the waste management system, as it typically ends up in landfills, burned at open sites, or dumped into the environment. However, it was also observed that plastic waste generated during sorting is gradually declining, not because of improvement in infrastructure but largely due to increased awareness among collectors, aggregators, and households about which plastics have economic value. The survey further explored the main causes of waste generation during sorting and pre-processing. Respondents highlighted several key factors. The most significant cause identified was the lack of aggregation and sorting infrastructure, cited by 56.3% of valid responses. This was closely followed by poor collection systems, reported by 53.7% of respondents, which often result in highly contaminated mixed waste streams. Another major barrier was the lack of specific infrastructure or appropriate technology to process certain types of plastics, such as multilayer films and contaminated packaging, highlighted by 39.5% of respondents.

Interestingly, the knowledge gap among collectors regarding plastics with economic value was the least cited factor, at 23.4%, suggesting a gradual improvement in awareness levels among waste pickers and aggregators. Field observations supported this trend of growing selectivity. For example, one respondent shared that buyer of aggregated materials would often immerse samples of the plastics in water to test their density and quality before allowing a truckload to enter the recycling yard. This practice reflects a market-driven quality control mechanism, indicating that while infrastructural deficiencies remain a major bottleneck, collector knowledge and material handling practices are slowly improving in response to buyer requirements and recycling market demands.

The growing awareness about plastic types and associated economic values has led to more selective collection practices. In some cases, collectors now refuse to pick certain plastics altogether, unlike earlier practices where anything plastic was collected first and sorted later. As a result, more unwanted or non-recyclable materials are being filtered out at the source, thereby reducing the volume of waste discarded during pre-processing. While this trend reflects a positive shift toward efficiency, it also underscores the need for broader education, market alignment, and improved sorting infrastructure to fully leverage this behavioural change and reduce material loss across the plastic value chain.

As awareness grows, particularly at the community level, households and pickers are becoming more selective, focusing on plastics that can be resold or reused within the value chain. This behavioural shift is also a result of improved linkages between aggregators, recyclers, and manufacturers, whereby aggregators receive clear input specifications such as preferred polymer types, colours, and levels of cleanliness from downstream actors. As a result, materials that do not meet those requirements are increasingly excluded at the point of collection. Consequently, plastic sorting practices across Ghana are increasingly shaped by the nature of recycling technologies available, as well as the processing preferences of buyers within the value chain. Where advanced recycling or washing infrastructure is limited, collectors tend to avoid low-grade or hard-to-recycle plastics. This dynamic reinforces the need for technology-driven standards, transparent market information, and localized training to ensure that sorting efforts align with evolving market demands and promote greater material recovery across the plastic value chain.

Field survey findings also revealed important insights regarding the off takers of aggregated plastic materials at the sorting and pre-processing stage. Most sorted plastics were sold to middlemen or brokers, who accounted for 57.2% of the valid responses. These middlemen typically purchase materials in bulk from informal collectors and aggregators and resell them either to local recyclers or export brokers. Recycling companies themselves were identified as direct off takers in 34.4% of the cases, usually sourcing higher-value plastics such as PET and HDPE directly from aggregators or collection hubs. Additionally, a smaller share 8.4% of aggregated plastics was purchased by local businesses engaged in repurposing and upcycling, such as artisans making woven mats, plastic lumber, or handcrafted goods.

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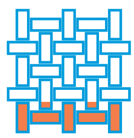
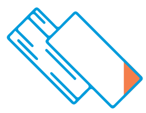


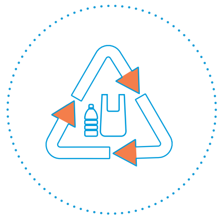


These offtake pathways are important not only for understanding end destinations of sorted plastic but also for tracking material flows and informing circular economy interventions. However, field observations also suggest the existence of a growing underground economy of plastic off-takers who operate informally and often prefer to remain anonymous.

These actors typically work through intermediary agents, who serve as the main point of contact with aggregators and informal collectors. As a result, the true end-users of the materials are often obscured, making it difficult to map value chain linkages, enforce quality standards, or monitor compliance with environmental and regulatory frameworks. This practice points to the urgent need for greater transparency and formalisation within the offtake market to support traceable, responsible, and inclusive recycling systems. For example, during the field survey, several recyclers, manufacturers, and upcyclers refused to disclose operational information, despite field assistants presenting official introductory letters. Notably, some manufacturing companies, particularly those owned by Chinese, Lebanese, and Taiwanese nationals were among those reluctant to share data, citing confidentiality concerns or displaying distrust toward data collection efforts. This underscores the opacity within segments of the plastics value chain and highlights the barriers to achieving a fully accountable and circular plastics economy in Ghana.

- **Recycling/Recovery:**

Recycling and recovery represent the final stage of material transformation in Ghana's plastic value chain, where selected plastics are either reprocessed into secondary raw materials or, in limited cases, repurposed or downcycled into new products. This stage is crucial for closing the loop in the circular economy, but it remains significantly constrained by infrastructure, contamination, and market dynamics. The recycling stage in the baseline is very small relative to total flows. Only an estimated 5–10% of Ghana's plastic waste is actually recycled into new materials (NPAP, 2021, UNDP, 2023 iucn.nlweforum.org). Confirmed by field surveys, NPAP (2021), and UNDP (2023). Many manufacturers in Ghana still rely almost exclusively on virgin resin for production, with negligible integration of recyclates. For instance, one survey response indicated that many manufacturers in Ghana are still relying entirely on virgin resin, with "0%" use of recycled content in production, while just a small fraction (0.6%) is exported (NPAP (2021).



Only an estimated **5–10%** of **Ghana's plastic waste** is actually **recycled** into new materials

A few enterprises do specialise in recycling (e.g. turning plastic waste into pellets or products like baskets), but their scale is small compared to the waste generation. In our private sector survey (70 companies), only a handful identified as recyclers, and even they face limitations – one recycler emphasized the need for "processing plastics that cannot be processed by us" currently, implying technology gaps for certain plastic types. Thus, of the ~0.35 tonne that reaches recycling facilities per tonne waste, a portion is successfully recycled (perhaps ~0.1 tonne, i.e. 10%), and the remainder (e.g. dirty or non-recyclable fractions) is again discarded. Recycled output (e.g. reprocessed pellets or flakes) re-enters the value chain as secondary input – but due to the small quantities, circular material use (fraction of recycled material in new products) is extremely low (likely <2%smepprogramme.org of material inputs overall). In effect, over 98% of plastic inputs are virgin, reflecting a very linear system.

Recycling in Ghana is primarily mechanical, involving washing, shredding, melting, and pelletizing plastics to be used in new products such as chairs, buckets, or pipes. A small number of mid-sized recyclers operate in cities like Accra, Kumasi, Sunyani, Tema and Takoradi, while numerous small-scale operations and workshops exist throughout the country, particularly in industrial zones and informal settlements. Most recyclers depend heavily on informal collectors and aggregators for their feedstock. According to field interviews, 70–80% of recyclable plastics are sourced through informal channels.

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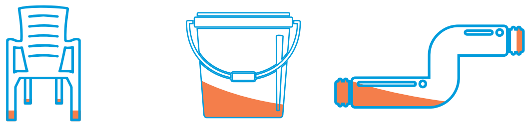


While formal waste management systems such as municipal services and private waste contractors do exist, they play a relatively limited role in collecting plastics suitable for recycling. Instead, recycling companies depend heavily on informal labour, particularly waste pickers and small-scale aggregators, to supply clean and sorted plastic feedstock. This informal supply chain is vital for maintaining material flow but also presents significant challenges in traceability and regulation. Because plastics are sourced through unregulated and highly fragmented pathways, it becomes difficult to track material flows, verify the quality and safety of the collected plastics, and monitor the working conditions or environmental practices of those involved. The plastics delivered to recycling firms typically include (Table 6) clean PET bottles, HDPE containers, and, to a lesser extent, LDPE films. Meanwhile, lower-value or contaminated plastics, such as multilayer sachets, polystyrene, or food-soiled wrappers, are often rejected. Table 6 shows the flow and performance metrics.

Table 6: Flow of materials

Flow Description	Estimated Volume (Tonnes/Year)	Notes/Data sources
Plastics reaching recycling stage	~82,000	From sorting and pre-processing
Successfully recycled	~75,000	Based on estimated 5–10% process losses
Lost during recycling (residue)	~5,000	Contaminated or unrecoverable waste
Downcycled applications	Significant share	Non-food packaging, lumber, mats, etc.

This means that only about 9.5% of the estimated 840,000 tonnes of plastic waste generated annually is effectively recycled into new materials. There are several inefficiencies that account for this. Data from the field survey shows that the number one factor is contamination due to a mixture of non-recyclable plastics (66%). Many recyclers report high levels of unusable materials due to organic waste such as food residue mixed with plastics (58.6%). Infrastructure Gaps-few centralized recycling hubs and limited access to industrial-scale washing, sorting, or extrusion equipment also recorded valid percentage of 11.4%.

Our field survey, interviews and rapid material assessment also revealed that at the recycling and recovery stage in Ghana, different types of plastics are sorted, processed, and reintroduced into the economy based on their market value, recyclability, and available technologies. The recycling flow is largely dictated by the type of polymer and the specific requirements of local industries. Table 7 presents an overview of the types of plastic materials that ultimately reach recycling firms in Ghana as feedstock, based on field survey data and observed sorting practices. The table highlights the primary polymers processed, the typical source products, pre-processing methods applied (e.g., shredding, pelletizing, agglomeration), and their common end uses. It also distinguishes between plastics with strong local market demand and those that are either downcycled, exported, or rejected due to technical or economic limitations.

Table 7: Overview of the Recycled Plastic Types

Plastic Type	Common Sources / Uses	Pre-Processing Method	End Use (Example Products)	Valid % (Survey)
PET (Polyethylene Terephthalate)	Water bottles, beverage packaging	Sorting by colour, Shredding	Foam for pillows, mattresses	22.9%
PP (Polypropylene)	Buckets, chairs, bottle caps, food containers	Shredding, Pelletizing	Household items, chairs, packaging	64.3%
HDPE – Film	Sachet water bags, flexible packaging	Sorting by colour, Agglomeration	Shopping bags, film wraps	68.6%
HDPE – Hard	Gallons, detergent bottles, water pipes	Shredding, Pelletizing	Containers, water tanks, piping	67.1%
LDPE (Low-Density Polyethylene)	Shopping bags, yogurt sachets, bottle wraps	Agglomeration, Pelletizing	Shopping bags, mats, upholstery	60.0%
LLDPE (Low Linear Density PE)	Airport wraps, transparent films	Agglomeration, Pelletizing	Shoe soles, curtain lines	52.9%
PS (Polystyrene)	Cups, fridge liners, food trays	Shredding	Exported or downcycled (limited local use)	10.0%

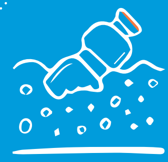
Plastic Type	Common Sources / Uses	Pre-Processing Method	End Use (Example Products)	Valid % (Survey)
PVC (Polyvinyl Chloride)	Pipes, windows, medical tubing	Rarely processed (toxic issues)	Not accepted by most recyclers in Ghana	14.3%
ABS (Acrylonitrile Butadiene Styrene)	Electronics, fridge parts, automotive components	Shredding	Export to foreign recyclers	14.6%
FRs (Flame Retardant Plastics)	TV casings, printer housings, electronics	Shredding	Specialized uses or exported (limited local uptake)	15.7%

The most processed plastics among surveyed actors are HDPE (Film and Hard), PP, and LDPE, each appearing in over 60% of responses. Plastics such as PET and LLDPE also feature prominently but to a lesser extent. Meanwhile, materials like PS, PVC, ABS, and FRs are less frequently handled, either due to market limitations, technical constraints, or toxicity concerns. The survey findings indicate that Ghana's recycling system is heavily concentrated on a narrow range of plastics, primarily HDPE (Film and Hard), PP, and LDPE, each processed by over 60% of respondents. While PET and LLDPE also feature, albeit less prominently, materials such as PS, PVC, ABS, and flame-retardant plastics are rarely handled due to market limitations, technical challenges, and toxicity concerns. This concentration highlights a technological and market gap within the recycling sector, where the inability to process a broader spectrum of plastics leads to high residual waste rates, increased environmental leakage, and missed opportunities for achieving full material circularity. Furthermore, dependence on a few plastic types makes the sector vulnerable to price fluctuations and market shocks. Addressing these gaps will require investment in advanced recycling technologies, market development for difficult plastics, and policies that promote diversification and inclusion of currently unrecycled materials into the circular economy.

- **Disposal & Leakage:**

This stage captures the end-of-life trajectories for plastics and associated waste that is either uncollected due to limited coverage of waste management companies or collectors, collected but rejected during sorting or processing, or lost due to transportation inefficiencies, including accidents and inadequate road infrastructure. It also encompasses plastics rejected at recycling or recovery facilities, reflecting systemic material losses across the plastics value chain and underscoring critical leakage points that undermine circular economy efforts. It includes plastics that are disposed of in landfills, openly dumped, burned, or leaked into the environment through stormwater systems, rivers, and coastal areas.

In **Ghana**, losses through **landfills, open dumping, burning,** or **leakage into the environment** through storm drains and rivers reflect the largest material loss point in the plastic value chain.



In Ghana, losses through landfills, open dumping, burning, or leakage into the environment through storm drains and rivers reflect the largest material loss point in the plastic value chain. The end-of-life fate for most plastics **(≈90–95%)** is disposal in some form either in official landfills, informal dumps, or outright leakage to the environment. Ghana has limited engineered landfill capacity; much waste ends up in uncontrolled dumps or is openly burned. The IUCN reports that aside from the 5% recycled, "the rest often ends up in the environment, is burnt or finds its way to a landfill"iucn.nl. Leakage to land and water is a severe issue: plastic waste clogs drain in cities and washes into rivers and the ocean.

Ghana is estimated to contribute nearly 1 ton of plastic to the ocean for every 1,000 tons mismanaged (coursesidekick.com). For our baseline MFA, we can approximate that per 1 tonne plastic waste generated: about 0.45 tonne leaks into nature (littered or burned in the open) and 0.50 tonne is disposed in dumps/landfills (managed, albeit often in suboptimal facilities), while only ~0.05–0.10 tonne is recycled. In short, material circularity is very low, and leakage is high, as illustrated by the flow diagram of the status quo.

Table 8: Baseline Flow estimates for disposal and leakages

Flow Description	Est. Volume (Tonnes/Year)	Notes	Source
Total plastic waste generated	~840,000-1.1m	Annual national generation figure across urban and rural settings	NPAP Ghana Action Roadmap (2021), Performance Audit on Plastic Waste (2023)
Plastics mismanaged	~440,000	Includes uncollected waste, open dumping, open burning, and leakage	Performance Audit on Plastic Waste (2023)
Landfilled / Openly Dumped	~250,000–300,000	Formal and informal dumpsites across cities like Accra, Kumasi, Takoradi	Ghana Plastic Country Brief (2020)
Burned (Informally)	~150,000	Widespread in areas with poor collection; ~39% of informal sector actors burn waste	Field Survey (2025); Accra Plastic Strategic Roadmap (2022)
Environmental Leakage	~80,000	Enters rivers, drains, lagoons and coastal areas (e.g., Ocean, Fosu Lagoon, Odaw river etc)	NPAP Ghana Action Roadmap; UNDP Ghana (2023)

Despite efforts to recover recyclable plastics, Ghana's plastic economy remains largely linear, with significant material loss occurring at nearly every stage. The only point in the value chain where plastics are least likely to end up in landfills is at the distribution or import stage, particularly in cases involving broken or damaged products. These plastics often new, unused, and uncontaminated, are quickly recovered by collectors and sold to recyclers due to their high quality and market value.

However, beyond this stage, almost all post-consumer processes including collection, sorting and aggregation, transportation, recycling, and recovery generate residual waste. This residual waste is typically disposed of via landfilling, open dumping, or burning, or it leaks into the environment through storm drains, rivers, coastal waters, and even remote forested areas. Recent studies by Choi et al. (2021) and Asare et al. (2024) have documented the alarming presence of plastic fragments in Ghana's virgin forests, underscoring how deeply embedded plastic pollution has become in natural ecosystems. From the survey, it was evident that almost all stakeholder groups including policy makers, collectors, aggregators, transporters, and recyclers identified urban storm drains, rivers, and coastal waters as the most common hotspots for plastic leakage. These areas serve as the final receptors of mismanaged plastics, particularly in urban centers where collection systems are overburdened or absent. Respondents also pointed to informal dump sites near wetlands, unregulated disposal in forest edges, and low-lying flood-prone communities as critical but often unaccounted-for leakage zones. In addition, abandoned construction sites, unlined open pits, and roadside gutters were highlighted as spaces where wind- or rain-driven plastics accumulate and eventually migrate into aquatic and terrestrial ecosystems.

Given the material flow data, a Sankey diagram is developed below:

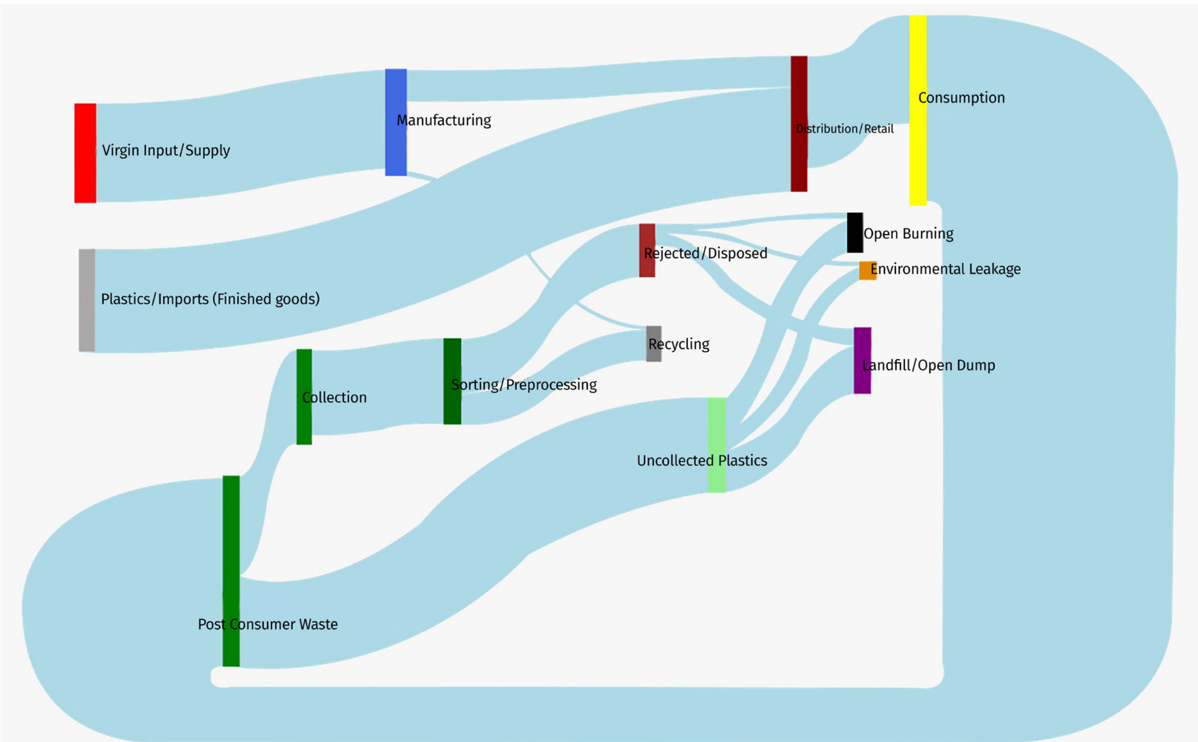


Figure 1: Sankey diagramme

The sankey was generated under the following conditions:

Ghana's plastic material flow under the assumption of 850,000 tonnes of post-consumer waste generation annually. Although import data provide lesser figures (233,000 tonnes/annum) probably due to customs classification limitations, approximately about **900,000 tonnes** of plastic materials (virgin inputs and imported finished goods) is believed to enter the economy yearly. Out of this, about **500,000 tonnes** are consumed domestically, while durable goods and underreported imports contribute to the build-up of material stocks and eventual waste generation. Post-consumption, Ghana generates an estimated 850,000 tonnes of plastic waste each year. Of this, **50%** is collected formally and informally, while the other **50%** remains uncollected, leading directly to environmental leakage.

Within the collected stream, about 90% reaches sorting facilities, but significant losses still occur during pre-processing. Only about 39% of sorted plastics are successfully recycled, with the remainder rejected to landfill, open burning, or environmental leakage. Importantly, the improved flow now introduces a feedback loop, representing approximately 20,000 tonnes/year of recycled plastics being reintegrated into manufacturing processes, reflecting growing but still modest circular economy practices in Ghana. Overall, the Sankey diagram highlights key systemic inefficiencies particularly the high rates of leakage and low recycling capture that must be addressed to accelerate Ghana's transition to a more circular plastics economy.

Key circularity indicators from this baseline mapping are poor: the Circular Material Use Rate (CMUR) – proportion of recycled materials in total inputs – is under 5%. The collection rate (waste collected vs. generated) may be on the order of 50–70%, leaving a large gap. The recycling rate (waste recycled vs. generated) is only ~5–10%iucn.nl. Consequently, the material recovery is low and retention time of plastics in the economy is short (often a single use cycle). Retention efficiency (how well materials remain in useful circulation) is very low: effectively, within a year of production, almost all plastic has exited use and only a slim margin gets a second life.

4.2 Baseline Performance Indicators (LCA Inventory)

The environmental footprint of the current plastics value chain was assessed across the 8 stages using a life-cycle approach. Table 9 presents an aggregated Life Cycle Assessment (LCA) inventory for the baseline, compiling energy use, water use, greenhouse gas (GHG) emissions, waste generated, material consumption, land use, and toxic emissions for each stage. Metrics are reported per functional unit of 1 tonne of plastic product passing through the entire value chain (from raw material production of 1 tonne of plastic to the end-of-life of that same tonne). "Totals" represent the cradle-to-grave impact for 1 tonne.

