

# A Data-Driven Circular Economy Roadmap for LDPE and LLDPE Plastics in Ghana:

2025-2028



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# About This Report

This report analyses circular economy opportunities in the LDPE and LLDPE plastics value chains in Ghana, with a focus on reducing leakage and improving recovery. The sections progress from baseline assessment to opportunity identification and practical recommendations to guide policy and programme design.





## Executive Summary

This roadmap builds on Ghana's national Plastics Circular Economy Opportunity Mapping (OM) initiative, a multi-partner effort led by UNIDO to identify material-specific pathways for transitioning key polymers from linear to circular value chains. The OM exercise assessed five dominant polymer streams, PET, HDPE, LDPE/LLDPE, PP, and PS, using detailed field data, value chain mapping, Material Flow Analysis (MFA), Life Cycle Assessment (LCA), and targeted stakeholder engagement. The findings highlight significant losses of material and value across the plastics system, particularly within the flexible plastic segment.

LDPE and LLDPE, which together account for approximately 35,000 tonnes of annual consumption, were identified as one of the most environmentally visible and economically underutilised streams. These polymers are found in water sachets, carrier bags, food packaging films, shrink wrap, and mulch films, all of which are in widespread daily use. Yet, they exhibit low collection and recovery rates, with fewer than 1 in 10 used sachets or bags entering any formal or

informal recycling stream. Much of this waste ends up in storm drains and open areas, contributing to flooding, localised pollution, and public health risks. In high-density districts such as Ashaiman, Ablekuma, Madina, and Techiman, LDPE/LLDPE film is a major cause of drain blockages, with visible accumulation especially during the rainy season.

Despite the widespread presence of these plastics, recovery efforts are hampered by poor segregation, low economic value, and limited infrastructure. However, the same hotspots also offer strategic opportunities: they are active zones for informal recovery, have proximity to urban markets, and house a growing network of micro and small-scale recyclers. The roadmap builds on this potential by identifying five critical hotspots and proposing a focused, measurable plan to reduce leakage, improve livelihoods, and close material loops.

Structured over three years (2025-2028), the roadmap outlines practical interventions designed to:





These **polymers** are found in **water sachets, carrier bags, food packaging films, shrink wrap, and mulch films**, all of which are in widespread **daily use**. Yet, they exhibit low collection and recovery rates, with fewer



than **1 in 10** used sachets or bags entering any formal or informal **recycling stream**. Much of this **waste** ends up in **storm drains** and open areas, contributing to **flooding, localised pollution, and public health risks**.



- Divert at least 1,500 tonnes of LDPE/LLDPE annually from open dumping and burning;
- Raise collection and reuse rates through local aggregation and reuse pilots;
- Support pilot-scale sachet-to-sheet conversion facilities and small-scale agglomeration hubs;
- Build inclusive business models that boost income generation for informal workers by up to 30%;
- Reduce drainage blockage incidents in key municipalities by at least 40%.

The approach is grounded in thirteen integrated steps, including baseline diagnostics, opportunity prioritisation, pilot

design, business model incubation, policy alignment, stakeholder mobilisation, and a robust monitoring and evaluation (M&E) strategy. It reflects Ghana's Medium-Term Development Policy Framework (MTDPF), aligns with targets under the National Plastic Action Partnership (NPAP), and contributes to SDG outcomes on sustainable cities (SDG 11), decent work (SDG 8), responsible consumption and production (SDG 12), and climate action (SDG 13).

The roadmap identifies measurable performance indicators and assigns responsibility across government, local authorities, private actors, and informal cooperatives. The interventions have been selected based on feasibility, impact potential, and relevance to Ghana's social and market conditions.

LDPE and LLDPE together account for approximately **35,000 tonnes** of annual consumption

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# 1. Background

## 1.1. Vision and Strategic Intent

By 2027, Ghana will establish a nationally coordinated, locally implemented circular system for LDPE and LLDPE films, where at least one in three discarded bags, wrappers or flexible sheets are recovered and valorised rather than lost to land, drain, or sea. The vision is to transform this high-leakage, low-value plastic stream, currently one of the most persistent pollutants in the country, into a regeneratively managed resource stream that supports inclusive economic

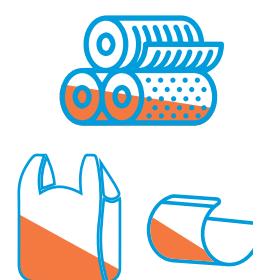
development, environmental restoration, and resilient urban infrastructure.

LDPE (Low-Density Polyethylene) and LLDPE (Linear Low-Density Polyethylene) account for approximately one in every five kilograms of plastic imported into Ghana. Together, they represent an estimated **350,000 tonnes** per year of inflows, the third most prevalent polymer type in the country's plastic economy. These materials dominate Ghana's most visible single-use plastics, including:

- Plastic carrier bags (black "market bags" and branded supermarket bags),
- Sachet water wrappers (thin films encasing 500ml water units),
- Shrink wraps used in transportation and packaging,
- Agricultural mulch films for soil cover,
- Inner linings of multi-layer food and hygiene packaging.