Table 9: LCA inventory for baseline

SN	Value Chain Stage	Energy Use (MJ)	Water Use (L)	GHG Emissions (kg CO_2-eq)	Waste Generated (kg)	Material Consumption (kg)	Land Use (m^2)	Toxic Emissions (kg)
1	Input Supply (Virgin)	~80,000	~200,000	~3,500	~0 (negl.)	~1,000 (petro-feedstock)	~0 (negl.)	~5 (chemical pollutants)
2	Manufacturing	~10,000	~1,000	~1,000	~50 (production scrap)	~1,000 (resin inputs)	~ 40,000 (factory land)	~2 (VOC/ fume emissions)
3	Distribution/ Retail	~200	~0	~15	~5 (packaging waste)	~5 (auxiliary materials)	~0	~1 (transport exhaust)
4	Use/Consumption	~0	~0	~0	~1,000 (post-use waste)	~0	~0	~0
5	Collection	~200	~0	~15	~0 (handled forward)	~0	~ 2,000	~1 (vehicle emissions)
6	Sorting/ Processing	~100	~100	~5	~150 (rejected residue)	~0	~ 4,000	~1 (dust, runoff)
7	Recycling	~700	~2,500	~70	~50 (residue / sludge)	~850 (waste input used)	~ 50,000 (negl.)	~5 (effluent, fumes)
8	Disposal (Dump/ Burn)	~50	~0	~1,500	~0 (end-of-life output)	~0	~500,000 (landfill area)	~10 (emissions, ash)
	Total (Life-Cycle per t)	~91,300	~203,600	~5,155	~1,255	~1,000	~2	~25

Normalized values (per tonne) allow identification of hotspots: for 1 tonne of plastics through the value chain. ***(Note: Values are approximate, derived from survey data and literature conversion factors. "Waste Generated" refers to process waste at each stage; the 1,000 kg of post-use waste in stage 4 eventually appears as outputs in stages 7–8. Material consumption here tracks new material input at each stage, hence 1,000 kg virgin in stage 1. Toxic emissions are non-GHG pollutants (air or water) emitted.)***

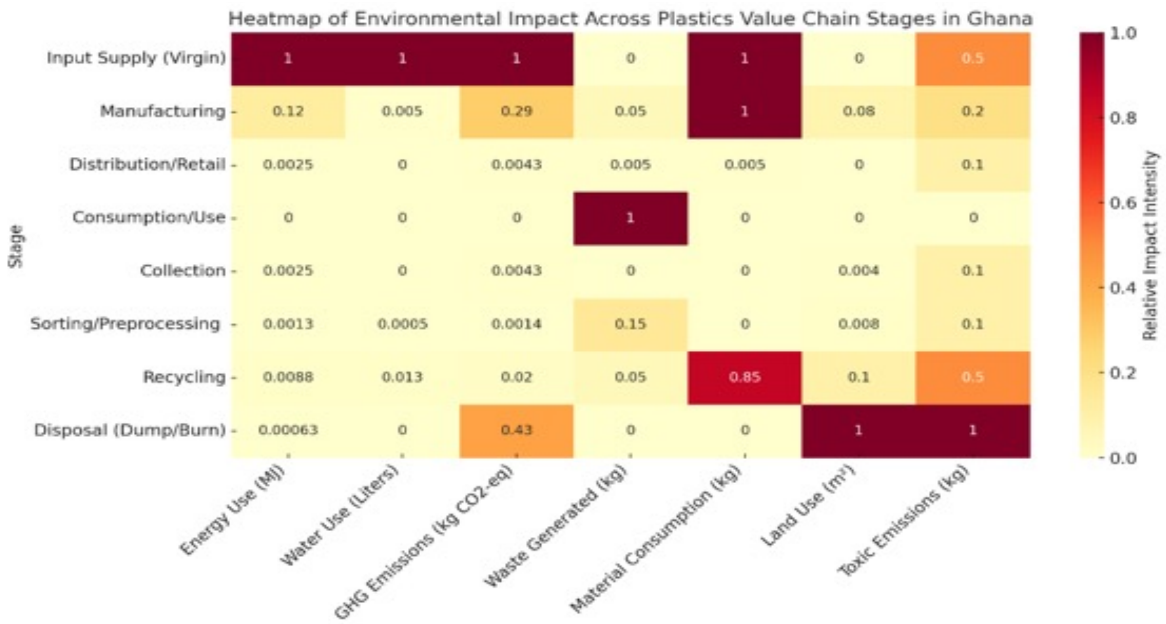


Figure 2: Heat map of environmental impact across stages

Several important observations emerge from these baseline LCA metrics and the heatmap:

1. **Upstream (Input Supply) dominates Energy, Water, and Carbon Footprints**
   The Input Supply stage—representing virgin resin production—remains by far the most energy- and carbon-intensive part of the life cycle. Producing one tonne of plastic resin typically requires around 80 GJ of energy (Nicholson et al., 2021) and emits approximately 3.5 tonnes of CO_2-equivalent (An et al., 2022). In the updated data, Input Supply accounts for ~80,000 MJ of the total ~91,250 MJ life-cycle energy, and ~3,500 kg of the total ~6,100 kg CO_2e emissions — confirming that virgin plastic carries a massive embedded carbon footprint even before it enters Ghana. Any strategy that reduces virgin resin demand (such as increasing recycled content or substituting alternative materials) would yield significant upstream energy and emissions savings.

2. **Virgin Plastic Production is Water-Intensive**
   The LCA also reaffirms that virgin resin production is highly water-intensive. The Input Supply stage shows ~200,000 liters of water usage, consistent with literature estimates of 180–200 liters per kilogram of plastic produced (Responsible Water Scientists, 2021). This water footprint includes both process and cooling water in petrochemical plants. In contrast, downstream stages (manufacturing, recycling, consumption) use minimal water, emphasizing that addressing upstream impacts is critical for water sustainability.

3. **Post-Consumer Waste and Open Burning are Major Downstream Hotspots.**
   The Disposal stage exhibits substantial environmental impacts: GHG Emissions: Open burning of plastic waste contributes significantly (~1,500 kg CO_2 per tonne),

accounting for about 25–30% of total life-cycle GHG emissions. Each kilogram of burned plastic emits approximately 3 kg CO_2. Toxic Emissions: Disposal stages also dominate toxic emissions, with an estimated ~10–15 kg of hazardous pollutants (e.g., dioxins, particulate matter) released per tonne of waste improperly burned or dumped. This aligns with field observations of open burning in informal dumpsites and confirms that downstream mismanagement is a major contributor to Ghana's waste-related climate and health impacts.

4. **Manufacturing and recycling stages** have relatively smaller footprints: The Manufacturing stage uses ~10,000 MJ of energy and emits ~1,000 kg CO_2/tonne, significantly less than the upstream supply stage but still relevant, especially where energy grids are fossil-fuel dependent. The Recycling stage shows even lower intensity: mechanical recycling typically requires only 0.7–1.0 GJ/tonne, which is <2% of the energy needed for virgin resin production (Techscience.com, 2023). The baseline LCA confirms two hotspots: (1) the upstream production of virgin plastic (huge energy/GHG burden), and (2) the downstream fate of plastic waste (large emissions and pollution due to improper disposal).

   The middle stages (manufacturing, distribution) have smaller, though not negligible, impacts (they matter more for economic cost than environmental cost). Transport fuel use (distribution and collection) is a relatively minor contributor in this footprint (~200 MJ and ~15 kg CO_2 per tonne for each stage). Water use is overwhelmingly upstream. Thus, any circular economy strategy that reduces virgin resin demand and avoids open burning/leakage of waste would drastically improve these indicators. Although recycling volumes are still small in Ghana's baseline, the potential to displace virgin production emissions is enormous if recycling is scaled up.

5. **End-of-Life Waste Generation is the Primary Material Flow Challenge**
   The LCA confirms that material waste generation is concentrated at end-of-life: Nearly 1,255 kg of waste per tonne of plastic must be managed (including process scrap and post-consumer waste), Consumption/Use generates ~1,000 kg of plastic waste per tonne — emphasizing that the plastics problem in Ghana is largely a post-use waste management issue.

6. **Land Use Impacts are Concentrated in Disposal**
   Plastics production itself requires little land, but land use at the disposal stage (especially landfilling and open dumping) consumes ~2 m^2-year per tonne of waste managed. In addition, environmental leakage spreads plastics into natural ecosystems, creating long-term environmental degradation not fully captured in land use statistics but evident from pollution hotspots like the Korle Lagoon and Fosu Lagoon.

7. **Toxic Emissions are a Critical but Underreported Externality**
   Aside from carbon emissions, plastics generate substantial toxic pollution: Open burning releases persistent organic pollutants (POPs) such as dioxins and furans. Manufacturing and recycling processes may release volatile organic compounds (VOCs) and wastewater pollutants. Toxicity risks, especially for communities living near informal dumpsites or burning areas, highlight an urgent need for better waste management infrastructure and air quality monitoring.

The results of the LCA confirms three critical intervention points for Ghana's plastics economy:

1. **Upstream:** From figure 2, the input Supply stage dominated energy use, water use, and GHG emissions, driven by virgin resin dependence. Reducing virgin plastic production through recycled content mandates, alternative materials, and recycling incentives would yield massive reductions in embedded energy, water use, and GHG emissions.
2. **Midstream:** (manufacturing, distribution, collection) contribute comparatively smaller footprints but still offer efficiency gains. Circular economy interventions targeting both ends of the plastics value chain will deliver the highest environmental, social, and economic returns.
3. **Downstream:** Improving post-consumer waste management—especially by eliminating open burning, expanding structured collection, and scaling recycling—would dramatically cut GHG emissions, toxic pollution, and land degradation.

4.3 Social Baseline: Labour, Inclusion and Safety

In addition to environmental performance, the baseline assessment considered social dimensions of the plastics value chain in Ghana – including labour profiles, the role of the informal sector, participation of youth and women, and occupational health and safety conditions.

Labour Distribution and Inclusion: The plastic industry in Ghana sustains a sizable workforce across both formal and informal sectors:

a. **Formal Private Sector:** Our survey of 70 private sector firms (manufacturers, recyclers, etc.) revealed a wide range of company sizes. Some small enterprises had under 5 employees, while a few larger firms had 50+ staff. For example, one recycling company in Kumasi reported **125 employees** (25 male, 100 female), whereas a plastic manufacturing firm had **39 employees** (30 male, 9 female). On average, formal firms employed a few dozen workers each. These jobs include skilled machine operators, factory labour, drivers, supervisors, etc. Notably, women are employed in the formal plastics sector to a significant extent in certain operations like waste picking and sorting, women outnumber men (as in the 80% female example above), while in others (heavy manufacturing) men are a majority. Overall, female representation in formal plastic enterprises varied widely (rough estimate from survey responses: 30–50% of the workforce were women). This suggests that the sector can provide employment opportunities for women, especially in roles such as sorting, quality control, and administration. However, women may still be underrepresented in technical or leadership positions (anecdotal evidence from interviews).

Notably, **women are employed** in the **formal plastics** sector to a **significant extent.** In certain operations

like **waste picking** and **sorting**, women outnumber men, while in others (heavy manufacturing) men are a majority.

b. Informal Sector: The informal waste value chain engages many low-income individuals who collect, buy, and sell plastic scrap. In our sample of 300 informal actors (waste pickers, itinerant collectors, small aggregators), operations were typically micro-scale family businesses. The median "enterprise" was just 1 or 2 people working together. Indeed, many respondents indicated only themselves (solo operators) or themselves plus a family helper. On average, informal respondents had ~2.5 workers (including themselves). Despite the small size of each unit, collectively this represents significant employment. If we conservatively estimate 2–3 thousand waste pickers nationwide weforum.org, plus thousands more engaged in informal retail of plastic products, it's clear the informal sector is a vital source of livelihoods.

Youth and women are prominently involved: Many waste pickers are young adults with limited formal employment options. Ghana's population is very young (over 50% under 30 iucn.nl), and this is reflected in the informal waste workforce. Field observations and respondent ages suggest that a large share of informal plastic workers is in their 20s or 30s youth drawn by the low entry barrier of waste picking. Women also play a key role, our survey data indicate roughly 45–50% of informal waste pickers/aggregators are female, which aligns with the notion that women in financially strapped communities engage in waste collection for income. This near gender-parity is significant; it means any improvements to the sector directly affect women's economic empowerment.

Youth and **women** are prominently involved: Many **waste pickers** are **young adults** with **limited formal employment options.**

c. Income and Job Quality: Formal sector jobs (e.g. at a manufacturing plant) tend to have steady wages (though often low) and some job security, whereas informal actors have highly uncertain incomes. For many waste pickers, earnings depend on daily scrap sales and fluctuating prices for plastic waste. Access to employee benefits, health insurance, and formal contracts remains extremely limited within the sector. Nevertheless, these jobs serve as a critical source of income, often representing a livelihood of last resort for marginalized and economically vulnerable groups

Occupational Health & Safety: Baseline conditions in the plastics value chain present numerous health and safety risks, especially for informal workers:

a. **Informal Waste Collectors:** These individuals typically work without any formal training or protective equipment. It was noted that gloves, boots, or masks are rarely used in the field. As a result, waste pickers are exposed to sharp objects (risk of cuts), medical waste (risk of infection), and hazardous substances. They also often manually burn plastic waste to reduce volume or retrieve metals, exposing themselves to toxic fumes. The survey explored the extent of regulatory oversight within the plastics value chain, particularly among informal sector actors. One respondent bluntly noted that there had been "no visit from regulators" to their operation, underscoring the reality that informal waste handling often exists within a regulatory vacuum. There appears to be little to no presence of environmental officers to monitor occupational safety, waste handling practices, or environmental compliance. Indeed, the sentiment that operations had "never been inspected by any regulators" was echoed across multiple respondents, highlighting the absence of external enforcement mechanisms to protect worker welfare or ensure adherence to safety and environmental standards. The lack of recognition and formalisation of the sector also means no access to government-sponsored programs (e.g. no health checks or support for waste pickers who perform an essential public service). Consequently, accidents and chronic health issues are common in this segment. Interviewees reported frequent minor injuries (cuts from broken glass or metal in mixed waste) and respiratory issues from smoke inhalation.

b. **Formal Sector Workers:** Conditions in factories can also be challenging. While larger companies may provide some PPE (e.g. gloves when operating crushers, ear protection near loud machines), smaller workshops often lack formal safety protocols. Plastic extrusion and molding involve high-temperature equipment – there is risk of burns. Inhalation of plastic fumes in inadequately ventilated facilities is another concern (leading to headaches or worse). Additionally, repetitive work and heavy lifting can cause ergonomic problems. However, formal workers at least fall under labor laws. Ghana's labor regulations require employers to ensure workplace safety, though enforcement may be inconsistent. None of the policy-maker survey respondents indicated strong monitoring of the plastics sector specifically (it's likely overshadowed by bigger industries). One positive note: formal jobs in recycling or manufacturing are generally not as socially stigmatized as waste picking, and they can offer more stability. Yet even in formal recycling plants, anecdotal reports suggest limited training on hazardous material handling. For instance, if workers must sort hospital waste for plastics, do they have proper gloves and tetanus shots? Often not.

c. **Community Health:** The baseline practice of open dumping and burning has ripple effects on communities. Many of the informal dumpsites where plastics end up are near residential areas or water sources. People living adjacent to dumps inhale smoke from burning plastics (which can contain carcinogens). Water sources can also be contaminated by runoff from plastic waste (microplastics and chemical additives leaching). These are indirect social impacts – harder to quantify, but clearly negative externalities affecting especially low-income neighbourhoods. Children are particularly vulnerable; it's not uncommon to see children scavenging in dumps (child labour issue) or playing near polluted waterways.

The social baseline reveals a mix of heavy reliance on informal labour (with associated vulnerabilities) and moderate formal employment in the plastics value chain. Youth and women are integral to the system but currently operate with insufficient support and protections. The situation presents opportunities for improvement (e.g. organizing waste pickers, providing safety gear, formalizing jobs) as part of a circular economy transition. Any circular solutions should strive for a "just transition" – improving job quality and inclusion while addressing environmental issues.

5

Opportunity Identification and Prioritisation

5.0 Opportunity Identification and Prioritisation

Building on the baseline gaps identified in Step 1, this section outlines key circular economy (CE) hotspots in Ghana's plastics value chain and then proposes a set of CE opportunities to address these issues. Finally, a prioritisation matrix is presented, ranking the opportunities by feasibility, impact, and alignment with the identified needs.
From the Step 1 assessment, several critical problem areas ("hotspots") in the current linear plastics system have been identified and presented in Table 11:

Table 10: Critical Problem Areas

Critical Problem Areas	Justification
Hotspot 1 – Extensive Material Leakage and Low Recovery	Most of the plastic waste is not recovered in any form. Only ~5–10% is recycled, while "the rest often ends up in the environment, is burnt or finds its way to a landfill"iucn.nl. This represents a huge loss of material value and causes environmental damage. Roughly half of all plastic waste generated in Ghana is uncollected and leaks directly into nature or urban areas(smepprogramme.org). The baseline flows showed ~450 kg out of every 1000 kg becoming litter or open-burning emissions. This is a core issue: a circular economy cannot be achieved while such a large fraction of material escapes the loop entirely.
Hotspot 2 – Dependence on Virgin Plastics (Resource Intensity)	Ghana's plastic value chain is currently almost entirely dependent on virgin resin inputs. Recycled content in new products is negligible. As a result, the industry's upstream footprint is massive – for example, producing virgin resin for Ghana's annual plastic demand (est. 1.1 million tonnes) embeds on the order of 3–5 million tonnes of CO_2 emissions (sciencedirect.com) and consumes enormous energy (sciencedirect.com). This reliance also means economic exposure to volatile global resin prices. In short, the system is resource-inefficient, using new fossil resources for single short uses. Every tonne of plastic is made from ~1,000 kg of petrochemicals and ~80 GJ of energysciencedirect.com, which is then mostly wasted. Reducing virgin plastic use is thus a hotspot for both environmental and economic reasons (GHG reduction and resource security).
Hotspot 3 – Inefficient Collection and Waste Management System	The baseline revealed a significant infrastructure and system gap in waste collection and sorting. Coverage of municipal waste services is inadequate (especially outside major cities), leading to piling of trash in communities. Even where collection exists, mixed waste collection without sorting leads to plastics being landfilled or burned rather than recycled. There are very few designated collection points or drop-off centres for recyclable plastics, a point highlighted by respondents: "Lack [of] collection points" was noted as a key barrier. Without an effective collection and sorting network, even recyclable materials cannot be looped. This is a clear hotspot: unless addressed, any downstream recycling facilities will be starved of feedstock.

Critical Problem Areas	Justification
Hotspot 4 – Single-Use and Short Product Lifespans	The predominance of single-use plastics and disposable packaging in Ghana creates a high waste volume relative to product utility. The baseline shows that essentially 1 kg of product yields 1 kg of waste almost immediately. Examples include water sachets, thin shopping bags, food containers – all often used for mere minutes. This is a huge inefficiency: valuable material is used in items with extremely short lifetimes, generating continuous waste management costs and litter. As noted, "most problematic plastics are SUPs, which have a significant negative effect on both humans and wildlife"iucn.nl. This hotspot suggests the need to redesign products and consumption models to extend product life or eliminate unnecessary single-use items altogether.
Hotspot 5 – Informal Workforce Vulnerabilities	While not a "material" inefficiency, the social inequity in the current chain is a hotspot from a sustainability perspective. The informal waste pickers who collect a large share of recycled plastics operate with low income, no health/safety nets, and societal stigma. This not only is a social issue but also affects system performance – when waste picking is dangerous and unrewarding, it is hard to scale up recycling via informal channels. The baseline evidence (no regulator support, no PPE, injuries, etc.) shows a clear gap. Any circular economy strategy must consider integrating and uplifting these workers; otherwise, improvements could bypass a key stakeholder group. In summary, the human element is a hotspot: unsafe, low-paying jobs and lack of inclusion of informal operators will impede a truly sustainable circular system.

These hotspots presented in Table 10 reflect symptoms of the linear system including material leakage, waste of resources (virgin trash), weak collection infrastructure, throwaway culture, and under-resourced labour. Each directly informs the opportunities for intervention.

5.1 Circular Economy Opportunities Matched to Baseline Gaps

From hotspots in Table 10, several Circular Economy opportunities for Ghana's plastics value chain were identified. These are not mutually exclusive "business models," but rather key areas of intervention or initiative that can be pursued (often in combination) to move toward a more circular system. Each opportunity is linked to one or more baseline gaps:

5.1.1 Opportunity 1: Source Segregation, Enhanced Collection and Sorting

The first and most urgent opportunity is to capture plastics before they leak by expanding and upgrading waste segregation, collection and sorting systems. This directly addresses Hotspot 1 (leakage) and Hotspot 3 (inefficient waste management). Specific initiatives could include:

5.1.1.1 Community Collection Centres and Drop-off Bins

Establish conveniently located plastic collection points. For example, one private sector respondent suggested providing dedicated "dustbins at locations to collect plastics" as a simple but effective step. This could be done in markets, neighbourhoods, and beaches to encourage the public to segregate and deposit plastics. Pilot programmes can offer small incentives (e.g., a token refund for each bag of bottles brought in).

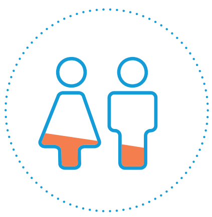
5.1.1.2 Support for informal collectors

In Ghana's evolving plastics economy, the informal sector plays an indispensable but under-recognised role in material recovery, particularly in post-consumer waste collection. Rather than pursuing parallel or competing systems, there is a strategic imperative to formally integrate informal waste pickers and aggregators into national circular economy frameworks. Organising waste pickers into registered cooperatives, social enterprises, or franchised micro-enterprises should form a cornerstone of the country's plastics strategy. These structures would enable collective bargaining, improve access to financing, standardise operations, and enhance traceability across the value chain. Logistical investments—such as the provision of pushcarts, tricycles, or low-cost cargo bikes – would significantly increase collection capacity, while personal protective equipment (PPE) distribution would promote occupational health and safety standards in alignment with Ghana's Labour Act (Act 651).

Furthermore, structured training programmes in safe collection practices, materials classification, and primary sorting can professionalise waste picker operations, improving the quality and cleanliness of collected plastics, thereby increasing their downstream market value. This directly addresses one of the most pressing bottlenecks in Ghana's recycling sector: high contamination rates at the point of recovery. The Global Plastic Action Partnership (GPAP) pilot has already demonstrated proof of concept by organising over 2,000 waste pickers into a digitised collection network, linked to traceable systems that monitor material flows and enable performance-based remuneration.

Replicating and scaling this model nationally could substantially increase plastic recovery rates while simultaneously formalising thousands of livelihoods. To incentivise sustained engagement, innovative financial instruments such as performance-based microgrants, mobile money disbursement systems, or cooperative-level microinsurance schemes could be deployed. These tools not only stabilise incomes but also extend financial inclusion to traditionally underserved populations, supporting Ghana's broader socio-economic development agenda.

Establishing community-level buy-back centres and material aggregation hubs would provide dedicated nodes where cooperatives can deliver sorted plastics at guaranteed floor prices. These hubs would serve multiple functions—collection, primary sorting, payments, data collection, and community sensitisation—thus enhancing efficiency and transparency across the value chain.



Gender and **youth** inclusion should be **explicitly embedded** in **programme design.**

Gender and youth inclusion should be explicitly embedded in programme design. With approximately 45–50% of Ghana's informal waste workforce comprising women and youth, targeted measures such as childcare provision at collection hubs, women-led cooperative models, and gender-responsive financing mechanisms would yield both environmental and social returns.

In summary, the structured integration of informal actors offers Ghana a triple dividend: - environmental: Increased volumes of clean, traceable plastic feedstock for domestic recycling industries; economic: Stable livelihoods for thousands of low-income workers, stimulating local economies; and - social: Advancements in gender equity, youth employment, and social protection. For Ghana to achieve its National Plastic Action Roadmap and Circular Economy objectives, systematic investment in the informal sector must be prioritised.

Key Finding

For Ghana to achieve its National Plastic Action Roadmap and Circular Economy objectives, systematic investment in the informal sector must be prioritised.

5.1.1.3 Sorting hubs and aggregation facilities

Invest in intermediate facilities where collected plastics are brought and sorted. Currently, lack of sorting means low-quality outputs. Small-scale Material Recovery Facilities (MRFs) can be set up (even simple sheds with conveyor belts and sorting tables) in cities like Accra, Kumasi, Tamale. These hubs should be equipped to separate PET, HDPE, PP, film, etc., and bale or prepare them for recycling. This ensures that once plastics are collected, they are actually usable by recyclers. It also reduces contamination (keeping organics out of plastic streams). Respondents noted absence of such centres: "lack of community recycling centres" was cited as a barrier, along with calls for "establishing community recycling centres" – exactly what this opportunity would implement.

Strategic investment in community-level sorting hubs could resolve these issues through the following actions:

1. ***Establish Small-Scale MRFs in Key Urban Centres:*** Setting up simple but effective Material Recovery Facilities in major cities like Accra, Kumasi, Takoradi, and Tamale would significantly increase material quality. These facilities can initially be basic sheds equipped with conveyor belts, sorting tables, balers, and basic washing units. By installing equipment that separates plastics by resin type – such as PET (bottles), HDPE (containers), LDPE (films), and PP (caps and tubs) – MRFs ensure that recyclers receive sorted, cleaner, and higher-value feedstock ready for reprocessing.
2. ***Reduce Downstream Contamination:*** Clean sorting at these hubs dramatically reduces the contamination burden at recycling plants. As found in field surveys, contamination remains a major cause of material rejection. By keeping organics and non-plastics out of recycling streams early, sorting hubs help ensure higher yields and better-quality recycled products.
3. ***Boost Informal Sector Integration and Employment:*** Community sorting

centres could serve as formalised workspaces where informal waste pickers are organised into cooperatives or micro-enterprises. Training waste pickers in basic material handling, health and safety standards, and material identification would improve both efficiency and working conditions. This would create formal jobs, enhance incomes, and drive inclusion of women and youth—key actors already dominating informal waste collection

4. *Create Aggregation Economies of Scale:* Small collectors often operate with insufficient volumes to negotiate fair prices. By aggregating collected plastics at community MRFs, small actors can pool materials and collectively sell larger, cleaner loads to recyclers at better prices. This strengthens the entire recycling market and improves profitability at all levels of the chain.
5. *Enable Regional Recycling Networks:* By strategically positioning MRFs, collected and sorted plastics can be channelled towards regional recycling centres or exported to regional markets under frameworks like the African Continental Free Trade Area (AfCFTA). This expands the potential market for Ghana’s recyclables and boosts regional trade in circular materials
6. *Catalyse Private Investment and Innovation:* These hubs can be public-private partnerships (PPPs) involving local governments, private recyclers, and investors. Subsidies or incentive schemes (such as tax breaks on equipment or concessional finance) could encourage private players to establish and operate these facilities sustainably. Additionally, digital platforms could be integrated for real-time material tracking and quality assurance.
7. *Respond to Community Demand and Policy Gaps:* Survey respondents and stakeholder consultations highlighted a strong call for “community recycling centres” and cited the absence of sorting hubs as a major barrier to recycling. Establishing MRFs directly responds to this demand and complements national policy objectives under the Ghana National Plastic Action Partnership (NPAP) and the Circular Economy Framework

Setting up intermediate sorting facilities would dramatically improve the overall efficiency, profitability, and environmental sustainability of Ghana’s plastic value chain. It would simultaneously strengthen livelihoods, reduce material leakage into the environment, increase recycling rates from the current <10% to potentially over 30% in targeted zones, and create scalable models for replication.

5.1.1.4 Innovative collection schemes

Introduce schemes like Deposit-Refund Systems for items such as PET bottles. As an example, a deposit on drink bottles (e.g., add GHC 0.20 per bottle, refundable on return) can drastically increase return rates. According to global examples, deposit systems can achieve 50–90% collection rates for targeted items. Ghana can start with PET or even beverage sachets – consumers return them to redemption points to reclaim their deposit, ensuring those plastics are gathered. (This aligns with extended producer responsibility principles and could be industry-funded.) The Plastics Europe “50 Villages” report suggests deposit-return as a high-feasibility solution in places with informal collection networks. Ghana could leverage its existing bottle collectors and aggregators to implement this.

In sum, by implementing these measures, Ghana can raise its plastic collection rate from ~50% toward 80–90% in urban centres over time. This is foundational – without feedstock, recycling can't scale. Moreover, this opportunity yields direct environmental benefits (less litter in communities, less pollution of waterways) and social benefits (jobs in collection, cleaner neighbourhoods). Technically, it is quite feasible: it relies on organization, relatively low-tech infrastructure, and community engagement rather than on advanced new technology. It does require coordination and funding (possibly public-private partnerships for waste management). Overall, improving collection & sorting is a "low-hanging fruit" that enables all other circular strategies.

In sum, by implementing these measures, **Ghana** can raise its **plastic collection** rate from ~**50% toward 80–90%** in **urban centres** over time.

5.1.2 Opportunity 2: Scale Up Domestic Recycling and Diversify Recycling Technologies

To tackle Hotspot 2 (virgin dependence) and Hotspot 1 (low material recovery), Ghana needs to significantly expand its recycling capacity and introduce new recycling/valorisation methods for harder-to-recycle plastics. Key actions under this opportunity:

5.1.2.1 Increase mechanical recycling for high-value plastics

There is ample room to grow the recycling of PET, HDPE, and PP (the easier polymers). Existing small recyclers could be supported to expand, and new entrants encouraged. For example, setting up PET bottle recycling plants (to produce clean PET flakes for export or local reuse) would capture the huge number of PET bottles currently littered. With sufficient feedstock from improved collection, a few medium-scale facilities (each maybe 5,000–10,000 tonnes/year capacity) can be viable. As one survey respondent put it, "Processing into pellets" from waste is an opportunity that also creates jobs. Indeed, establishing plastic pelletizing lines (for PE film or PP rigid plastics) can supply secondary raw material back to Ghanaian manufacturers, reducing virgin imports. Every tonne of recycled plastic replaces a tonne of virgin resin, avoiding ~80 GJ energy and ~3.5 tCO_2 emissions (sciencedirect.com). This has triple-bottom-line appeal: economically, it can be cheaper than imports; environmentally, it cuts emissions; socially, it creates local employment in recycling operations.

5.1.2.2 Introduce chemical or alternative recycling for low-grade plastics

Not all plastics are easily recycled mechanically (e.g., multi-layer sachets, soiled plastics, certain thermoset plastics). For these, Ghana can explore technologies like plastic-to-fuel pyrolysis, or plastic-to-construction material initiatives. Some respondents hinted at this need, mentioning the idea of processing "plastics that cannot be processed" currently. One concrete example: converting low-value plastic waste into bricks or paving tiles. This is being piloted in some African countries – shredding and melting mixed plastic with sand to form bricks. It has the benefit of locking waste into useful building materials (and those bricks can have good durability). Another example is small-scale pyrolysis units that turn dirty plastics into diesel fuel or oil. While not a materials-circular solution (it recovers energy more than material), it can deal with the fraction of waste that would otherwise be burned in the open, at least recovering some energy and replacing diesel.

Feasibility studies could determine if such pyrolysis units are viable in Ghana's context (considering oil price, feedstock supply, emissions controls needed). The valorisation of currently unrecycled plastics is crucial to approach zero plastic leakage. Rather than dumping "residuals" (the 150 kg rejects per tonne in baseline), this opportunity would find a use for them – whether as fuel for cement kilns, ingredients in road asphalt (some countries mix shredded plastic in bitumen for roads), or other innovative products. This corresponds to the survey suggestion of "upcycling" waste into new products, as well as ideas like making furniture or art from plastics.

5.1.2.4 Enhance recycling market and linkages

An often-overlooked aspect is developing stable markets for recycled material. Manufacturers need to be confident in the quality and supply of recyclate. This opportunity includes creating quality standards for recycled pellets, and perhaps incentives for companies that use them. Policy support (like reduced taxes on local recyclate or mandatory recycled content targets for certain products) can stimulate demand. One policy-maker respondent likely would support such measures – aligning with Ghana's plastic policy that encourages recycling industries. Additionally, linking recyclers with producers is key: platforms or exchange programs can be set up to facilitate the sale of recycled plastic (so recyclers know who will buy their output). This ensures the scaled-up recycling doesn't falter due to market failures.

In summary, scaling and diversifying recycling will move Ghana up from ~5% recycling towards the national target (the NPAP roadmap targets 20%+ recycling in coming years). Technically, mechanical recycling is well-understood and can be expanded with moderate investment. The more novel recycling (chemical, materials) will require pilots and careful evaluation, but small pilots (like a plastic bricks project) can be started by local entrepreneurs or NGOs with support. The impact of this opportunity is high on all fronts:

a. environmentally, it cuts reliance on virgin production (each additional tonne recycled avoids upstream impacts and reduces waste to dumps);
b. economically, it develops an entire sector (recycling industry) with value creation from waste;
c. socially, it can generate thousands of green jobs (in collection, operation of recycling plants, and downstream manufacturing using recyclate).

One can imagine, for instance, a cooperative in Accra collecting plastic film, operating a low-tech extruder to make plastic lumber that is then sold for building benches – a circular micro-industry enabling livelihood. This opportunity thus directly addresses the "waste into value" transformation at the heart of circular economy.

5.1.3 Opportunity 3: Promote Reuse, Refilling, and Alternative Delivery Systems – "Design Out Waste"

Tackling the single-use culture (Hotspot 4) requires upstream innovation in how products are delivered to consumers. This opportunity is about redesigning products and packaging for reuse or using sustainable alternatives, thereby preventing waste generation in the first place. Key facets include:

5.1.3.1 Reusable packaging systems

Shift from disposable plastic packaging to reuse models wherever feasible. For example, introduce refillable bottle schemes for water or beverages, as an alternative to the common small sachets and bottles. Large water jug refills (as used in dispensers) are already common in offices; this could be extended to households with deposits on 18L polycarbonate bottles. Another approach is container return programmes for food containers or takeaway packaging – customers pay a deposit and can return the container for cleaning and reuse.

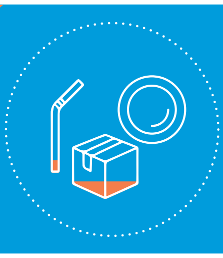
One respondent explicitly suggested a *"Reusable packaging system"* as a solution, indicating local interest in such models. Additionally, industries like the beverage sector could reintroduce glass bottle reuse (with modern twists, e.g., durable PET that withstands multiple uses). Reusable cloth shopping bags can replace single-use plastic bags – some campaigns promote this in Ghana (and a few municipalities have considered bans on thin plastic bags). Encouraging consumers to adopt durable packaging through awareness and slight incentives (e.g., small discount for bringing your own bag/container) can make a difference. The goal is to extend the life of packaging from minutes to months or years.

5.1.3.2 Product-as-a-Service models

In some cases, selling the service or content rather than the container can eliminate waste. For instance, water dispensers and milk dispensing machines in communities could allow people to fill their own containers, avoiding millions of sachets. Cleaning product companies could offer a service where soap or detergent is delivered in bulk to neighbourhood refill stations, shifting away from single-use sachet packaging. These innovative models require new business approaches but can thrive with the right support. They also open entrepreneurship avenues (e.g., local refill station franchises). Several African countries are exploring dispensing systems to cut sachet waste – Ghana could pilot the concept in a few districts.

5.1.3.3 Biodegradable or sustainable material alternatives

Where reuse is difficult, switch to materials that have a lesser environmental impact at end-of-life. For example, compostable cassava starch-based bags for certain uses (garbage bags, shopping bags) can replace conventional plastic bags, so that if they leak into the environment they biodegrade relatively harmlessly. There is research in Ghana on cassava starch films. This aligns with the idea of "bioplastics development" for Ghana's circular economy file-3avkauza9qjrqklmupbwwh. Another alternative is paper-based packaging for items like straws, plates, or boxes – these are biodegradable and easier to manage in waste streams. Even traditional materials (woven baskets, calabash containers) could be promoted for specific uses. One surveyed company highlighted "Biodegradable packaging materials" as an area to pursue. However, it's important to ensure these alternatives truly break down in local conditions and do not just shift the



Another alternative is **paper-based** packaging for items like **straws, plates,** or **boxes** – these are **biodegradable** and easier to manage in waste streams.

problem (e.g., some "compostable" plastics need industrial composting which Ghana lacks). Pilot projects and standards will be needed.

5.1.3.4 Policy measures to support reuse/refill

Regulatory action can accelerate this opportunity. Bans or levies on certain single-use plastics can drive consumers and businesses toward alternatives. Indeed, as noted in the baseline, Ghana Youth Environmental Movement is campaigning for a ban on single-use plastics by 2025(iucn.nl). If implemented (even partially – e.g., banning lightweight plastic bags or plastic straws), it would create demand for reusable or non-plastic options. Additionally, extended producer responsibility (EPR) schemes can require producers to take back or manage packaging waste, which encourages them to redesign packaging to be easier to collect and reuse. An example could be mandating major water bottling companies to recollect a percentage of their bottles (which might make them consider reusable bottle models).

The impact of this opportunity is significant: it prevents waste at source, reducing the burden on collection and recycling. If fewer single-use plastics are in circulation, leakage automatically drops. Reuse models also tend to be more labour-intensive (in a good way) – e.g., systems for cleaning and re-distributing containers create service jobs and micro-enterprises. Culturally, reuse is not alien to Ghana (e.g., historically, glass soda bottle returns were standard, and markets often use returnable bowls for food). Revitalizing these practices with modern systems could be well-received if convenience and affordability are maintained.

Technically, implementing reuse models requires coordination (setting up return logistics, cleaning facilities) and initial investment, but it's very feasible and has been proven in other countries for certain sectors. Biodegradable packaging development might need R&D and careful rollout. Over time, this opportunity can significantly reduce the flow of single-use plastic into the waste stream, thereby tackling the root cause of plastic pollution. It complements Opportunities 1 and 2 – while those deal with existing waste, these aims to generate less waste to begin with.

5.1.4 Opportunity 4: Formalize and Empower the Informal Plastics Sector. (Cross-cutting social opportunity)

Alongside the technical solutions, Ghana has the chance to create a more inclusive and safe circular economy by deliberately integrating informal workers. This opportunity is essentially a social innovation to address Hotspot 5 (informal workforce vulnerabilities), while also reinforcing Opportunity 1 and 2. Key elements:

5.1.4.1 Organize waste pickers into cooperatives or SMEs

Instead of individuals selling scrap for pittance, cooperatives can aggregate larger volumes, negotiate better prices, and receive training. For example, forming local plastic collection cooperatives in the slums of Accra, Kumasi, Tamale and Takoradi could give waste pickers collective bargaining power. NGOs and government can assist with registration, skill development, and seed funding for these groups. Once organized, they can become contracted service providers for municipalities or recycling companies – effectively formalizing their role in the waste management chain (as has been done in countries like Brazil and India).

5.1.4.2 Provide training, equipment, and recognition

Equip informal workers with proper protective gear (gloves, boots, uniforms) and tools (carts, balers). Train them on efficient sorting, first-aid, and business skills. Some respondents noted the lack of any regulator or training – filling that gap can improve both safety and efficiency. Recognition can come in forms such as official ID cards or permits that acknowledge them as legitimate environmental service providers. This can reduce harassment and improve self-esteem among workers.

5.1.4.3 Inclusive value chain integration

Ensure that as new recycling facilities or collection systems come online, informal actors are not displaced but rather integrated as partners or employees. For instance, a new sorting centre could hire experienced waste pickers as staff and supervisors. A plastic recycling plant could establish a feedstock agreement with an informal collectors' network, guaranteeing them a steady buyer (and income). Such integration was highlighted by the GPAP initiative which plans to use data to give waste pickers fair pricesweforum.org. By bringing informal operators "into the fold," both can improve their livelihoods and secure reliable collection for recycling.

5.1.4.4 Health and safety interventions

Set up basic healthcare outreach for informal waste workers. Periodic medical check-ups, vaccination drives (for tetanus, Hepatitis B, etc.), and distribution of clean water and soap at work sites can go a long way. Also, educating workers on dangers (for example, not to burn PVC or electronic waste without protection) is important. In the long run, improving conditions will make this work more attractive and sustainable, ensuring the supply of labour for collection doesn't dwindle.

Set up basic **healthcare** outreach for informal waste workers. **Periodic medical check-ups, vaccination drives** (for tetanus, Hepatitis B, etc.), and **distribution of clean water** and **soap at work sites** can go a long way

5.1.4.5 Financial inclusion

Many informal pickers lack access to credit or savings mechanisms. Setting up micro-credit schemes or mobile payment systems for the cooperatives can help them invest in better tools (e.g., a cooperative might get a loan for a second-hand pickup truck to expand their collection radius). Some global programmes like Plastic Bank incentivize waste collectors by paying them digitally and even allowing conversion of earnings to savings or insurance. Ghana could pilot something similar, perhaps via mobile money, to modernize the trade of recyclables and secure better financial outcomes for workers. Though this opportunity is more of a supportive measure, it directly contributes to the success of the core circular strategies. A well-organized, professionalized informal sector will collect more plastic (feeding Opportunity 1), produce cleaner sorted material (feeding Opportunity 2), and help build public awareness (as they often interact with households).

Many informal pickers lack access to credit or savings mechanisms. Setting up micro-credit schemes or mobile payment systems for the cooperatives can help them invest in better tools

Socially, this is critical for equity – it ensures the transition to circular economy is just and improves livelihoods at the base of the pyramid. This opportunity is also quite feasible with government or NGO support; it doesn't rely on high tech – just good governance, capacity building, and modest investment in people. The impact is high socially (poverty reduction, better health), and environmentally it indirectly boosts recycling rates and reduces litter (since motivated, equipped workers will collect more waste).

5.2 Prioritisation of Opportunities

All the above opportunities are important, but to maximize impact and use resources effectively, we rank them based on technical feasibility, anticipated triple-bottom-line impact, and how directly they address the identified gaps. Table 11 presents a prioritisation matrix for the top three opportunities (as these encompass the most critical needs: collection, recycling, and reuse). Each opportunity is scored qualitatively:

Table 11. Prioritisation of Circular Economy Opportunities

Opportunity (Brief Description)	Technical Feasibility*	Triple-Bottom-Line Impact* (Environmental, Social, Economic)	Alignment with Gaps (Baseline evidence)	Priority Rank
1. **Enhance Collection & Sorting – e.g., community collection hubs, informal sector integration, deposit schemes to capture plastics.**	High. Relies on proven methods (bins, basic sorting) and existing workforce; requires coordination more than tech. Ghana has success examples (e.g., youth clean-ups).	High. Environment: reduces >50% of leakage and plastic pollution; Social: creates jobs for waste pickers with better income; Economic: provides feedstock for recycling industries (value retention).	Directly addresses low collection (50% waste uncollected) and leakage hotspotiucn.nl. Closes the loop for materials currently lost. Leverages suggestions like "provide dustbins at locations" from survey.	1 (Top Priority) – Forms the foundation for all other CE measures; immediate action here yields quick wins in cleanliness and resource recovery.
2. Scale-Up Recycling & Recovery – invest in recycling plants, support recyclers, and introduce tech for hard-to-recycle plastics (plastic-to-fuel, bricks, etc.).	Medium. Requires moderate capital and technical know-how. Mechanical recycling is straightforward; advanced methods (pyrolysis) need R&D but small pilots possible. Feasible with public-private investment and tech transfer.	High. Environment: each +1 ton recycled avoids virgin production (saving ~80 GJ energy, 3.5 tCO_2) and reduces landfill/burn sciencedirect.com; Social: green jobs in recycling facilities, possibly women-led microenterprises; Economic: fosters a domestic recycling market, reduces import costs, can generate export revenue from recyclate.	Directly targets the mere ~5–10% recycling rateiucn.nl. Responds to evidence of unused waste ("Bad roll" scrap and "plastics… cannot be processed by us"). Aligns with Ghana's need to cut virgin resin use (currently ~98% virgin inputs smepprogramme.org).	2 (High Priority) – Critical to implement once collection improves, to actually loop materials. Some parts can start now (e.g., boost existing recyclers), yielding high TBL benefits.

Opportunity (Brief Description)	**Technical Feasibility***	**Triple-Bottom-Line Impact* (Environmental, Social, Economic)**	**Alignment with Gaps (Baseline evidence)**	**Priority Rank**
3. Implement Reusable Packaging & SUP Alternatives – develop reusable packaging systems, refilling models, and promote biodegradable alternatives for single-use plastics.	Medium. Behaviour and business model shifts needed. Technically viable (models exist in other countries for refills, etc.). Requires stakeholder buy-in and possibly policy push (bans/ incentives). Feasible in pilot scale initially.	Medium-High. Environment: significantly reduces waste generation at source (e.g., could eliminate a large fraction of SUP waste), easing burden on downstream systems; Social: consumers save money long-term (e.g., buying in bulk or reusing containers), new service jobs (cleaning, refill services); Economic: businesses can save material costs, and new markets for alternative materials (e.g., cassava bag industry) can emerge, though initial costs to transition may be high.	Directly addresses single-use plastics hotspot (which are a major portion of wasteiucn.nl). Aligns with suggestions like "Reusable packaging system" from local stakeholders and the national goal to ban SUPs by 2025iucn. nl. Helps alleviate waste at source, complementing collection/recycling.	3 (Medium Priority) – A transformative but longer-term opportunity. Should be pursued in parallel (policy framework now, pilots now), but impact materializes over time. Lower immediate feasibility than 1 & 2, but crucial for sustained circularity.

Technical Feasibility: Assesses how practical and achievable an opportunity is based on current technology, infrastructure, and skills*

*Triple Bottom Line Impact**: Evaluates environmental, social, and economic outcomes of the opportunity.*

From the Table 11 the opportunity 1 (improving collection & sorting) is ranked highest priority due to its immediate feasibility and necessity as a precursor to other actions. Opportunity 2 (scaling recycling) is the next priority, capitalizing on collected materials to close the loop and cut down virgin demand. Opportunity 3 (reuse and alternative systems) is slightly lower priority in the short term – it requires more systemic change – but remains essential for long-term waste prevention. (Opportunity 4, not in the table, underpins all as a social enabler: integrating informal workers should be woven into Opportunity 1 and 2 implementations)

Justification:

The above ranking reflects a logical sequencing: first stop the bleeding (capture and sort the waste to prevent ongoing leakage), then heal the wound by processing that waste into new value (recycling) and simultaneously change the lifestyle that caused the injury (move away from single-use throwaways). Opportunity 1 yields quick environmental gains (cleaner communities within months of rollout) and supplies the inputs for Opportunity 2. It's also something Ghana can do with low-tech approaches and community engagement – making it highly feasible and "shovel-ready." Opportunity 2 then builds the industrial capacity for circularity – it has slightly more barriers (finance, tech skill) but brings high payback in jobs and carbon savings. Opportunity 3, while slightly less immediate, is what will reduce the plastic footprint fundamentally – it ensures that in the future far less plastic needs to be managed. The reason it's ranked third is that it involves behaviour change and market shifts that might take more time and policy effort to bear fruit; however, work on it should start now (e.g., drafting regulations, running pilot reusable programs) so that it can scale in a few years.

It is worth noting that these opportunities are mutually reinforcing. For example, introducing reusable packaging (Opp. 3) will reduce the volume that Opp. 1 needs to collect, and Opp. 2 needs to recycle, focusing those efforts on the remaining plastics. Conversely, improving collection (Opp. 1) will make it easier to implement deposit-return schemes (also Opp. 1) that tie into reuse (Opp. 3). And formalizing the informal sector (Opp. 4) is a thread that should run through Opp. 1 and 2 – e.g., training waste pickers (Opp.1) to better sort plastics improves quality for recycling (Opp.2) and giving them better livelihood uplifts the social bottom line.

In conclusion, Step 2 has identified the major leverage points to transition Ghana's plastics value chain towards a circular economy. By focusing first on plugging leakages and ramping up recycling, Ghana can make immediate progress (within 1–2 years seeing cleaner streets and higher recycling tonnage). In parallel, pushing innovation in reuse and alternative systems will set the stage for longer-term sustainability (5+ years, significantly reducing single-use plastics in circulation). These opportunities, pursued together, will address the baseline gaps highlighted in Step 1 – turning a linear system characterized by waste and pollution into a more circular one where materials are retained, value is created from waste, and the environmental and social outcomes are vastly improved.

The roadmap forward should integrate these priorities into national action plans, with clear roles for government (policy incentives, infrastructure investment), private sector (implementing new business models and recycling facilities), civil society (education and community projects), and the informal workers (as key execution partners). With concerted effort, the result will be a plastics circular economy in Ghana that delivers economic opportunities, cleans up the environment, and improves quality of life for its citizens.

6

Action Plan Development

6.0 Action Plan Development

6.1 Phased Action Plans (Short, Medium, Long Term)

To effectively transition Ghana's plastics value chain toward circularity, this action plan adopts a phased implementation strategy—short, medium, and long-term. Table 12 shows the phased actions.

Table 12: Phased Action Plan

Phase	Time Horizon	Key Actions	Linked Opportunity
Short-Term Actions	0–2 years	• Launch large-scale community collection hubs (50–100 hubs) • Formalize and integrate 20% of informal sector collectors • Pilot separation-at-source programs (household & business) • Fast-track PPP agreements with recyclers • Launch pilot reusable packaging programs (markets, malls) • Draft Extended Producer Responsibility (EPR) regulations	• Opportunity 1: Enhance Collection & Sorting • Opportunity 2: Scale Recycling (basic upgrades) • Opportunity 3: Pilot Reuse Systems • Crosscutting: Informal Sector Integration
Medium-Term Actions	3–5 years	• Scale up the national sorting and aggregation infrastructure • Build/upgrade 5–7 recycling plants (mechanical recycling + pilot advanced recycling) • Launch market incentives for reusable packaging adoption • Implement deposit-refund schemes (PET bottles, high-value plastics • Enforce bans or levies on Single-Use Plastics (SUP)	• Opportunity 2: Scale-Up Recycling & Recovery • Opportunity 3: Expand Reusable & Biodegradable Systems
Long-Term Actions	5+ years	• Reach 50% recycling rate nationally • Achieve 25% reduction in virgin resin imports • Integrate plastic-to-fuel and biodegradable material businesses • Institutionalise circularity standards into procurement and retail systems • Consolidate informal sector formalisation	• Sustained implementation of Opportunities 1–3 • Full systemic transition

Short-Term Actions (0–2 Years): Foundation Building and Piloting

The short-term phase focuses on establishing enabling structures and the ecosystem, piloting innovations, and formalising key actors. It also lays the groundwork for all three opportunity areas, with a strong emphasis on Opportunity 1 (Collection & Sorting) and pilot initiatives under Opportunity 3 (Reusable Packaging). The specific implementable actions include:

- **Launch of Community Collection Hubs (50–100 hubs):** These will serve as decentralised points for clean plastic collection, strategically placed in urban and peri-urban communities to increase recovery rates.
- **Integration of Informal Sector:** activities will be aimed at consolidating existing associations with some level of integration and expand to include other relevant actors through ID systems, records keeping, health insurance support, pensions planning among others and digital payments, the plan acknowledges their critical role while improving safety, data visibility, and compliance.
- **Pilot Separation-at-Source Programs:** These will target households and businesses in selected districts to test feasibility and promote behaviour change in waste segregation.
- **Fast-Track PPPs with Recyclers:** Public-private partnerships will be secured to ensure a ready off-take for collected plastics and support infrastructure growth.
- **Pilot Reusable Packaging Initiatives:** Targeting high-volume areas (like markets and malls), pilots will test consumer and retailer acceptance of refilling stations and reusable packaging models.
- **Draft Extended Producer Responsibility (EPR) Regulations:** This lays the legal groundwork for producers to take responsibility for post-consumer plastic, a critical step for scaling circularity.

Medium-Term Actions (3–5 Years): Infrastructure Expansion and Policy Instruments

In this phase, the focus shifts to scaling infrastructure, rolling out national programs, and enforcing policies that shift market behaviour for sustainable and alternative products. Within this period, technical and financial support should be focused on Scaling Opportunity 2 (Recycling & Recovery) and deepening Opportunity 3 (Reusable Systems) with supportive market and policy instruments.

- **Scale-Up Sorting & Aggregation Infrastructure:** Build or expand regional Material Recovery Facilities (MRFs) and collection centers to support growing demand for sorted plastics.
- **Upgrade 5–7 Recycling Plants:** Mechanical recycling is prioritised, but pilot investments in advanced recycling (e.g., chemical recycling for low-value plastics) are introduced.
- **Incentivise Reusable Packaging Adoption:** Through subsidies, green procurement guidelines, and business partnerships, reusable packaging becomes economically viable.
- **Deposit-Refund Schemes (PET, HDPE):** These market-based mechanisms will drive the collection of high-value plastics, especially beverage bottles.
- **Enforce Bans or Levies on SUPs:** Focused policy tools will restrict use of difficult-to-recycle single-use plastics while stimulating demand for alternatives.

Long-Term Actions (5+ Years): Systems Transformation and Policy Consolidation

This phase aims for a **national systemic shift,** marked by behavioural change, economic realignment, and institutionalisation of circularity principles.

- **Achieve 50% National Recycling Rate:** Through combined efforts in collection, processing, reuse, and regulation.
- **Reduce Virgin Resin Imports by 25%:** Encouraging local recycled content uptake and eco-design among manufacturers.
- **Integrate Plastic-to-Fuel & Bioplastics:** These higher-tech solutions will manage residual plastics and support diversification of the circular plastics economy.
- **Institutionalise Circular Procurement Standards:** Government and large retailers adopt procurement policies that favour circular and sustainable packaging.
- **Complete Informal Sector Formalisation:** All key actors are integrated into formal frameworks, improving livelihoods, compliance, and sector data.

6.3 Resource and investment requirements (Financial, Technical, Human Capital)

Table 13: Resource and Investment Requirements

Opportunity	Resource Type	Resource Description	Estimate
Enhance Source Segregation, Collection & Sorting	Financial	Capital for community collection hubs; subsidies to integrate informal sector	USD 5–10 million
	Technical	Sorting bins, baling units, and digital monitoring systems	Included in broader circular tech transfer programs
	Human	Training for waste pickers and municipal officers; capacity-building for households and organizational waste generators through community workshops, education campaigns, and incentive programs to encourage source segregation	Educational materials, community trainers, digital engagement tools, and cash-back/reward systems (budget: approx. USD 2–3 million)
Scale-Up Recycling & Recovery	Financial	Capital investment in recycling plants	USD 1M–2M per plant; estimated 5–10 plants = USD 10–20 million
	Technical	Mechanical recycling equipment (shredders, extruders, pelletizers), advanced recycling tech pilots	Technology transfer required; supported by partnerships
	Human	Training for plant operators and informal aggregators	Part of 5,000+ workforce training target

Opportunity	Resource Type	Resource Description	Estimate
Implement Reusable Packaging & SUP Alternatives	Financial	Seed funding for reusable packaging start-ups and eco-design innovations	USD 5–10 million over 5 years
	Technical	Support for refill infrastructure and biodegradable alternatives (e.g., cassava bags)	Pilot-scale investment; requires R&D backing
	Human	Skills training for youth entrepreneurs and retail sector adaptation	Training included in circular economy capacity-building programs

6.3 Risk Management and Mitigation Strategies Identified Business Opportunities

The successful implementation of the identified circular economy business opportunities—enhanced collection and sorting, scaled recycling and recovery, and reusable packaging and SUP alternatives—requires proactive risk identification and management. Given the complexity of the plastics value chain in Ghana and the multi-stakeholder nature of these interventions, potential risks span financial, operational, regulatory, social, and technological domains. This section outlines the key risks associated with each opportunity, their potential impact on project outcomes, and proposed mitigation strategies. The goal is to ensure that all interventions are resilient, inclusive, and capable of adapting to emerging challenges while maintaining long-term viability and stakeholder confidence.

6.4 Assumptions Behind Risk Assessment

The risk ratings applied in this analysis are grounded in a contextual understanding of Ghana's plastics value chain, informed by past implementation experiences, stakeholder behaviour, regulatory trends, and operational realities. Each risk is evaluated based on two core dimensions: likelihood of occurrence and potential impact on the proposed circular economy business opportunities.

Likelihood refers to the probability that a risk will materialise during implementation. This is categorised as:

1. High: The risk has frequently materialised in similar projects in Ghana, particularly in areas involving informal sector engagement, enforcement of regulations, or market adoption of new models.
2. Medium: The risk has been observed occasionally and is influenced by factors such as community engagement, institutional coordination, or donor policy shifts.
3. Low: The risk is considered rare under the current project design and existing safeguards, though continuous monitoring remains essential.

Impact refers to the degree to which the risk could disrupt project activities or compromise intended outcomes:

1. High: The risk could significantly delay implementation, undermine project credibility, or affect financial sustainability (e.g., failure to secure PPPs or regulatory barriers).

2. Medium: The risk may cause moderate disruptions, such as cost overruns or delays in specific phases (e.g., slower than expected uptake of reusable packaging).
3. Low: The risk would lead to minor setbacks, with limited implications on project goals and easily managed through contingency measures.

Table 14 provides details of the specific risks expected, potential likelihood, impact and mitigation mechanisms.

Table 14. Risk Management

Opportunity	Risk	Potential Likelihood	Potential Impact	Mitigation Strategy
Enhance Source Segregation, Collection & Sorting	Weak coordination between MMDAs, waste sector actors and communities	High	High	Strong municipal and community collaboration
	Political interference or slow decision-making	Medium	High	Sign MOUs between MMDAs and waste sector actors to formalize roles
	Community distrust due to failed past projects	High	Medium	Pilot small, visible quick wins to build early trust
	Low public interest in separating waste at source	Medium	Medium	Launch public awareness campaigns linked to incentives and competitions
	Informal collectors may resist formal registration	Medium	Medium	Offer incentives such as PPE, microloans, and access to buyer networks
	Collection hubs may face maintenance and operating cost issues	Medium	High	Partner with private sector sponsors to adopt a hub
	Difficulty accessing small loans for waste pickers	High	High	Develop financing schemes targeting women and vulnerable groups

Opportunity	Risk	Potential Likelihood	Potential Impact	Mitigation Strategy
Scale-Up Recycling & Recovery	High upfront capital needed for recycling plants and equipment	High	High	Blended finance models with development partners
	Limited access to affordable financing for SMEs	High	Medium	Create risk-sharing mechanisms such as guarantee schemes
	Fluctuating quality and quantity of collected plastics	Medium	High	Deploy pre-sorting hubs near collection centers
	Contaminated or mixed waste reducing recyclability	Medium	Medium	Train informal aggregators on plastics grading and contamination control
	Limited local technical know-how for advanced recycling	Medium	High	Launch technician training programs via TVET institutions
	Poor consumer perception about quality of recycled products	Medium	Medium	Promote 'Made with Recycled Plastics' labeling campaigns
	Lack of strong offtake agreements or guaranteed buyers	Medium	High	Mandate minimum recycled content in public procurement
	Lack of coding and eco-labelling of materials and products	Medium	Medium	Support eco-labelling practices
Implement Reusable Packaging & SUP Alternatives	Resistance to shifting from cheap, convenient SUPs	High	High	Partner with retailers and offer discounts for reusable containers
	Higher upfront cost of reusable products	Medium	High	Support youth entrepreneurs in producing affordable reusables
	Industrial reluctance to shift supply chains	Medium	Medium	Provide government incentives for eco-friendly businesses

Opportunity	Risk	Potential Likelihood	Potential Impact	Mitigation Strategy
Implement Reusable Packaging & SUP Alternatives	Delay in enacting bans or levies on SUPs	High	Medium	Fast-track SUP bans for priority items
	Weak enforcement of eco-design and packaging standards	Medium	High	Mandate eco-design regulations and progressive phase-out timelines
	Retailer and manufacturer resistance to transition costs	Medium	Medium	Link eco-certification to procurement and tax incentives

The risk management analysis show the importance of proactive, localised, and collaborative approaches to ensure the success of Ghana's transition to a circular plastics economy. While many of the risks identified (such as political inertia, public apathy, and financing constraints) are common in similar initiatives across Ghana, they are not insurmountable. The practical mitigation strategies proposed reflect a blend of community engagement, institutional agreements, market-based incentives, and public-private partnerships. For example, tackling resistance to formalising informal collectors through incentives like PPEs, health insurance schemes and access to markets, or addressing weak enforcement by tying eco-design standards to tax and procurement incentives, ensures that solutions are not only feasible but also socially and economically anchored. Moreover, the integration of quick-win pilots, blended financing models, TVET-based training, and labelling campaigns strengthens both the credibility and resilience of the proposed actions. Overall, the proposed mitigation measures offer a realistic roadmap for de-risking investment, building local trust of key stakeholders, and achieving lasting impact across the three identified circular economy opportunities.

7

Ecosystem Collaboration & Governance

7.0 Ecosystem Collaboration & Governance

7.1 Stakeholder Mapping, Roles and Responsibilities, and Interaction Mechanisms

Effective implementation of circular economy (CE) interventions within Ghana's plastics value chain requires coordinated engagement across a diverse ecosystem of actors. These include public institutions, private enterprises, civil society organisations, informal sector groups, research institutions, and end users. Each actor brings unique capabilities, mandates, and incentives that must be aligned through structured roles and robust mechanisms of interaction.

Stakeholder engagement in Ghana's plastics value chain has historically been fragmented, with weak coordination between municipal authorities, recyclers, and informal collectors. This section maps out key stakeholder categories, defines their primary roles within the three opportunity areas, and outlines practical interaction mechanisms to ensure transparency, synergy, and impact. A special focus is placed on institutionalising partnerships, strengthening policy-industry linkages, and formalising informal sector participation, which are crucial to Ghana's CE transition. Table 15 presents the stakeholders and their role towards the successful implementation of the identified opportunities.

Table 15. Stakeholder Collaboration and Governance

Opportunity Area	Activity No.	Activity Description	Stakeholders	Interaction Mechanisms
1. Enhance Source Segregation, Collection & Sorting	1.1	Establish community and industrial collection hubs	MESTI, MMDAs, Retailers, Aggregators	Municipal Plastic Action Committees
	1.2	Implement deposit-return schemes (DRS)	Producers, Retailers, EPA	Industry Working Group on Collection
	1.3	Develop training and certification programs	NGOs, Informal Sector, Microfinance Institutions	Informal Sector Association Meetings
2. Scale-Up Recycling & Recovery	2.1	Establish 5 new recycling and recovery plants	Recyclers, MoTI, Private Investors	Industry Working Group on Recycling
	2.2	Facilitate PPPs for plant investments	MoTI, World Bank, National Development Bank	National Stakeholder Coordination Platform

Opportunity Area	Activity No.	Activity Description	Stakeholders	Interaction Mechanisms
2. Scale-Up Recycling & Recovery	2.3	Support SMEs with finance, tech transfer, training	Circularity Capital, UNDP, Academia	Circular Economy Innovation Forum
	2.4	Pilot plastic-to-fuel and plastic brick technologies	UNDP, Small Recyclers, Research Institutions	Online Circularity Knowledge Hub
3. Reusable Packaging & SUP Alternatives	3.1	Support development of reusable packaging solutions	Packaging Firms, Retailers, MESTI	Industry Working Group on Reuse
	3.2	Promote R&D for biodegradable packaging	Academia, Research Institutions, NGOs	Public-Private Academic Collaboration
	3.3	Launch refill/reuse consumer campaigns	Communities, NGOs, Retailers	Social Media, Retail Network Campaigns
	3.4	Establish 100 refill/bulk dispensing stations	Retailers, Local Business Owners, Associations	Local Retailer Partnerships

The successful implementation of circular economy (CE) solutions in Ghana's plastics value chain depends on the collective action and coordinated governance of diverse stakeholders, each holding different levels of power, influence, and responsibility. Below is a detailed breakdown of stakeholders by opportunity area, emphasising their roles, interdependencies, and mechanisms for collaboration.

Enhance Collection, Sorting & Source Segregation

This opportunity hinges on improving upstream systems for plastic waste capture through community-based collection hubs, deposit-return schemes (DRS), and training for informal actors.

Table 16: Stakeholder power and impact for Enhance Collection, Sorting & Source Segregation

Stakeholder	Power Level	Critical Role
MEST	High	Policy leadership and integration of CE in local environmental agendas
MMDAs	High	Operational authority for waste management, zoning for hubs, and community outreach
Retailers	Medium	Facilitate in-store collection points, and educate customers
Aggregators & Informal Collectors	Medium	Frontline actors for recovery need support, training, and formalisation

Stakeholder	Power Level	Critical Role
EPA	High	Regulator for DRS implementation and compliance
NGOs	Medium	Build capacity, mobilise communities, and support certification schemes
Microfinance Institutions	Low-Medium	Provide access to microloans and equipment financing
Community Members / Households	High (Behavioural Power)	Primary actors responsible for separating plastics at source; their willingness directly determines system success

Scale-Up Recycling & Recovery

This opportunity centres on expanding and upgrading plastic recycling infrastructure across Ghana, promoting both mechanical and advanced recycling (e.g., plastic-to-fuel or plastic bricks), improving material quality, and facilitating sustainable financing and offtake arrangements. The effectiveness of this opportunity depends on strong coordination between the government, financiers, industry, SMEs, and academia.

Table 17: Stakeholder power and impact for Scale-Up Recycling & Recovery

Stakeholder	Power Level	Critical Role
MoTI (Ministry of Trade & Industry)	High	Policy leadership on industrial growth, PPP facilitation, SME development
Private Investors / Development Banks	High	Financing for infrastructure and equipment, risk-sharing, blended finance
Recyclers (Formal & Informal)	Medium-High	Operationalise recycling plants; innovate on end-products; absorb waste
UNDP, World Bank, and Development Partners	High	Provide technical assistance, financing, and advisory support
SMEs and Startups	Medium	Local job creators and innovators in recovery, upcycling, and product design
TVETs & Academia	Medium	Develop skilled workforce for recycling technologies; conduct materials R&D
Municipal Authorities (MMDAs)	Medium	Allocate land for recycling hubs; facilitate licensing and integration with collectors
Waste Aggregators & Suppliers	Medium	Ensure consistent quality and volume of feedstock for recyclers
Consumers and Businesses	Low-Medium	Influence demand for recycled products and adoption of take-back models

Implement Reusable Packaging & Single-Use Plastic (SUP) Alternatives

This opportunity area aims to transform Ghana's consumption and distribution models by promoting reusable packaging systems, developing biodegradable alternatives, and phasing out problematic SUPs. It requires shifting consumer behaviour, reengineering packaging design, and incentivising local production of alternatives.

Table 18: Stakeholder power and impact for Implement Reusable Packaging & Single-Use Plastic (SUP) Alternatives

Stakeholder	Power Level	Critical Role
MESTI & EPA	High	Draft and enforce eco-design policies, standards, and SUP phase-out regulations
Retailers and Supermarket Chains	High	Distribute reusable packaging, offer bulk/refill options, and drive public visibility
Packaging Manufacturers	High	Redesign packaging systems and invest in reusable product lines
Academia and Research Institutions	Medium	Lead R&D on biodegradable materials, product testing, and design validation
NGOs & CSOs	Medium	Raise public awareness, influence consumer behaviour, run community pilots
Consumers & Households	High (Behavioural Power)	Key drivers of market uptake and behavior change
Local Entrepreneurs & SMEs	Medium	Develop and distribute affordable reusable packaging and refilling stations
Municipal Authorities (MMDAs)	Medium	Support local policy enforcement and community engagement
Standards Authority & GSA	Medium	Develop packaging and eco-labeling guidelines

7.2 Stakeholder Engagement & Capacity Building

The following have been suggested as strategies for ensuring continuous participation and adaptation

7.2.1 Formal Inclusion of Informal Sector:

The informal sector plays a critical yet undervalued role in Ghana's plastic waste management system, collecting, aggregating, and supplying large volumes of post-consumer plastics to recyclers. Informal collectors handle up to 60–70% of all post-consumer plastic in urban areas but remain excluded from formal policy, funding, and infrastructure decisions. To ensure inclusive and sustainable circular economy outcomes, the opportunity mapping will promote the structured engagement and empowerment of informal waste workers through the following actionable measures:

1. Register and formalise cooperatives,
2. Provide legal identity cards, occupational safety training, and financial literacy programs.
3. Occupational Safety and Skills Training
4. Financial Literacy and Inclusion: tailored financial literacy workshops
5. Incentive-Based Integration: Capacity Building for Policy Makers and Regulators, Specialised training on Extended Producer Responsibility (EPR), Workshops on circular economy enforcement, market incentives, and waste monitoring.

7.4.2 Capacity Building for Policy Makers and Regulators

The effective implementation of circular economy interventions requires that policymakers and regulators possess a deep and up-to-date understanding of both the technical principles and policy instruments that drive successful transitions. In Ghana, although policy frameworks such as the National Plastic Management Policy and the draft Extended Producer Responsibility (EPR) Scheme are emerging, enforcement capacity and inter-agency coordination remain weak. To strengthen institutional leadership and regulatory readiness, this project will support targeted capacity-building initiatives for government actors at the national and sub-national levels, which will include the ff:

1. Specialized training on Extended Producer Responsibility (EPR),
2. Workshops on circular economy enforcement, market incentives, and waste monitoring.
3. Capacity Building for Policy Makers and Regulators, Specialised training on Extended Producer Responsibility (EPR),
4. Workshops on circular economy enforcement, market incentives, and waste monitoring.

7.4.3 Technical Skills Development

As Ghana scales up its circular economy infrastructure, the availability of skilled technicians, entrepreneurs, and value chain operators will be a key success factor. The transition from basic aggregation to advanced recycling and upcycling demands not only hands-on technical training but also a business mindset that enables local actors to manage viable enterprises. The following are some actions that can boost the technical skills of the key actors and recyclers.

1. Technical training on Recycling technologies (e.g., extrusion, pelletizing, plastic-to-fuel),
2. Business skills for recyclers, aggregators, and upcyclers.
3. Recognition and Certification: 7.2.3 Technical Skills Development, Recycling technologies training (e.g., extrusion, pelletizing, plastic-to-fuel), Business skills for recyclers, aggregators, and upcyclers.

7.4.4 Continuous Public Awareness Campaigns:

Public awareness and behaviour change are central to the success of Ghana's transition to a circular plastics economy. Behavioural change campaigns in Ghana are most effective when they are community-led, visually engaging, and culturally resonant. Many Ghanaians, especially youth, spend more time on mobile and social media than traditional platforms, making these critical tools for scale. Past initiatives (e.g., cholera campaigns, voter mobilisation drives) have shown that consistent, targeted messaging across multiple channels leads to lasting change.

Without active participation from consumers, households, and businesses, efforts in recycling, source segregation, and reusable packaging adoption will fall short. Therefore, sustained and inclusive communication strategies are needed to reshape public perception and inspire action at the community level.

- Behaviour changes communications (e.g., "Separate at Source" initiatives),
- Use of mobile technology and social media to drive community action.
- Social Media and Influencer Campaigns

7.4.5 Incentives for Private Sector Innovation:

Private sector actors (including recyclers, packaging manufacturers, logistics providers, and technology start-ups) play a central role in driving circular economy solutions. However, many of these actors face high upfront costs, regulatory uncertainty, and limited access to affordable finance, which often discourage innovation and scaling.

- Green investment tax incentives,
- Priority access to circular economy grant funds
- Preferential Procurement for Green Products
- Access to Finance and Business Development Services

8

Measurement, Monitoring, and Continuous Improvement

8.0 Measurement, Monitoring, and Continuous Improvement

Measurement, monitoring, and continuous improvement involve systematically assessing performance through data collection, tracking progress over time, and using insights gained to make ongoing enhancements to processes, products, or outcomes. In the plastic value chain business, it involves systematically tracking key performance indicators (such as collection rates, recycling efficiency, and contamination levels), regularly assessing operations against set targets, and implementing iterative changes to optimise resource use, reduce waste, and enhance sustainability outcomes.

8.1 Monitoring, Evaluation, and Reporting Framework

Activities in monitoring, evaluation, and reporting (MER) framework include:

8.1.1 Progress Tracking

- Collection and transport logs for waste volumes,
- Plant operational reports and landfill audits,
- Training certification and participant records for workforce integration,
- Retail and supplier data for consumer behaviour change.

8.1.2 Data Collection Methods

- Monthly waste audits,
- Quarterly site inspections (collection hubs, refill stations),
- Bi-annual PPP contract reviews,
- Annual landfill diversion assessments,
- Annual consumer market surveys.

8.1.3 Data Sources

- Municipal waste authorities
- Recycling plants
- Landfill operators
- Retailers
- NGOs
- private sector partners.

8.1.4 Responsible Parties

- M&E Officers,
- Project Field Coordinators,
- Investment Promotion Units,
- SME Support Units,
- Business Engagement Specialists.

8.2 Feedback Loops for Continuous Improvement

The strategy for feedback to enhance continuous improvement include leveraging on the lessons learnt and refinement approaches. The Logical framework and the assumptions for the key performance indicators are presented in Tables 12 and 13.

8.2.1 Lessons Learnt Mechanisms:

- Quarterly stakeholder reflection meetings (municipalities, informal sector, private sector),
- Semi-annual workshops to review hub and recycling plant performance,
- Adaptive management strategies where KPIs are updated based on emerging challenges (e.g., new SUP alternatives, new recycling technologies).

8.2.2 Refinement Approaches

Revise incentive schemes based on collection and recycling performance,
Adjust public awareness campaigns based on consumer adoption data,
Pilot new technologies in small-scale sites before scaling nationally.

8.3 Reporting Framework

Table 14 highlights the reporting framework for activities within the logical framework for activities in the plastic value chain. The element in the framework includes reporting timelines, and reporting channels

8.3.1 Reporting Timelines:

- **Monthly** internal tracking reports (collection and recycling volumes),
- **Quarterly** progress reports to stakeholders (community hubs, refill stations),
- **Semi-Annual** updates on PPP projects and private sector engagement,
- **Annual** impact reports covering landfill diversion rates, Single-Use Plastics (SUP) reduction, and employment outcomes.

8.3.2 Reporting Channels:

- Stakeholder roundtables,
- Public dissemination (e.g., government portals, NGO newsletters),
- Private-sector investor briefs,
- Community forums for informal sector feedback.

Table 19: Logical Framework for Prioritized Circular Economy Opportunities

Opportunity	Key Performance Indicators (KPIs)	List of Activities	Measurement Indicators	Means of Verification
Enhance Collection & Sorting	1. Achieve a 30% increase in plastic waste collection volume in 2 years 2. Establish at least 50 community-based collection hubs 3. Formalize and integrate 40% of informal waste pickers into organized waste value chains	1. Establish community and industrial collection hubs 2. Implement deposit-return schemes for plastics 3. Develop training and certification programs for informal collectors	1. Tons of plastic waste collected monthly (baseline vs target) 2. Number of hubs operational 3. Number of collectors trained and certified	1. Collection and transport logs 2. Hub operational reports 3. Training completion certificates
Scale-Up Recycling & Recovery	1. Increase national recycling capacity by 25% within 3 years 2. Establish 5 new recycling and recovery plants (including at least 2 piloting plastic-to-fuel technology) 3. Achieve 20% reduction in landfill-disposed plastics	1. Facilitate public-private partnerships (PPP) for recycling plant investments 2. Support SME recyclers through financing, technology transfer, and technical training 3. Pilot innovative recycling technologies (e.g., plastic bricks, plastic fuel conversion)	1. Tons of plastic recycled (monthly/ annually) 2. Number of new plants established 3. Volume of landfill diversion (baseline vs target)	1. Plant operational reports 2. PPP agreements and investment documents 3. Landfill audit and tracking reports

Opportunity	Key Performance Indicators (KPIs)	List of Activities	Measurement Indicators	Means of Verification
Implement Reusable Packaging & Single-Use Plastics (SUP) Alternatives	1. Reduce SUP consumption in key sectors by 35% in 3 years 2. Establish 100 refill/bulk dispensing stations nationwide 3. Achieve a 20% market penetration of biodegradable packaging alternatives	1. Support businesses to develop reusable and refillable packaging solutions 2. Promote biodegradable material innovation through R&D grants and industrial partnerships 3. Launch public-private campaigns encouraging refill/reuse models	1. Retailer SUP sales reduction data 2. Number of refill/bulk stations operational 3. Market share of alternative packaging products	1. Retail market studies 2. Business compliance reports 3. Consumer adoption surveys

Table 20. Assumptions for the Key Performance Indicators

Opportunity	Key Performance Indicator (KPI)	Assumption Behind KPI
Enhance Collection & Sorting	30% increase in plastic waste collection volume in 2 years	Ghana's current formal collection rate is low (approx. 12–14%), and structured initiatives (hubs, deposit schemes) combined with community engagement can drive a 30% increase.
	Establish 50 community-based collection hubs	Urban population centres (Accra, Kumasi, Takoradi, Tamale) can each sustain multiple hubs, with average service radius of 10,000–15,000 residents.
	Formalize and integrate 40% of informal waste pickers	Informal waste sector openness to formalization is achievable through training, incentives, and cooperative models, as demonstrated in other African cities.
Scale-Up Recycling & Recovery	Increase recycling capacity by 25% in 3 years	Establishment of 5 plants (new and expanded) and technical upgrades is sufficient to achieve 25% capacity growth with private-sector investment.
	Establish 5 recycling/recovery plants (including 2 plastic-to-fuel pilots)	Sufficient financial, technical feasibility and public-private partnership (PPP) interest exist; reduced technology costs make pilot plants viable.

Opportunity	Key Performance Indicator (KPI)	Assumption Behind KPI
	Achieve 20% reduction in landfill-disposed plastics	Integrated collection, recycling, and recovery systems will reduce landfilling rates, building on successes in comparable emerging economies.
Implement Reusable Packaging & SUP Alternatives	Reduce SUP consumption by 35% in 3 years	Consumer behaviour is shifting, and national policies on plastics reduction combined with private sector innovation will accelerate SUP phase-out.
	Establish 100 refill/bulk dispensing stations	Retailers and SMEs will participate if given access to grants and infrastructure support, and consumer willingness to use refill models will increase.
	Achieve 20% market penetration of biodegradable packaging alternatives	Cost competitiveness of biodegradable materials will improve through R&D support, tax incentives, and rising environmental consciousness among businesses and consumers.

Table 21. Reporting Framework

Opportunity Area	Activity No.	Activity Description	Stakeholders	Interaction Mechanisms	Reporting Frequency	Reporting Document
1. Enhance Collection & Sorting	1.1	Establish community and industrial collection hubs	MESTI, MMDAs, Retailers, Aggregators	Municipal Plastic Action Committees	Quarterly	Hub Operational Reports
	1.2	Implement deposit-return schemes (DRS)	Producers, Retailers, EPA	Industry Working Group on Collection	Quarterly	DRS Implementation Log
	1.3	Develop training and certification programs	NGOs, Informal Sector, Microfinance Institutions	Informal Sector Association Meetings	Semi-Annually	Training Completion Certificates
2. Scale-Up Recycling & Recovery	2.1	Establish 5 new recycling and recovery plants	Recyclers, MoTI, Private Investors	Industry Working Group on Recycling	Bi-Annually	Recycling Plant Inspection Reports
	2.2	Facilitate PPPs for plant investments	MoTI, World Bank, National Development Bank	National Stakeholder Coordination Platform	Annually	Signed PPP Agreements

Opportunity Area	Activity No.	Activity Description	Stakeholders	Interaction Mechanisms	Reporting Frequency	Reporting Document
	2.3	Support SMEs with finance, tech transfer, training	Circularity Capital, UNDP, Academia	Circular Economy Innovation Forum	Annually	SME Support Progress Reports
	2.4	Pilot plastic-to-fuel and plastic brick technologies	UNDP, Small Recyclers, Research Institutions	Online Circularity Knowledge Hub	Bi-Annually	Technology Pilot Evaluation Reports
3.Reusable Packaging & SUP Alternatives	3.1	Support development of reusable packaging solutions	Packaging Firms, Retailers, MESTI	Industry Working Group on Reuse	Quarterly	Reusable Packaging Development Logs
	3.2	Promote R&D for biodegradable packaging	Academia, Research Institutions, NGOs	Public-Private Academic Collaboration	Annually	R&D Progress Reports
	3.3	Launch refill/reuse consumer campaigns	Communities, NGOs, Retailers	Social Media, Retail Network Campaigns	Quarterly	Consumer Campaign Reports
	3.4	Establish 100 refill/bulk dispensing stations	Retailers, Local Business Owners, Associations	Local Retailer Partnerships	Quarterly	Retail Station Site Inspection Reports

9

Conclusion & Recommendations

9.0 Conclusion & Recommendations

This study has underscored the urgent need for systemic transformation in Ghana's plastic value chain. The country's plastics economy remains predominantly linear, resulting in significant resource loss, environmental degradation, and missed economic opportunities. Despite notable efforts, recycling rates remain low while mismanaged plastic waste continues to burden natural ecosystems. However, the analysis also reveals promising circular economy opportunities that, if properly leveraged, can transform plastic waste from an environmental liability into a driver of sustainable economic growth, job creation, and climate resilience.

9.1 Policy and Business Recommendations for Fostering Circularity

To foster a transition toward a circular plastics economy, a combination of policy reforms, private sector incentives, and social innovations is essential:

9.1.1 Strengthen Extended Producer Responsibility (EPR) Enforcement

EPR should not only be a voluntary practice but enforced with legal mandates requiring producers to manage the lifecycle of their products. This will shift the financial and physical burden of waste management from public authorities to producers, encouraging sustainable design and collection systems.

9.1.2 Incentivize Circular Business Models

Governments should establish financial incentives, such as tax relief and green financing options, for businesses that integrate recycled materials, adopt modular design principles, or invest in waste reduction technologies. This would lower barriers to innovation and encourage early adopters.

9.1.3 Develop Mandatory Source Segregation Policies

Municipal regulations must require separation of plastics at the household and commercial levels, supported by widespread education and provision of differentiated waste bins to reduce contamination rates.

9.1.4 Formalize and Support the Informal Sector

Waste pickers and small aggregators must be integrated into formal systems through certification, training, and access to social security, thereby enhancing material recovery rates and improving livelihoods.

9.1.5 Expand Local Recycling Capacity

Decentralised recycling hubs in key regions would reduce logistical costs, stimulate local economies, and ensure higher recovery rates of plastics, especially in underserved secondary cities.

9.1.6 Promote Circular Public Procurement

The government should lead by example by prioritising procurement from suppliers that use recycled materials and adhere to sustainable practices, thus creating a reliable market for circular products.

9.1.7 Implement Plastic Consumption Levies

A carefully structured levy system on non-recyclable plastics could both discourage consumption and generate dedicated funds to support circular infrastructure projects.

9.4 Roadmap for Further Research and Implementation Strategies

Future research must focus on deepening the evidence base for practical circular interventions:

9.4.1 Research on Alternative Materials and Eco-Design

Focused investment into bio-based materials suited to local contexts, such as cassava starch-based packaging or coconut fiber composites, can foster local innovation ecosystems.

9.4.2 Material Flow and Leakage Hotspot Mapping

High-resolution mapping of plastic leakage will inform targeted interventions in critical areas such as stormwater drains, coastal communities, and markets.

9.4.3 Behavioural Studies on Waste Segregation

Behavioural science research will be essential to designing effective public awareness campaigns and nudge interventions that drive behavioural change.

9.4.4 Innovation Pilots in Informal Sector Integration

Digital platforms could streamline transactions between collectors and recyclers, ensuring traceability, transparency, and fair pricing.

9.4.5 Circular Finance Mechanisms

Blended finance models should be piloted to de-risk private sector investment in recycling infrastructure and green SMEs.

9.4.6 Ecosystem Mapping and Cluster Development

Building innovation hubs where recyclers, designers, and policymakers collaborate can accelerate market development for circular products.

9.5 Proposed Next Steps for Stakeholders

Every actor across the plastics value chain must take deliberate steps to contribute to the circular transition:

Government:

- Immediate: Update national policies to mandate source segregation and ban problematic single-use plastics.
- Medium-Term: Build 10–15 decentralised material recovery centres in key cities within three years.
- Long-Term: Embed circular economy targets in Ghana's National Development Plan by 2030.

Private Sector

- Immediate: Conduct plastic footprint assessments and set internal targets for recycled content.
- Medium-Term: Establish partnerships with recyclers and startups innovating in circular solutions.
- Long-Term: Invest in R&D for circular product innovation and sustainable packaging alternatives.

Informal Sector

- Immediate: Form cooperatives or associations to collectively negotiate for better prices and training opportunities.
- Medium-Term: Collaborate with municipalities to deliver last-mile collection services formally.

Development Partners and NGOs

- Immediate: Launch grant schemes and incubation support for circular economy startups.
- Medium-Term: Support national data generation initiatives to strengthen policy monitoring and evaluation frameworks.
- Long-Term: Facilitate cross-border partnerships to scale up successful models regionally.

9.6 Way Forward: Innovative Opportunities and Identified Gaps

The analysis points to several promising opportunities as well as critical gaps:

Innovative Opportunities

- Plastic-to-Construction Materials: Scaling enterprises that convert waste plastics into construction bricks, tiles, and road paving materials.
- Digital Circularity Solutions: Platforms using blockchain and AI to ensure transparent plastic tracking from production to recycling.
- Design for Disassembly: Promoting product design that allows easy dismantling and recycling of parts.

- *Gaps Identified:*
  Data Gaps: There is an urgent need for granular, timely data on plastic flows, recovery rates, and recycling markets.
- Policy Coherence: Aligning national, regional, and municipal policies to ensure synergistic action.
- Consumer Awareness: Public education campaigns on circular economy benefits remain sporadic and need to be institutionalised.
- Financial Accessibility: Innovative SMEs, particularly those in recycling and reuse, need better access to affordable, long-term financing.

In moving forward, Ghana must integrate circular economy principles not as isolated pilot projects but as an overarching economic and industrial strategy. Bold leadership, targeted investment, regulatory reforms, and broad-based behavioural shifts will be required to unlock the full potential of plastic waste as a valuable resource rather than an environmental burden.

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10 Appendices

10 Appendices

Data Collection Instrument for Informal actors: collectors/aggregators

UNIDO PLASTIC VALUE CHAIN LEAD
FOR THE CENTER OF EXCELLENCE FOR CIRCULAR ECONOMY
IN GHANA

Value Chain Opportunity Mapping and Baseline Assessment

Dear Participant,
Thank you for taking the time to complete this survey. This study is part of a project funded by Global Affairs Canada (GAC) and Implemented by the United Nations Industrial Development Organisation (UNIDO) in partnership with the Ministry of Environment, Science and Technology to establish a **Centre of Excellence for Circular Economy** in Ghana. The Centre aims to promote sustainable and innovative solutions for circularity, foster collaboration among stakeholders, and advance circular economy practices in Ghana.

As part of this initiative, the project has identified three priority sectors—plastics, textiles, and agriculture & agro-processing—as key focus areas for advancing the circular economy transition. Among these, the plastics sector will involve value chain leads who will play a strategic role in managing and promoting circular economy practices. These leads will drive collaboration, inclusivity, and innovation within their respective sectors, ensuring a more effective and sustainable transition.

The survey is aimed at collecting relevant data on the various plastics value chains, the potential opportunities, ecosystem institutions, and performance measurement systems. We deeply appreciate your valuable input, which will contribute to shaping a more sustainable future for Ghana.
Thank you for your time and support.

Informed Consent
Before we begin, I would like to seek your consent. Your participation is completely **voluntary**, and you are free to withdraw at any time. Your responses will be **kept confidential** and used only for research purposes.

Please let me know if you agree to participate by responding to the following:

→ Do you consent to be audio recorded for accuracy purposes? ☐ Yes ☐ No
→ Do you consent to being photographed during this interview? ☐ Yes ☐ No
→ Do you have any questions or concerns before we begin? ☐ Yes ☐ No (If yes, please address the respondent's questions)
→ May I proceed with the interview now? ☐ Yes ☐ No

If the respondent declines to participate or has concerns, kindly address their questions and reassure them. If they still choose not to proceed, politely thank them for their time and terminate the interview

GENERAL INFORMATION/FIRM DESCRIPTION	
Organisation/Role:	*Location of organisation (town/city):*
Age range: ☐ 15-24 ☐ 25-34 ☐ 35-44 ☐ 45-54 ☐ 55-64 ☐ 65-74 ☐ 75-84 ☐ 85+	*Sex:* ☐ Male ☐ Female
Educational Level:	*How long have you been working in plastic waste activities?*
What is your primary role: ☐ Waste Picker (collecting from streets, landfills, or homes) ☐ Aggregator (buying from collectors and selling in bulk) ☐ Transporter ☐ Others (Please specify)	*How many employees do you have?*

PLASTIC COLLECTION, SORTING AND AGGREGATION	
Which types of plastic do you mostly collect? (Select all that apply)	
☐ Polyethylene Terephthalate (PET) – Beverage bottles, food containers	☐ Polypropylene (PP) – Bottle caps, food containers, straws, Gallons, Chairs, Tables, Bottles
☐ High-Density Polyethylene (HDPE-Film) – packaging materials including shopping bags, water sachets	☐ Polystyrene (PS) – Disposable cutlery, foam cups, packaging peanuts
☐ High-Density Polyethylene (HDPE-Hard) - Bottles, Containers, Water pipes, water tanks	☐ Polyvinyl Chloride (PVC) – Pipes, flooring materials, medical waste
☐ Low-Density Polyethylene (LDPE) – Shopping bags, shrink wraps, squeeze bottles	☐ Plastics from waste electronic devices
☐ Low Low-Density Polyethylene (LLDPE) used in wrapping, e.g. suitcases at airports etc.	☐ Others (please specify): ....

Which areas or locations are these materials mostly found		
☐ Urban drainage systems and gutters	☐ Open dumpsites and landfills	☐ Roadside and public transport stations
☐ Coastal areas and beaches	☐ Rivers and water bodies	☐ Markets and commercial areas
☐ Residential areas	☐ Industrial areas	☐ Other (please specify):

On average, how much plastic waste do you collect per week (in tonnes)		*On average, how much plastic waste do you transport to be sold per week (in tonnes)*	

What activities do you perform after collection? (Select all that apply):					
☐ Cleaned and Sorted by type (e.g., PET, HDPE, LDPE)	☐ Only cleaned, no sorting	☐ labelling	☐ aggregation	☐ weighing	☐ Others

During plastic collection, do you also generate waste that cannot be sold or recycled?	☐ Yes ☐ No	How much waste do you generate during collection, sorting and aggregation per month?	...............sacks		
If yes, what types of waste do you generate while collecting, sorting, or transporting plastic waste? (Select all that apply)					
☐ Non-recyclable plastics (e.g., multi-layer packaging, Styrofoam)	☐ Contaminated or dirty plastics that cannot be sold	☐ Organic waste mixed with plastics (food, leaves, etc.)	☐ Broken plastic that cannot be processed	☐ Others (Please specify):	
On average, how much of this waste do you generate per collection cycle					
☐ Less than 5% of total collected plastic	☐ 5–10% of total collected plastic	☐ 11–20% of total collected plastic	☐ More than 20% of total collected plastic		
How do you usually handle or dispose of the waste generated during collection and sorting? (Select all that apply)?					
☐ Burn it	☐ Dump it in open spaces or drains	☐ Sell or give it to someone else for use	☐ Left in the open spaces	☐ sent to regulated landfill	☐ Others (Please specify):

Would you be interested in solutions that help reduce the waste generated during collection and sorting? (Select all that apply):					
☐ Yes, I need better sorting tools	☐ Yes, I need buyers for all plastic types	☐ Yes, I need training on better waste handling	☐ Source separation by households	☐ Access to machines	☐ Others

Where does uncollected plastic waste typically end up? (Select all that apply):					
☐ Water bodies (rivers, lakes, etc.)	☐ Informal dumpsites	☐ Burned openly	☐ Left in the environment	☐ sent to regulated landfill	☐ Others (Please specify):

How do you transport the plastic waste you collect?	☐ tricycle ☐ truck ☐ carts ☐ Headload	*How far do you transport plastic waste before selling*	☐ Within 1 km ☐ 1–5km ☐ 6–10km ☐ More than 10km	*Where do you sell or deliver the collected plastic?*	☐ Middlemen ☐ Recycling companies ☐ Local businesses ☐ Informal markets

EFFICIENCY IN COLLECTION, WASTE PICKING, AND AGGREGATION				
What percentage of plastic waste generated is collected for processing?				
☐ < 25%	☐ 25–50%	☐ 50–75%	☐ > 75%	☐ Not Sure

Where does uncollected plastic waste typically end up? (Select all that apply):					
☐ Water bodies (rivers, lakes, etc.)	☐ Informal dumpsites	☐ Burned openly	☐ Left in the environment	☐ sent to regulated landfill	☐ Others (Please specify):

What are the main causes of uncollected plastic waste in your area? (Select all that apply)		
☐ Poor collection systems	☐ Inefficient transportation of waste	☐ Lack of infrastructure for processing
☐ Lack of segregation practices	☐ Improper management by the informal sector	☐ Others (Please specify): ....

On average, how long does it take to collect enough plastic waste to sell?:					
☐ Less than 1 day	☐ 1 to 5 days	☐ 1 to 2 weeks	☐ 2 to 3 weeks	☐ more than 3 weeks	☐ Others (Please specify):

What are the most common contaminants in plastic waste?				
☐ Organic waste (food, leaves, etc.	☐ Hazardous waste (chemicals, sharp objects)	☐ Mixed plastics that cannot be separated	☐ Burns and other damages	☐ Others:

In your view, what percentage of the plastic waste:		
Is collected...........%	Is reused.................. %	Is disposed (landfill/open dumps): .... %
Is recycled........... %	Leaks into water bodies/informal dumps: .... %	

How often Do you wash plastics before selling	☐ most often ☐ often ☐ not	*Where do you get water for washing plastics*	☐ Public tap ☐ Well/ borehole ☐ River/ stream ☐ Others: ___________	*How many buckets (15Ltre) of water are used per day for washing plastics*	☐ 1–3 buckets ☐ 4–6 buckets ☐ More than 6 buckets
What happens to the dirty water after washing	☐ Poured into the drain or gutter ☐ Poured into a river or stream ☐ Left to soak into the ground ☐ Treated and Reused for another washing cycle	*How much of the plastic you collect cannot be sold or recycled?*	☐ Less than 10% ☐ 10–30% ☐ 31–50% ☐ More than 50%	*What do you do with the plastic waste that you cannot sell*	☐ Leave it at collection sites/dumps ☐ Burn it ☐ Throw it away in an open space ☐ Sell/ give it to someone else

What are the major inefficiencies in the plastic waste collection system? (Select all that apply):		
☐ Low collection capacity	☐ Low plastic waste collection rates	☐ High pollution due to outdated technology
☐ High contamination rates in waste	☐ High operational costs for recycling businesses	☐ Lack of proper waste segregation at source
☐ Limited access to collection systems	☐ High energy/water consumption	☐ Others (Please specify):

EMISSIONS AND RESOURCE INTENSITY DURING COLLECTION & TRANSPORTATION				
What percentage of plastic waste generated is collected for processing?				
☐ < 25%	☐ 25–50%	☐ 50–75%	☐ > 75%	☐ Not Sure

Do you use motorized transport (e.g., trucks, motorcycles) for plastic waste collection?	☐ Yes ☐ No	If yes, how frequently do you use motorized transport	☐ Daily ☐ 2–3 times a week ☐ Weekly ☐ Occasionally	What is the primary fuel source used for transport?	☐ Petrol ☐ Diesel ☐ Gas ☐ Electric
How many trips do you make per month for transporting plastic waste?	☐ 1–3 trips ☐ 4–7 trips ☐ 8–10 trips ☐ More than 10 trips	Do you burn plastic waste as part of your work?	☐ Yes ☐ No	How much plastic do you estimate is lost due to inadequate sorting/ burning or other disposal methods?	☐ Less than 10% ☐ 10–30% ☐ 31–50% ☐ More than 50%
How many gallons of fuel do you use per month to transport aggregated plastic before selling	☐ < 10 gal ☐ 10-20 gal ☐ 20-30 gal ☐ > 20 gal	How far do you travel before selling your plastics	☐ Within the town (0 – 10 miles), ☐ To another city (10 – 50 miles), ☐ Across multiple regions (50 – 150 miles)	How far do you travel before gathering enough plastics to sell	☐ Within the town (0 – 10 miles), ☐ To another city (10 – 50 miles), ☐ Across multiple regions (50 – 150 miles)
Do you lose plastics while transporting them (e.g., plastics falling off, being stolen, getting damaged	☐ Yes, a lot ☐ Yes, sometimes ☐ No, not at all	What causes plastic waste loss during transportation	☐ Plastics falling off the vehicle ☐ Buyers rejecting part of the load ☐ Accidents ☐ Others:	How many bags/sacks of plastic can the vehicle carry per trip ***NB: Probe for the weight of a sack***	☐ 1–5 sacks ☐ 6–10 sacks ☐ 11–20 sacks ☐ More than 20 sacks
What is the condition of the truck you use					
☐ New (less than 3 years old)	☐ Used but in good condition (3–10 years old)	☐ Old and requires frequent repairs (more than 10 years old)	☐ Very old and inefficient (more than 15 years old)	☐ Very old and inefficient and does not pass DVLA road worthy criteria	

Does the vehicle produce visible smoke while transporting plastic		
☐ No smoke	☐ Light smoke sometimes	☐ Heavy smoke all the time
What challenges do you face with transporting plastic waste?		
☐ Fuel is too expensive	☐ Vehicle breaks down frequently	☐ Roads to collection sites are bad

ECONOMIC AND SOCIAL CONTEXT					
Can you provide an estimate of the number of people in your community employed in plastic waste sector?					
☐ Waste pickers		☐ Aggregators:		☐ Sorters:	
What percentage of your workforce consists of youth (aged 18 – 35 years)	☐ <10% ☐ 10–30% ☐ 30–50% ☐ >50%	What percentage of your workforce consists of women	☐ <10% ☐ 10–30% ☐ 30–50% ☐ >50%	What percentage of your income (or that of informal workers) is derived from plastic waste-related activities?	☐ <10% ☐ 10–30% ☐ 30–50% ☐ >50%
Are some of your workers persons with disabilities	☐ Yes ☐ No	If yes, how many persons with disabilities are employed in your company		☐ 1 – 5 employees ☐ 6 – 10 employees ☐ More than 10 employees	
What roles do women, youth, and persons with disabilities typically perform in your company? (Select all that apply)					
☐ Plastic waste picking	☐ washing and cleaning		☐ Aggregating	☐ Others	

OPERATIONAL AND FINANCIAL CHALLENGES			
What are the main challenges/barriers associated with plastic waste management? (Tick as many as applicable).			
☐ Lack of infrastructure	☐ Lack of funding	☐ High operational costs	☐ Low demand for products made from recycled plastic
☐ Limited public awareness	☐ Low public participation in source separation	☐ Too many regulatory hurdles	☐ Lack of technology
☐ Inefficient transportation	☐ No funding support	☐ Others (Please specify):	

What would make it easier for you to collect, sort, and sell enough plastic waste			
☐ Resources to increase collection efficiency	☐ Public awareness campaigns	☐ Set up a community-based collection	☐ Encouraging source segregation
☐ Enhance recycling infrastructure	☐ Develop circular economy solutions	☐ Training on the types and how to sort plastics better and know their value	☐ Others (Please specify):

STAKEHOLDERS, ECOSYSTEM INSTITUTIONS

Who are the important institutions who help or regulate your work in the plastic waste business? (Select all that apply):		
☐ Government institutions (EPA, MEST, MMDAa)	☐ International development partners	☐ Private sector (e.g., manufacturers, recyclers)
☐ NGOs and community-based organisations	☐ Associations among informal sector	☐ Others (Please specify):

What kind of help do you think these groups (above) should give to make your work better? (Select all that apply):		
☐ Make rules to support our work and protect us	☐ Give training on how to collect, sort, or recycle plastics better	☐ teach people in the community about plastic waste and the importance of segregating it
☐ Give money, tools, or equipment to help our work	☐ Bring machines or technology to make the work easier	☐ Others (Please specify):

How can the institutions you identified work together to support your work? (Select all that apply):		
☐ Hold regular meetings with everyone involved (government, companies, collectors)	☐ Organize workshops or training programs every year on recycling and plastic waste	☐ Support waste collection programmes in the communities (giving free bins, organizing pickups)
☐ Share information online about opportunities, prices, and training	☐ Work with schools or community leaders to collect information and teach others	☐ others:

Data Collection instrument for manufacturers/Importers/Distributors

UNIDO PLASTIC VALUE CHAIN LEAD
FOR THE CENTER OF EXCELLENCE FOR CIRCULAR ECONOMY
IN GHANA

Value Chain Opportunity Mapping and Baseline Assessment

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As part of this initiative, the project has identified three priority sectors—plastics, textiles, and agriculture & agro-processing—as key focus areas for advancing the circular economy transition. Among these, the plastics sector will involve value chain leads who will play a strategic role in managing and promoting circular economy practices. These leads will drive collaboration, inclusivity, and innovation within their respective sectors, ensuring a more effective and sustainable transition.

The survey is aimed at collecting relevant data on the various plastics value chains, the potential circular opportunities, ecosystem institutions, and performance measurement systems. We deeply appreciate your valuable input, which will contribute to shaping a more sustainable future for Ghana.
Your responses will be treated with the utmost confidentiality and used solely for this project. Participation is voluntary, and you may withdraw from the survey at any time.
Thank you for your time and support.

GENERAL INFORMATION	
Name/Description of Organisation:	*Role:*
Age range: ☐ 15-24 ☐ 25-34 ☐ 35-44 ☐ 45-54 ☐ 55-64 ☐ 65-74 ☐ 75-84 ☐ 85+	*Sex:* ☐ Male ☐ Female
Educational Level:	*How long have you been working in plastic sector?*
What role do you play in the upstream plastic sector ☐ Local producer/manufacturer ☐ Distributor ☐ Importer ☐ Others (Please specify):	Location (Town/City):

RAW MATERIAL SOURCING, PRODUCTION AND DISTRIBUTION				
What type of raw materials do you primarily use for plastic production? (Select all that apply)?				
☐ Virgin plastic (newly produced from fossil fuels)	☐ Recycled plastic	☐ Biodegradable plastics	☐ Others (Please specify)	
Where do you source your raw materials from? (Select all that apply)				
☐ Local suppliers/ manufacturers within Ghana	☐ Importers/ distributors in Ghana	☐ Direct import from foreign manufacturers	☐ Informal sector/recyclers for secondary raw materials	
What percentage of your plastic products are made from waste recycled materials				
☐ 0% (we only use virgin plastic)	☐ 1–25%	☐ 26–50%	☐ 51–75%	☐ More than 75%
What are the main reasons for using virgin plastic instead of recycled plastic? (Select all that apply)				
☐ Lack of sufficient supply of quality recycled plastic	☐ Higher cost of recycled plastic compared to virgin plastic	☐ Quality concerns with recycled plastic	☐ Regulatory or certification requirements	☐ Other (please specify):
Do you generate waste such as rejects or scraps during plastic production? ☐ *Yes* ☐ *No*				
If yes, what happens to plastic waste generated during production? (Select all that apply)				
☐ Reused in production as secondary raw material	☐ Sold to recycling companies or waste aggregators	☐ Disposed of in landfills or dumpsites	☐ Incinerated (burned) for energy recovery	☐ Stored temporarily due to lack of recycling options
How much of your production waste is recycled or reused in-house?				
☐ 0%	☐ 1%–25%	☐ 26%–50%	☐ 51%–75%	☐ More than 75%
What measures have you implemented to improve production efficiency? (Select all that apply)				
☐ Upgraded to energy-efficient machines	☐ Reduced raw material usage through design optimization	☐ Automated processes to reduce manual errors	☐ Implemented quality control systems to reduce rejections	☐ Other (please specify)
If you import plastic to resell, what type of plastics do you import (For importers/Distributors)				
☐ Virgin plastic resins (e.g., PET, HDPE, LDPE, PP, PVC)	☐ Recycled plastic pellets or flakes	☐ Fully processed plastic products	☐ Other (please specify)	

What type of plastic products do you manufacture? (Select all that apply)					
☐ Packaging materials (e.g., bottles, containers, wrappers)	☐ Household Products (e.g., Buckets, kitchenware, chairs)	☐ Construction materials (e.g., PVC pipes and fittings)	☐ Agricultural Products (e.g., bottles, containers, wrappers)	☐ Industrial Products (e.g Plastic pallets and crates, drums, tanks)	☐ others.

What is the estimated volume of plastic your company produces or distributes per month?			
☐ Less than 10 tonnes	☐ 10 – 50 tonnes	☐ 51 – 100 tonnes	☐ More than 100 tonnes

RESOURCE AND EMISSION INTENSITY DURING PLASTIC PRODUCTION		
How much water (in litres) do you use per tonne of plastic processed for the following activities?		
Washing: ________litres/tonne	Cooling: _________ litres/ tonne	Other processes: _______litres/ tonne

Can you estimate the amount of greenhouse gases (GHG) released from plastic production				
☐ Less than 100 kg CO_2-eq/tonne	☐ 100–300 kg CO_2-eq/tonne	☐ 301–500 kg CO_2-eq/tonne	☐ More than 500 kg CO_2-eq/ tonne	☐ Not sure

What type of energy do you mainly use in production?			
☐ Electricity (national grid)	☐ Diesel generators	☐ Renewable energy (solar, etc.)	☐ Others (please specify):

What is the end-of-life destination of your products? (Estimate percentage for each):				
☐ Recycled domestically: _______%	☐ Recycled abroad: _________%	☐ Landfilled: _________%	☐ Incinerated: _________%	☐ Open dumping: _________%

What kind of waste is generated during production? (Select all that apply)			
☐ Off-cuts and scraps (e.g., trimmings, defective items)	☐ Dust (e.g., grinding, shredding processes)	☐ Sludge from washing/recycling	☐ Other (please specify):

How much finished product (plastic items) is rejected due to quality issues per production batch?			
☐ Less than 1%	☐ 1–5%	☐ 6–10%	☐ More than 10%

How do you manage water discharged from cooling or washing operations?				
☐ Treated before discharge	☐ Discharged untreated	☐ Treated and reused in the factory	☐ Sent to external treatment facility	☐ Others

If you reuse water, on average, how many times do you reuse water in your production or recycling process before disposal?				
☐ We don't reuse water	☐ 1–2 times	☐ 3–5 times	☐ More than 5 times	☐ Not sure
What measures have you taken to reduce emissions and waste?				
☐ Switched to energy-efficient machines	☐ Reduced raw material usage	☐ Recycled production waste	☐ Installed air/ water pollution controls	☐ None yet
If you produce some plastic products using recycled plastic materials, how does the energy required to process recycled plastic compare to processing virgin (new) plastic materials				
☐ Much lower for recycled plastics	☐ Slightly lower for recycled plastics	☐ About the same	☐ Higher for recycled plastics	☐ Not sure
If you produce some plastic products using recycled plastic materials, how does the water consumption required to process recycled plastic compare to processing virgin (new) plastic materials				
☐ Much lower for recycled plastics	☐ Slightly lower for recycled plastics	☐ About the same	☐ Higher for recycled plastics	☐ Not sure

PLASTIC WASTE COLLECTION AND RECOVERY			
On the average, how long is your plastic product typically used before disposal?			
☐ Less than 1 day (single-use plastic)	☐ 1 week – 1 month	☐ 1 month – 1 year	☐ More than 1 year
What happens to your plastic products after use? (Select all that apply)			
☐ Collected for formal recycling	☐ Collected and sold to informal waste pickers	☐ Disposed of in general waste (landfills, dumpsites)	☐ Reused for other purposes by consumers
Do you provide take-back programs or incentives for recycling your plastic products? ☐ Yes ☐ No			
What percentage of your plastic products are likely to be collected after use?			
☐ Less than 10%	☐ 10 – 30%	☐ 31 – 50%	☐ More than 50%
Where does uncollected plastic waste typically end up? (Select all that apply):			
☐ Water bodies (rivers, lakes, etc.)	☐ Water bodies (rivers, lakes, etc.)	☐ Water bodies (rivers, lakes, etc.)	☐ Water bodies (rivers, lakes, etc.)
How is plastic waste typically collected in your area? (Select all that apply)			
☐ Municipal waste collection services	☐ Informal waste pickers and aggregators	☐ Private waste management companies	☐ Community-based collection programs

What are the main causes of uncollected plastic waste in your area? (Select all that apply)		
☐ Poor collection systems	☐ Inefficient transportation of waste	☐ Lack of infrastructure for processing
☐ Lack of segregation practices	☐ Lack of public awareness	☐ Others (Please specify):

In your view, looking at general plastic waste levels in the country, what percentage of the plastic waste:		
Is collected............%	Is reused.................. %	Is disposed (landfill/open dumps): .... %
Is recycled........... %	Leaks into water bodies/sea .... %	Is upcycled.................. %

What steps can be taken to improve collection efficiency? (Select all that apply)		
☐ Collaborating with private waste management companies/informal waste collectors	☐ Providing incentives for source segregation at collection points	☐ Investing in better transportation & logistics for plastic collection
☐ Engaging producer responsible organisations (companies that work on behalf of plastic producers to collect, recycle and dispose off properly)	☐ Investing in collection mechanisms and buy back centers	☐ Others (Please specify)
Do you collaborate with any organizations or agencies to improve plastic collection? ☐ *Yes* ☐ *No*		

ECONOMIC AND SOCIAL IMPACT					
What are the main social benefits or challenges associated with plastic waste management in your area?					
What percentage of the workforce consists of youth (aged 18 – 35 years)					
☐ Less than 10%	☐ 10 – 30%	☐ 31 – 50%	☐ More than 50%		
Does this sector employ persons with disabilities ☐ Yes ☐ No					
What roles do women, youth, and persons with disabilities typically perform in this sector? *(Select all that apply)*					
☐ Plastic waste collection and sorting	☐ Processing and recycling operations	☐ Administrative and managerial roles	☐ Sales and marketing	☐ Logistics and transportation	☐ Others

How has the market demand for plastics changed in the past five years?				
☐ Increased significantly	☐ Increased slightly	☐ Remained the same	☐ Decreased slightly	☐ Decreased significantly
What financial support mechanisms would help businesses in this sector grow? *(Select all that apply)*				
☐ Government subsidies for recycling businesses	☐ Low-interest loans for equipment and expansion	☐ Tax incentives for companies using recycled materials	☐ Grants for innovation in plastic recycling and upcycling	☐ Other (please specify):

OPERATIONAL AND FINANCIAL CHALLENGES			
What are the main challenges/barriers associated with plastic waste management? (Tick as many as applicable).			
☐ Lack of infrastructure (e.g. collection points)	☐ Lack of funding	☐ High costs	☐ Limited demand for products made from recycled plastic
☐ Limited public awareness	☐ Low public participation in source separation	☐ Too many regulatory hurdles	☐ Lack of technology
☐ Inefficient transportation	☐ Limited facilities	☐ Others (Please specify):	

What are the main challenges in respect of infrastructure?		
☐ Limited sorting facilities	☐ Lack of decentralized recycling hubs	☐ Lack of technology to upscale innovations
☐ Insufficient storage capacity	☐ Inadequate waste collection and transportation systems	☐ Other (please specify):.

Are there policies governing plastic waste management in? ☐ Yes ☐ No
If yes, how effective are these policies? (Rate 1–5, where 1 = Not effective and 5 = Very effective):

What are the main challenges with respect to these policies/regulations?	
☐ Weak enforcement of waste management regulations	☐ Lack of incentives for producers to use recycled materials
☐ Absence of strong enforcement of Extended Producer Responsibility (EPR)	☐ Limited government policies supporting circular economy initiatives
☐ Insufficient funding for regulatory bodies to monitor compliance	☐ Others (Please specify):
Are there resources/government incentives/dedicated funds addressing plastic waste? ☐ Yes ☐ No	

If yes, what resources/government incentives (financial, material, human) are readily available to support these initiatives?						
What alternative materials to conventional plastics are currently being promoted or supported by your institution?						
☐ Biodegradable plastics	☐ Compostable packaging materials	☐ Paper-based packaging	☐ Cloth or jute bags	☐ None currently promoted		
What factors make it difficult for manufacturers like your company to invest in or switch to alternatives to plastics? (Select all that apply)						
☐ High production cost of alternative materials	☐ Limited availability of raw materials for alternatives	☐ Low customer demand for alternative products	☐ Lack of technical knowledge and equipment to produce alternatives	☐ Limited government support or incentives	☐ Concerns about the durability or quality of alternatives	☐ Resistance from supply chain partners or customers

INEFFICIENCIES IN WASTE MANAGEMENT AND POTENTIAL OPPORTUNITIES			
What are the main activities in the plastic value chain that contribute to most pollution? (Select all that apply):			
☐ Plastic production	☐ Plastic use/ consumption	☐ Collection/ aggregation	☐ Sorting and pre-processing
☐ Plastic recycling and upcycling	☐ Transportation	☐ Disposal (e.g., incineration or landfill)	☐ Others.............

What are the major inefficiencies in the plastic waste management system? (Select all that apply):		
☐ Low recycling capacity	☐ Low plastic waste collection rates	☐ High pollution due to outdated technology
☐ High contamination rates in waste	☐ High operational costs for recycling businesses	☐ Lack of proper waste segregation at source
☐ Limited access to collection systems	☐ High energy consumption	☐ Others (Please specify): ....
What business opportunities could help keep plastic waste in use for longer, and reduce waste in your area?		

In your view, what plastic waste problems could be turned into business opportunities?				
Based on the problems, describe some opportunities that can be turned into business to solve the problems you have identified.				
How easy or difficult would it be to implement the proposed opportunities/businesses:				
☐ Highly feasible	☐ Moderately feasible	☐ Low feasibility	☐ Difficult	
Are there available resources (money, equipment, skills) to start these opportunities? ☐ Yes ☐ No				
Would training be required to start or develop innovative businesses in circular economy? ☐ Yes ☐ No				
What type of training would be required? (Select all that apply)				
☐ Technical and Vocational Education and Training (TVET)	☐ On-the-job training with experienced recyclers	☐ Online courses and certification programmes	☐ Business management and entrepreneurship training	☐ Others (Please specify)
What specific skills would be required to run a successful circular economy business? (Select all that apply)				
☐ Plastic waste collection, sorting, and segregation techniques	☐ Recycling technology operations	☐ Advanced processing (chemical recycling, plastic-to-fuel conversion)	☐ Upcycling and product development	☐ Business and financial management
☐ Quality control and certification for recycled materials	☐ Policy and regulatory compliance	☐ Digital skills for circularity	☐ Marketing and sales of recycled products	☐ Others (please specify)
What training format would be most effective for skill development? (Select all that apply)				
☐ Hands-on practical workshops	☐ Apprenticeships and mentorship programs	☐ Short-term technical courses (1–3 months)	☐ Long-term vocational training (3 months – 1 year)	☐ Online training with certification

STAKEHOLDERS, ECOSYSTEM INSTITUTIONS AND GOVERNANCE		
Who are the key stakeholders/institutions to collaborate for circular economy opportunities in the plastics sector? (Select all that apply):		
☐ Government institutions (EPA, MEST)	☐ International development partners	☐ Private sector (e.g., manufacturers, recyclers)
☐ NGOs and community-based organisations	☐ Informal waste collectors	☐ Others (Please specify):
What important roles or support must be provided by these stakeholders/institutions? (Select all that apply):		
☐ Policy-making and regulation	☐ Technical support	☐ Community engagement, Advocacy and Awareness programmes
☐ Funding and resource mobilization	☐ Technology/Operations	☐ Others (Please specify):
What forms of engagement among stakeholder would be appropriate to support businesses in the sector? (Select all that apply):		
☐ Regular multi-stakeholder meetings	☐ Joint task forces or working groups	☐ Coordinating with research institutions for data collection and analysis
☐ Online knowledge sharing/ collaboration platforms	☐ Annual circular economy workshops	☐ Facilitating community-based waste collection programmes

Data Collection instrument for Private/formal collectors/recyclers/upcycling firms

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Thank you for your time and support.

Informed Consent
Before we begin, I would like to seek your consent. Your participation is completely **voluntary,** and you are free to withdraw at any time. Your responses will be **kept confidential** and used only for research purposes.

GENERAL INFORMATION/FIRM DESCRIPTION	
Organisation/Role:	*Location (Town/City):*
Age range: ☐ 15-24 ☐ 25-34 ☐ 35-44 ☐ 45-54 ☐ 55-64 ☐ 65-74 ☐ 75-84 ☐ 85+	*Sex:* ☐ Male ☐ Female
Educational Level:	How long have you been working in plastic waste sector?

What plastic waste processing activities do you engage in: ☐ Waste collection company ☐Plastic recycling company ☐ Upcycling business (making new products from waste plastic) ☐ Processed Plastic materials exporting ☐ Others (please specify): ___________	How many employees:	What is your company's daily or monthly waste processing capacity (in tonnes)

PLASTIC COLLECTION AND PROCESSING

What types of plastic do you mostly collect? (Select all that apply)	
☐ Polyethylene Terephthalate (PET) – Beverage bottles, food containers	☐ Polypropylene (PP) – Bottle caps, food containers, straws, Gallons, Chairs, Tables, Bottles
☐ High-Density Polyethylene (HDPE-Film) – packaging materials including shopping bags, water sachets	☐ Polystyrene (PS) – Disposable cutlery, foam cups, packaging peanuts
☐ High-Density Polyethylene (HDPE-Hard) - Bottles, Containers, Water pipes, water tanks	☐ Polyvinyl Chloride (PVC) – Pipes, flooring materials, medical waste
☐ Low-Density Polyethylene (LDPE) – Shopping bags, shrink wraps, squeeze bottles	☐ Plastics from waste electronic devices
☐ Low Low-Density Polyethylene (LLDPE) used in wrapping, e.g. suitcases at airports etc.	☐ Others (please specify): ....

Where do you source most of your plastic waste or raw materials from?		
☐ Informal waste pickers & aggregators	☐ Self-implemented collection points	☐ Roadside and public transport stations
☐ Direct collection from businesses (factories, supermarkets, etc.)	☐ Imported plastic waste from other countries	☐ Markets and commercial areas
☐ Residential areas	☐ Industrial areas	☐ Other (please specify):

What activities do you perform after collection? (Select all that apply):					
☐ Cleaning and Sorting by type or colour (e.g., PET, HDPE, LDPE)	☐ Shredding and crushing	☐ Bailing/ Palletizing	☐ agglomeration	☐ recycling	☐ Others
On average, how much plastic waste do you collect per week (in tonnes)	.... tonnes	*During your plastic collection, do you also generate waste that cannot be sold or recycled?*	☐ Yes ☐ No	*How much waste do you generate during recycling and other processing activities in tonnes)*	.... tonnes

If yes, what types of waste do you generate while collecting, sorting, or transporting plastic waste? (Select all that apply)				
☐ Non-recyclable plastics (e.g., multi-layer packaging, Styrofoam)	☐ Hazardous waste from processing	☐ Organic waste mixed with plastics (food, leaves, etc.)	☐ Residual waste from mechanical recycling	☐ Others (Please specify):

On average, how much of this waste do you generate per processing cycle			
☐ Less than 5% of total collected plastic	☐ 5–10% of total collected plastic	☐ 11–20% of total collected plastic	☐ More than 20% of total collected plastic

How do you usually handle or dispose of the waste generated during recycling processing (Select all that apply)?					
☐ Sent to landfill/ dumpsite	☐ Incinerated (burned)	☐ Sold or given to another company for further processing	☐ Repurposed into other products or materials	☐ Processed into alternative fuel (e.g., refuse-derived fuel)	☐ Others (Please specify):

What innovative solutions has your company explored to reduce waste generated during collection, sorting, recycling, and processing? (Select all that apply)?					
☐ Improved sorting techniques to reduce contamination and rejection rates	☐ Upcycling or repurposing rejected plastic waste into new products	☐ Investing in better recycling technology to improve material recovery	☐ Training staff on best practices to minimize material loss	☐ Partnering with other companies to utilize waste materials	☐ Others (Please specify):

What means of transport does your company use for collecting plastic waste and dispatching of processed materials?				
☐ Tricycles (motorized or non-motorized)	☐ Light-duty vehicles (e.g., pickups, vans)	☐ Medium-duty trucks (e.g., small cargo trucks)	☐ Heavy-duty trucks (e.g., large cargo trucks, containers)	☐ Others:

How do you sell the processed plastics?				
☐ Selling plastic flakes or pellets to manufacturers	☐ Exporting processed plastic materials to other countries	☐ Producing non-traditional recycled products	☐ Local businesses as raw materials	☐ Others:

INFRASTRUCTURE AND TECHNOLOGY	
What types of infrastructure does your company have for plastic waste processing? (Select all that apply)	*What challenges do you face in adopting newer technologies? (list as many as possible)*
☐ Collection centers for plastic waste ☐ Sorting facilities ☐ Plastic shredding or crushing machines ☐ Plastic washing stations ☐ Storage and warehouse facilities ☐ Recycling plant for reprocessing plastic into pellets or flakes ☐ Upcycling facility (e.g., making plastic-based products like tiles, bricks, etc.) ☐ Waste-to-energy facility (e.g., converting plastics into fuel)	☐ High cost of modern recycling machines ☐ Lack of skilled workers to operate new technology ☐ Limited access to technical support and spare parts ☐ Unavailability of suitable technology for local plastic types ☐ Difficulty integrating new systems into existing operations ☐ Technical support for maintenance and repairs of recycling equipment ☐ Other (please specify): ___________

EFFICIENCY IN COLLECTION AND PROCESSING				
What percentage of plastic waste generated is collected for processing?				
☐ < 25%	☐ 25–50%	☐ 50–75%	☐ > 75%	☐ Not Sure
What percentage of plastic waste is lost or discarded after processing				
☐ < 25%	☐ 25–50%	☐ 50–75%	☐ > 75%	☐ Not Sure

Where does uncollected plastic waste typically end up? (Select all that apply):					
☐ Water bodies (rivers, lakes, etc.)	☐ Informal dumpsites	☐ Burned openly	☐ Left in the environment	☐ sent to regulated landfill	☐ Others

What are the main causes of uncollected plastic waste in your area? (Select all that apply)		
☐ Poor collection systems	☐ Inefficient transportation of waste	☐ Lack of infrastructure for processing
☐ Lack of segregation practices	☐ lack of support for informal collectors to improve collection	☐ Others (Please specify):

On average, how long does it take to collect enough plastic waste for processing?					
☐ Less than 1 day	☐ 1 to 5 days	☐ 1 to 2 weeks	☐ 2 to 3 weeks	☐ more than 3 weeks	☐ Others (Please specify):

What are the most common contaminants in plastic waste?				
☐ Organic waste (food, leaves, etc.	☐ Hazardous waste (chemicals, sharp objects)	☐ Mixed plastics that cannot be separated	☐ Burns and other damages	☐ Others:

In your view, looking at general plastic waste levels in the country, what percentage of the plastic waste:		
Is collected............%	Is reused.................. %	Is disposed (landfill/open dumps): .... %
Is recycled........... %	Leaks into water bodies/sea .... %	Is upcycled.................. %

What percentage of collected plastic is actually suitable for processing	☐ Less than 50% ☐ 50–75% ☐ 76–90% ☐ More than 90%	*What do you do with the plastic waste that you cannot sell*	☐ Leave it at collection sites/dumps ☐ Burn it ☐ Throw it away in an open space ☐ Sell/give it to someone else

What steps has your company taken to improve collection efficiency? (Select all that apply)		
☐ Partnering with informal waste collectors	☐ Providing incentives for source segregation at collection points	☐ Investing in better transportation & logistics for plastic collection
☐ Reducing reliance on contaminated plastics	☐ Investing in collection mechanisms at decentralized location to increase efficiency	☐ Others (please specify):

EMISSIONS AND RESOURCE INTENSITY DURING COLLECTION & PROCESSING			
What are the main activities in the plastic value chain that contribute to most pollution? (Select all that apply):			
☐ Plastic production	☐ Plastic use/ consumption	☐ Collection/ aggregation	☐ Sorting and pre-processing
☐ Plastic recycling and upcycling	☐ Transportation	☐ Disposal (e.g., incineration or landfill)	☐ Others.............

Do you use motorized transport (e.g., trucks, motorcycles) for plastic waste collection?	☐ Yes ☐ No	*If yes, how frequently do you use motorized transport*	☐ Daily ☐ 2–3 times a week ☐ Weekly ☐ Occasionally	*What is the primary fuel source used for transport?*	☐ Petrol ☐ Diesel ☐ Gas ☐ Electric
How many trips do you make per month for transporting plastic waste?	☐ 1–3 trips ☐ 4–7 trips ☐ 8–10 trips ☐ More than 10 trips	*Do you burn plastic waste as part of your work?*	☐ Yes ☐ No	*How much plastic do you estimate is lost due to inadequate sorting/ burning or other disposal methods?*	☐ Less than 10% ☐ 10–30% ☐ 31–50% ☐ More than 50%

How many gallons of fuel do you use per month on transportation of raw materials and processed materials	☐ < 10 gal ☐ 10-20 gal ☐ 20-30 gal ☐ > 20 gal	*How far do you travel before selling your products*	☐ Within the town (0 – 10 miles), ☐ To another city (10 – 50 miles), ☐ Across multiple regions (50 – 150 miles)	*How far do you travel before gathering enough plastics for processing*	☐ Within the town (0 – 10 miles), ☐ To another city (10 – 50 miles), ☐ Across multiple regions (50 – 150 miles)
Do you lose plastics while transporting them (e.g., plastics falling off, being stolen, getting damaged	☐ Yes, a lot ☐ Yes, sometimes ☐ No, not at all	*What causes plastic waste loss during transportation*	☐ Plastics falling off the vehicle ☐ Buyers rejecting part of the load ☐ Accidents ☐ poor loading/ handling	*What is the capacity of the truck your company uses for transporting plastic waste*	☐ Less than 1 ton ☐ 1–3 tonnes ☐ 4–7 tonnes ☐ 8–10 tonnes ☐ More than 20 tonnes

How does the capacity of the truck used for transportation compare with the tonnes of plastic loaded per trip			
☐ *Trucks are always fully loaded, minimizing fuel and costs*	☐ Trucks are loaded but not always at full capacity	☐ *Trucks often operate below their full carrying capacity*	☐ Trucks frequently make trips with low plastic volume

What is the condition of the truck you use?				
☐ *New (less than 3 years old)*	☐ Used but in good condition (3–10 years old)	☐ *Old and requires frequent repairs (more than 10 years old)*	☐ Very old and inefficient (more than 15 years old)	☐ *Very old and inefficient and does not pass DVLA road worthy criteria*

What challenges do you face with transporting plastic waste?				
☐ *Fuel is too expensive*	☐ Vehicle breaks down frequently	☐ *Roads to collection sites are bad*	☐ High demands from security agencies	☐ *Others (State)*
What is your company's primary source of energy for plastic processing?				
☐ *National electricity grid*	☐ Solar power	☐ *Diesel generators*	Other (please specify)	
What is your estimated energy consumption per tonne of plastic processed? (kWh/ton, or cost per month)				
☐ *Less than 100 kWh/ton*	☐ 101 – 250 kWh/ton	☐ *251 – 500 kWh/ton*	☐ More than 500 kWh/ton	
How does your energy consumption compare to your production output?				
☐ *Very efficient – low energy use per ton of plastic processed*	☐ Moderately efficient – reasonable energy use per ton processed	☐ *Inefficient – high energy use per ton processed*	☐ Very inefficient – excessive energy use, increasing production costs	

Based on your operations, what do you estimate as your total CO_2 emissions per ton of plastic processed?				
☐ Less than 100 kg CO_2 per ton	☐ 100 – 300 kg CO_2 per ton	☐ 301 – 500 kg CO_2 per ton	☐ More than 500 kg CO_2 per ton	☐ Not sure
What is the average volume of water consumed during recycling operations (e.g., washing PET flakes)??				
☐ < 100 liters per tonne of plastic	☐ 100–500 liters per tonne of plastic	☐ > 500 liters per tonne of plastic	Other (please specify)	
Where do you get water for washing plastics				
☐ Public tap	☐ Well/ borehole	☐ River/stream	☐ Others:	
What happens to the dirty water after washing?				
☐ Goes into a drainage system	☐ Goes into a river or stream	☐ Left to soak into the ground untreated	☐ Treated and Reused for other washing cycle	
What percentage of the water used in recycling operations is treated and reused?				
☐ 0%	☐ < 25%	☐ 25–50%	☐ 50–75%	☐ > 75%

ECONOMIC AND SOCIAL CONTEXT					
Can you provide an estimate of the number of people in your community employed in plastic waste sector?					
What are the main social benefits or challenges associated with plastic waste management in your area?					
What percentage of your workforce consists of women					
☐ Less than 10%	☐ 10 – 30%	☐ 31 – 50%	☐ More than 50%		
What percentage of your workforce consists of youth (aged 18 – 35 years)					
☐ Less than 10%	☐ 10 – 30%	☐ 31 – 50%	☐ More than 50%		
Does your company employ persons with disabilities ☐ Yes ☐ No					
If yes, how many persons with disabilities are employed in your company					
☐ 1 – 5 employees	☐ 6 – 10 employees	☐ More than 10 employees			
What roles do women, youth, and persons with disabilities typically perform in your company? *(Select all that apply)*					
☐ Plastic waste collection and sorting	☐ Processing and recycling operations	☐ Adminis-trative and managerial roles	☐ Sales and marketing	☐ Logistics and trans-portation	☐ Others
What is your company's primary source of revenue?					
☐ Sale of recycled plastic pellets or flakes	☐ Sale of upcycled plastic products	☐ Export of processed plastic materials	☐ Providing waste management and collection services	☐ Others	
How has the market demand for recycled plastics changed in the past five years?					
☐ Increased significantly	☐ Increased slightly	☐ Remained the same	☐ Decreased slightly	☐ Decreased significantly	
What financial support mechanisms would help your business grow? *(Select all that apply)*					
☐ Government subsidies for recycling businesses	☐ Low-interest loans for equipment and expansion	☐ Tax incentives for companies using recycled materials	☐ Grants for innovation in plastic recycling and upcycling	☐ Other (please specify):	

OPERATIONAL AND FINANCIAL CHALLENGES

What are the main challenges/barriers associated with plastic waste management? (Tick as many as applicable).

☐ Lack of infrastructure (e.g. collection points)	☐ Lack of funding	☐ High costs	☐ Limited demand for products made from recycled plastic
☐ Limited public awareness	☐ Low public participation in source separation	☐ Too many regulatory hurdles	☐ Lack of technology
☐ Inefficient transportation	☐ Limited facilities		☐ Others (Please specify):

What are the main challenges in respect of infrastructure?

☐ Limited sorting facilities	☐ Lack of decentralized recycling hubs	☐ Lack of technology to upscale innovations
☐ Insufficient storage capacity	☐ Inadequate waste collection and transportation systems	☐ Other (please specify):.

What are the main challenges with respect to policy/regulations?

☐ Weak enforcement of waste management regulations	☐ Lack of incentives for producers to use recycled materials
☐ Absence of strong enforcement of Extended Producer Responsibility (EPR)	☐ Limited government policies supporting circular economy initiatives
☐ Other (please specify):	

What are the main challenges in respect of market access for end products

☐ Limited demand for recycled plastics due to cost competitiveness with virgin plastic	☐ Poor access to funding for recycling businesses
☐ Lack of consumer awareness and preference for recycled products	☐ Inconsistent supply of high-quality recycled plastics
☐ Other (please specify):	

How would you rate the adequacy of infrastructure for plastic waste management? (Select one):

☐ Highly Adequate	☐ Adequate	☐ Highly Inadequate	☐ Not Sure

Are there policies governing plastic waste management in your area? ☐ Yes ☐ No

If yes, how effective are these policies? (Rate 1–5, where 1 = Not effective and 5 = Very effective):
....

Are there resources/government incentives/dedicated funds addressing plastic waste in your area? ☐ Yes ☐ No		
If yes, what resources/government incentives (financial, material, human) are readily available to support these initiatives		
What are some measures for improving plastic waste management in areas of collection, sorting, segregation, transportation and recycling? (Select all that apply):		
☐ Increase collection efficiency	☐ Public education campaigns	☐ Set up a community-based collection
☐ Enhance recycling infrastructure	☐ Develop circular economy solutions	☐ Others (Please specify): ....

INEFFICIENCIES AND POTENTIAL OPPORTUNITIES		
What are the major inefficiencies in the plastic waste management system? (Select all that apply):		
☐ Low recycling capacity	☐ Low plastic waste collection rates	☐ High pollution due to outdated technology
☐ High contamination rates in waste	☐ High operational costs for recycling businesses	☐ Lack of proper waste segregation at source
☐ Limited access to collection systems	☐ High energy consumption	☐ Others (Please specify): ....
What business opportunities could help keep plastic waste in use for longer, and reduce waste?		
In your view, what plastic waste problems could be turned into business opportunities?		
Based on the problems, describe some opportunities that can be turned into business to solve the problems you have identified.		

How easy or difficult would it be to implement the proposed opportunities? (Select one):		
☐ Highly feasible	☐ Moderately feasible	☐ Low feasibility
Are there available resources (money, equipment, skills) to start these opportunities? ☐ *Yes* ☐ *No*		
Would training be required to start or improve businesses in circular economy? ☐ *Yes* ☐ *No*		

What type of training would be required? (Select all that apply)				
☐ Technical and Vocational Education and Training (TVET)	☐ On-the-job training with experienced recyclers	☐ Online courses and certification programmes	☐ Business management and entrepreneurship training	☐ Others (Please specify)

What specific skills would be required to run a successful circular economy business? (Select all that apply)				
☐ Plastic waste collection, sorting, and segregation techniques	☐ Recycling technology operations	☐ Advanced processing (chemical recycling, plastic-to-fuel conversion)	☐ Upcycling and product development	☐ Business and financial management
☐ Quality control and certification for recycled materials	☐ Policy and regulatory compliance	☐ Digital tools for circularity	☐ Marketing and sales of recycled products	☐ Others (please specify)
What training format would be most effective for skill development? (Select all that apply)				
☐ Hands-on practical workshops	☐ Apprenticeships and mentorship programs	☐ Short-term technical courses (1–3 months)	☐ Long-term vocational training (3 months – 1 year)	☐ Online training with certification

SUSTAINABILITY IMPACT OF POTENTIAL OPPORTUNITIES					
Rate 1–5, where 1 = less likely and 5 = Most likely	1	2	3	4	5
These potential circular businesses can help cut down air pollution from burning plastic?					
These initiatives will help save natural resources by reducing the need for new plastic production?					
Recycling help protect animals and marine life from plastic pollution					
The proposed interventions will provide economic benefits such as cost savings, job creation, and revenue generation					
The proposed opportunities will create social benefits such as improved livelihoods, better community health, and social inclusion					

RESOURCE REQUIREMENT/FEASIBILITY			
What is the estimated financial requirement to develop proposed circular opportunities?			
☐ <GHS50,000	☐ GHS 50,000– GHS 100,000	☐ GHS 100,000– GHS 500,000	☐ > GHS 500,000
Which types of human resources are required? (Select all that apply):			
☐ Technical experts	☐ Field workers/laborers	☐ Community/ informal	
☐ Administrative staff	☐ Others (Please specify):		

What material resources are essential? (Select all that apply):		
☐ Collection and transport equipment	☐ Awareness-raising materials	☐ Monitoring tools
☐ Recycling infrastructure	☐ Small scale industrial machines	☐ Others (Please specify): ....

What funding sources are available or can be mobilised? (Select all that apply):		
☐ Government grants	☐ International donors	☐ Financial institutions
☐ Private sector investment	☐ Community contributions	☐ Others (Please specify):

STAKEHOLDERS, ECOSYSTEM INSTITUTIONS AND GOVERNANCE		
Who are the key stakeholders to collaborate for circular economy opportunities? (Select all that apply):		
☐ Government agencies	☐ International development partners	☐ Private sector (e.g., manufacturers, recyclers)
☐ NGOs and community-based organisations	☐ Informal waste collectors	☐ Others (Please specify):
What important roles must be performed by these stakeholders? (Select all that apply):		
☐ Policy-making and regulation	☐ Technical expertise and innovation	☐ Community engagement and advocacy
☐ Funding and resource mobilization	☐ Operations and implementation	☐ Others (Please specify):
Are there existing stakeholder groups or platforms that can be leveraged for collaboration?		
☐ Yes	☐ No	☐ Not Sure
If Yes, what are the key contributions of these groups/platforms to CE initiatives?		
☐ Policy and regulations	☐ Networking and knowledge sharing	☐ Advocacy and stakeholder engagement
☐ Funding and technical assistance	☐ Others (Please specify):	

How would you want to be engaged?? (Select all that apply):		
☐ Regular multi-stakeholder meetings	☐ Joint task forces or working groups	☐ Others (Please specify):
☐ Online collaboration platforms	☐ Annual circular economy workshops	

RISKS AND MITIGATION STRATEGIES			
To what extent do the following risks pose a challenge to implementing the proposed opportunities? (Select all that apply): (Rate 1–5, where 1 = less likely and 5 = Most likely			
Lack of funding or investment	☐	**Limited technical skills or expertise**	☐
Weak government policies or regulations	☐	**Low community awareness or engagement**	☐
Poor waste collection and sorting infrastructure	☐	**Limited market demand for recycled plastic products**	☐
Competition with virgin plastic	☐	**Lack of stakeholder cooperation**	☐

What strategies should be put in place to mitigate these risks? (Select all that apply):		
☐ Contingency funding	☐ Policy advocacy	☐ Capacity-building programs
☐ Strengthened stakeholder engagements	☐ Government support	☐ Others (Please specify):

Data Collection instrument for Policy Makers/Support Institutions

UNIDO PLASTIC VALUE CHAIN LEAD
FOR THE CENTER OF EXCELLENCE FOR CIRCULAR ECONOMY
IN GHANA

Value Chain Opportunity Mapping and Baseline Assessment

Dear Participant,
Thank you for taking the time to complete this survey. This study is part of a project funded by Global Affairs Canada (GAC) and Implemented by the United Nations Industrial Development Organisation (UNIDO) in partnership with the Ministry of Environment, Science and Technology to establish a **Centre of Excellence for Circular Economy** in Ghana. The Centre aims to promote sustainable and innovative solutions for circularity, foster collaboration among stakeholders, and advance circular economy practices in Ghana.

As part of this initiative, the project has identified three priority sectors—plastics, textiles, and agriculture & agro-processing—as key focus areas for advancing the circular economy transition. Among these, the plastics sector will involve value chain leads who will play a strategic role in managing and promoting circular economy practices. These leads will drive collaboration, inclusivity, and innovation within their respective sectors, ensuring a more effective and sustainable transition.

The survey is aimed at collecting relevant data on the various plastics value chains, the potential opportunities, ecosystem institutions, and performance measurement systems. We deeply appreciate your valuable input, which will contribute to shaping a more sustainable future for Ghana. Your responses will be treated with the utmost confidentiality and used solely for this project. Participation is voluntary, and you may withdraw from the survey at any time.

Thank you for your time and support.

GENERAL INFORMATION	
Name of Organisation: ☐ EPA ☐ MEST ☐ MMDA ☐ GSA ☐ CSO *(policy advocacy)* ☐ Others *(Specify)*	*Location (Town/City):*
Age range: ☐ 15-24 ☐ 25-34 ☐ 35-44 ☐ 45-54 ☐ 55-64 ☐ 65-74 ☐ 75-84 ☐ 85+	*Role/Position:*
Educational Level:	*Sex:* ☐ Male ☐ Female

What type of support do you or your organisation provide to businesses in the waste management sector?	*How long have you been providing this support, advocacy or polices in waste management sector?*

IMPROVING EFFICIENCY IN COLLECTION AND PROCESSING				
What percentage of plastic waste generated is collected for processing?				
☐ < 25%	☐ 25–50%	☐ 50–75%	☐ > 75%	☐ Not Sure
What percentage of plastic waste is lost or discarded after processing				
☐ < 25%	☐ 25–50%	☐ 50–75%	☐ > 75%	☐ Not Sure

Where does uncollected plastic waste typically end up? (Select all that apply):					
☐ Water bodies (rivers, lakes, etc.)	☐ Informal dumpsites	☐ Burned openly	☐ Left in the environment	☐ sent to regulated landfill	☐ Others (specify)

What are the main causes of uncollected plastic waste in your area? (Select all that apply)		
☐ Poor collection systems	☐ Inefficient transportation of waste	☐ Lack of infrastructure for processing
☐ Lack of segregation practices	☐ Lack of public awareness	☐ Others (Please specify):

In your view, looking at general plastic waste levels in the country, what percentage of the plastic waste:		
Is collected............%	Is reused.................. %	Is disposed (landfill/open dumps): .... %
Is recycled........... %	Leaks into water bodies/sea .... %	Is upcycled.................. %

What steps can be taken to improve collection efficiency? (Select all that apply)		
☐ Partnering with informal waste collectors	☐ Providing incentives for source segregation at collection points	☐ Investing in better transportation & logistics for plastic collection
☐ Increasing public awareness	☐ Investing in collection mechanisms at decentralized location	☐ Making laws that require plastic companies to pay or support people who collect and bring back plastic waste (EPR)

What innovative solutions can be explored to reduce waste generated during collection, sorting, recycling, and processing? (Select all that apply)?					
☐ Improved sorting techniques to reduce contamination and rejection rates	☐ Upcycling or repurposing rejected plastic waste into new products	☐ Investing in better recycling technology to improve material recovery	☐ Training staff on best practices to minimize material loss	☐ Partnering with other companies to utilize waste materials	☐ Improvement in product design and raw material composition

ECONOMIC AND SOCIAL CONTEXT					
Can you provide an estimate of the number of people in your community employed in plastic waste sector?					
What are the main social benefits or challenges associated with plastic waste management in your area?					
What percentage of the workforce consists of women?					
☐ Less than 10%		☐ 10 – 30%	☐ 31 – 50%		☐ More than 50%
What percentage of the workforce consists of youth (aged 18 – 35 years)					
☐ Less than 10%		☐ 10 – 30%	☐ 31 – 50%		☐ More than 50%
Does this sector employ persons with disabilities ☐ Yes ☐ No					
What roles do women, youth, and persons with disabilities typically perform in this sector? *(Select all that apply)*					
☐ Plastic waste collection and sorting	☐ Processing and recycling operations	☐ Administrative and managerial roles	☐ Sales and marketing	☐ Logistics and transportation	☐ Others
How has the market demand for recycled plastics changed in the past five years?					
☐ Increased significantly	☐ Increased slightly	☐ Remained the same	☐ Decreased slightly	☐ Decreased significantly	
What financial support mechanisms would help businesses in this sector grow? *(Select all that apply)*					
☐ Government subsidies for recycling businesses	☐ Low-interest loans for equipment and expansion	☐ Tax incentives for companies using waste recycled materials	☐ Grants for research, development and innovation in plastic recycling and upcycling	☐ Other (please specify):	

OPERATIONAL AND FINANCIAL CHALLENGES			
What are the main challenges/barriers associated with plastic waste management? (Tick as many as applicable).			
☐ Inadequate collection and recycling facilities	☐ Lack of funding	☐ High processing costs	☐ No market for products made from recycled plastic
☐ Limited public awareness	☐ Low public participation in source separation	☐ Too many regulatory hurdles	☐ Lack of technology
☐ Inefficient transportation systems	☐ Lack of buy back centers	☐ importation of waste materials from abroad	☐ Others (Please specify): lack of proper labeling/ coding

What are the main challenges in respect of infrastructure?		
☐ Limited sorting facilities	☐ Lack of decentralized recycling hubs	☐ Lack of technology to upscale innovations
☐ Insufficient storage capacity	☐ Inadequate waste collection and transportation systems	☐ Other (please specify):

Are there policies governing plastic waste management in your area? ☐ Yes ☐ No	
If yes, how effective are these policies? (Rate 1–5, where 1 = Not effective and 5 = Very effective): …………………………………………………………………………………………	
What are the main challenges with respect to these policies/regulations?	
☐ Weak enforcement of waste management regulations	☐ Lack of incentives for producers to use recycled materials
☐ Absence of strong enforcement of Extended Producer Responsibility (EPR)	☐ Limited government policies supporting circular economy initiatives
☐ Insufficient funding for regulatory bodies to monitor compliance	☐ Others (Please specify):
What are the main challenges in respect of market access for recycled waste plastic products	
☐ Limited demand for recycled plastics due to cost competitiveness with virgin plastic	☐ Poor access to funding for recycling businesses
☐ Lack of consumer awareness of the environmental benefits and poor perception for recycled products	☐ Inconsistent supply of high-quality recycled raw materials
☐ Lack of quality standards or certifications for recycled plastic products (difficult to prove product quality to buyers)	☐ Lack of organized distribution channels (no reliable network to get recycled products to the market)
☐ Others (please specify)	

Are there resources/government incentives/dedicated funds addressing plastic waste in your area? ☐ Yes ☐ No		
If yes, what resources/government incentives (financial, material, human) are readily available to support these initiatives?		
What are some measures for improving plastic waste management in areas of collection, sorting, segregation, transportation and recycling?		
☐ Increase collection efficiency	☐ Public education campaigns	☐ Set up a community-based collection
☐ Enhance recycling infrastructure	☐ Develop circular economy solutions	☐ Others (Please specify): ....

What alternative materials to conventional plastics are currently being promoted or supported by your institution?				
☐ Biodegradable plastics	☐ Compostable packaging materials	☐ Paper-based packaging	☐ Cloth or jute bags	☐ None currently promoted

What are the biggest challenges to promoting alternatives to plastics in Ghana? (Select all that apply)					
☐ High cost of alternative materials	☐ Lack of public awareness and education	☐ Limited supply of alternatives	☐ Resistance from manufacturers or businesses	☐ Lack of incentives for businesses to switch	☐ Customers prefer traditional plastic products

INEFFICIENCIES IN WASTE MANAGEMENT AND POTENTIAL OPPORTUNITIES			
What are the main activities in the plastic value chain that contribute to most pollution? (Select all that apply):			
☐ Plastic production	☐ Plastic use/ consumption	☐ Collection/ aggregation	☐ Sorting and pre-processing
☐ Plastic recycling and upcycling	☐ Transportation	☐ Disposal (e.g., incineration or landfill)	☐ Others.............

What are the major inefficiencies in the plastic waste management system? (Select all that apply):		
☐ Low recycling capacity	☐ Low plastic waste collection rates	☐ High pollution due to outdated technology
☐ High contamination rates in waste	☐ High operational costs for recycling businesses	☐ Lack of proper waste segregation at source
☐ Limited access to collection systems	☐ High energy consumption	☐ Others (Please specify): ....

<table>
<tr><td colspan="5">What business opportunities could help keep plastic waste in use for longer, and reduce waste in your area?</td></tr>
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<tr><td colspan="5">How easy or difficult would it be to implement the proposed opportunities/businesses:</td></tr>
<tr><td>☐ Highly feasible</td><td colspan="2">☐ Moderately feasible</td><td>☐ Low feasibility</td><td>☐ Difficult</td></tr>
<tr><td colspan="5">Are there available resources (money, equipment, skills) to start these opportunities?
☐ Yes ☐ No</td></tr>
<tr><td colspan="5">Would training be required to start or develop innovative businesses in circular economy?
☐ Yes ☐ No</td></tr>
<tr><td colspan="5">What type of training would be required? (Select all that apply)</td></tr>
<tr><td>☐ Technical and Vocational Education and Training (TVET)</td><td>☐ On-the-job training with experienced recyclers</td><td>☐ Online courses and certification programmes</td><td>☐ Business management and entrepreneurship training</td><td>☐ Others (Please specify)</td></tr>
<tr><td colspan="5">What specific skills would be required to run a successful circular economy business? (Select all that apply)</td></tr>
<tr><td>☐ Plastic waste collection, sorting, and segregation techniques</td><td>☐ Recycling technology operations</td><td>☐ Advanced processing (chemical recycling, plastic-to-fuel conversion)</td><td>☐ Upcycling and product development</td><td>☐ Business and financial management</td></tr>
<tr><td>☐ Quality control and certification for recycled materials</td><td>☐ Policy and regulatory compliance</td><td>☐ Digital skills for circularity</td><td>☐ Marketing and sales of recycled products</td><td>☐ Others (please specify)</td></tr>
</table>

What training format would be most effective for skill development? (Select all that apply)				
☐ Hands-on practical workshops	☐ Apprenticeships and mentorship programs	☐ Short-term technical courses (1–3 months)	☐ Long-term vocational training (3 months – 1 year)	☐ Online training with certification

SUSTAINABILITY IMPACT OF POTENTIAL OPPORTUNITIES					
Rate 1–5, where 1 = less likely and 5 = Most likely	1	2	3	4	5
These potential circular businesses can help cut down air pollution from burning plastic?					
These initiatives will help save natural resources by reducing the need for new plastic production?					
Recycling help protect animals and marine life from plastic pollution					
The proposed interventions will provide economic benefits such as cost savings, job creation, and revenue generation					
The proposed opportunities will create social benefits such as improved livelihoods, better community health, and social inclusion					

STAKEHOLDERS, ECOSYSTEM INSTITUTIONS AND GOVERNANCE			
Who are the key stakeholders/institutions to collaborate for circular economy opportunities? (Select all that apply):			
☐ Government institutions (EPA, MEST, MoTI, GSA, MMDAa)	☐ International development partners	☐ Private sector (e.g., manufacturers, recyclers, importers)	
☐ NGOs, CSOs and community-based organisations	☐ Informal waste collectors	☐ Others (Please specify):	
What important roles or support must be provided by these stakeholders/institutions? (Select all that apply):			
☐ Policy-making and regulation	☐ Technical support	☐ Community engagement, Advocacy and Awareness programmes	
☐ Funding and resource mobilization	☐ Technology/ Operations	☐ Others (Please specify):	
What forms of engagement among actors/stakeholders would support businesses in the sector? (Select all that apply):			
☐ Regular multi-stakeholder meetings	☐ Joint task forces or working groups	☐ Coordinating with research institutions	☐ Formation of association among informal sector
☐ Online knowledge sharing/ collaboration platforms	☐ Annual circular economy workshops	☐ Facilitating community-based waste collection programmes	

RISKS AND MITIGATION STRATEGIES			
To what extent do the following risks pose a challenge to implementing the proposed opportunities? (Select all that apply): (Rate 1–5, where 1 = less likely and 5 = Most likely			
Lack of funding or investment	☐	**Limited technical skills or expertise**	☐
Weak government policies or regulations	☐	**Low community awareness or engagement**	☐
Poor waste collection and sorting infrastructure	☐	**Limited market demand for recycled plastic products**	☐
Competition with virgin plastic (cheaper alternatives)	☐	**Lack of stakeholder cooperation**	☐

What strategies should be put in place to mitigate these risks? (Select all that apply):		
☐ Contingency funding	☐ Policy advocacy	☐ Capacity-building programs
☐ Strengthened stakeholder engagements	☐ Government support	☐ Others (Please specify):

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

University of
Cape Coast

In partnership with
Canada

Introductory Letters

Office No. 4, New Examination
Centre North Campus,
University of Cape Coast

17th March, 2025

The Municipal Coordinating Director,
LaNMMA,
Madina,
Accra.

Dear Sir/Madam,

LETTER OF INTRODUCTION

DATA COLLECTION ON PLASTIC VALUE CHAIN AND OPPORTUNITY MAPPING

The University of Cape Coast was selected as Plastic Value Chain Lead (VCL)) for the establishment of Center of Excellence for Circular Economy in Ghana. The Project is funded by Global Affairs Canada (GAC) and implemented by the United Nations Industrial Development Organisation (UNIDO) in collaboration with the Ministry of Environment, Science, and Technology (MEST), Ho Technical University (HTU), Kwame Nkrumah University of Science and Technology (KNUST) and The Or Foundation.

The project aims to accelerate Ghana's transition to a circular economy by exploring sustainable and innovative solutions within the plastics, textiles, and agriculture and agro-processing value chains. As part of the deliverables, we are conducting field data collection to assess baseline and Circular Opportunity Mapping. The exercise will require input from relevant stakeholders and actors involved in the plastic value chain at both the national and subnational levels, particularly within the designated Metropolitan, Municipal, and District Assemblies (MMDAs).

We kindly request your assistance and cooperation to support this important exercise. In addition, we welcome any referrals or contacts of other key stakeholders whose contributions may be valuable to the success of this assignment.

We would greatly appreciate your participation in the survey during the data collection period, which is scheduled to take place from 17th March to 21st March 2025.

Thank You

Partners: City Waste Recycling Ltd — CAPE COAST TECHNICAL UNIVERSITY

Yours faithfully,

Prof. Daniel Agyapong
Project Lead, UNIDO Plastic Value Chain

In partnership with Canada

Ghana Circular Economy Centre

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Republic of Ghana

About Ghana Circular Economy Centre

The Ghana Circular Economy Centre (GCEC) project supports Ghana's transition to a resource-efficient and inclusive circular economy by promoting innovation, strengthening policy and institutional frameworks, and building capacity across key value chains, including plastics, agriculture and agro-processing (cassava, mango, pineapple and tilapia), and textiles.

The project is implemented by the United Nations Industrial Development Organization (UNIDO) in partnership with the Ministry of Environment, Science and Technology (MEST), with funding support from Global Affairs Canada.

The GCEC serves as a national hub for knowledge generation, stakeholder engagement, and the piloting of circular solutions to advance sustainable industrial development, improve resource efficiency, and create decent jobs.

Host Institution

Ho Technical University

Value Chain Leads

KNUST – Kwame Nkrumah University of Science and Technology

University of Cape Coast

The Or Foundation

Cape Coast Technical University

City Waste Recycling Ltd. *Friends of the Environment*

UNIDO Division of Circular Economy and Green Industry
Vienna International Centre, P. O. Box 300, 1400, Vienna Austria.

Ghana Circular Economy Centre
Ho Technical University, 1st Floor, Agric Engineering Block
Email: info@gcec.org.gh
Tel: 0362295799

www.gcec.org.gh

Ghana Circular Eonomy Centre