By **2027**, Ghana will establish a **nationally coordinated, locally implemented circular system** for **LDPE and LLDPE films**, where at least one in three discarded **bags, wrappers** or **flexible sheets** are **recovered** and **valorised** rather than lost to **land, drain, or sea**.



Their widespread use in the informal economy, particularly in retail, food vending, and household storage, combined with their lightweight nature and low scrap value, makes them one of the most frequently littered plastic types, often seen clogging stormwater drains, entangled in vegetation, or burned in open piles.

Currently, less than one in 10 LDPE/LLDPE products in Ghana are collected for recycling,

and even fewer are reprocessed due to heavy contamination, poor segregation, and lack of adequate film-processing infrastructure. Informal collectors, who form the backbone of the recovery ecosystem, are unable to prioritise this stream due to its low density and market price, despite LDPE waste comprising a disproportionately high share of the urban visual plastic burden.



Currently, less than **one in 10 LDPE/LLDPE products** in **Ghana** are **collected for recycling**, and even fewer are **reprocessed** due to **heavy contamination**, **poor segregation**, and **lack of adequate film-processing infrastructure**.



The vision is to:

- Reduce reliance on virgin resin imports by accelerating domestic recovery and processing;
- Incentivise eco-design and material substitution where appropriate;
- Empower a new generation of community-scale circular enterprises;
- And embed LDPE film recovery into formal urban planning and sanitation services.

This vision aligns directly with the goals of Ghana's National Plastics Management Policy and the National Plastic Action Partnership (NPAP), both of which commit to a low-leakage, high-recovery plastics economy anchored in just transition principles.

## 1.2. Strategic Goals

### 1.2.1. Goal 1: Cut LDPE Leakage by More Than Half

#### a. Target:

Reduce the proportion of LDPE waste entering the environment from approximately 1 in every 2 pieces to fewer than 1 in 4.

#### b. Justification:

Out of an estimated 400,000 tonnes of LDPE-dominated single-use packaging waste generated annually in Ghana, over 200,000 tonnes currently leak into the environment. These films clog city drains, contribute to flooding, and are among the most persistent forms of urban litter. Reducing leakage by over 50% will directly improve urban resilience, sanitation, and health outcomes.

### 1.2.2. Goal 2: Triple LDPE Recycling Rate

#### a. Target:

Increase the effective recycling rate of LDPE films from below 10% to 30% by 2027.

#### b. Justification:

At present, only around 1 in 10 LDPE items is recycled, largely due to contamination, low value, and inadequate film-processing infrastructure. Boosting this to 3 in 10 through better segregation, densification, and agglomeration will significantly reduce landfill pressure and create a reliable secondary feedstock for local manufacturers.



### 1.2.3. Goal 3: Reduce Virgin LDPE Use by at Least 25%

#### a. Target:

Cut virgin LDPE imports by one-quarter through recycled-content mandates and reuse schemes.

#### b. Justification:

90% of plastics used in Ghana are virgin, and LDPE packaging is almost entirely made from imported virgin resin. One tonne of virgin LDPE resin generates ~3.5 tonnes of CO<sub>2</sub> and consumes energy equivalent to 10 household gas cylinders. Reducing virgin imports by 25% (approx. 100,000 tonnes) could avoid emissions equivalent to over 350,000 tonnes of CO<sub>2</sub> annually, comparable to removing 75,000 cars from the road.

### 1.2.4. Goal 4: Formalise 1 in 3 Informal LDPE Waste Pickers

#### a. Target:

Transition 30% of informal film waste collectors, particularly women and youth, into registered cooperatives or micro-enterprises by 2027.

#### b. Justification:

The LDPE recovery ecosystem is highly dependent on informal pickers, yet their incomes remain unstable and working conditions hazardous. Formalising 1 in 3 waste pickers would improve health, provide income security, and enhance traceability of collected volumes. With women and youth comprising nearly half of the informal workforce, this goal also aligns with gender equity and youth employment targets.

## 1.3. Alignment with Policy and Global Frameworks

- a. National Development Plans:** Ghana's Medium-Term Development Framework (MTDF) prioritises environmental sustainability, local manufacturing, and inclusive growth, all of which are advanced through LDPE circularity initiatives.
- b. Relevant Sectoral Policies:** This roadmap directly supports the National Plastics Management Policy, the National Waste Management Strategy, and the Local Government Act mandates for improved sanitation and decentralised waste services.
- c. Sustainable Development Goals (SDGs):** Contributes to SDG 11 (Sustainable Cities), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 8 (Decent Work and Economic Growth).
- d. Just Transition Principles:** Groups, and equitable access to circular economy opportunities. Embedding these principles in LDPE recovery helps ensure environmental goals are achieved without sacrificing livelihoods.



Table 1. Vision and Strategic Goals

Element	Details
<b>Vision</b>	Transform Ghana's LDPE film sector into a closed-loop, inclusive, and regenerative system by 2027.
<b>Goal 1</b>	Reduce LDPE leakage into the environment by >50% (~200,000 tonnes/year avoided).
<b>Goal 2</b>	Increase LDPE recycling from ~10% to $\geq 30\%$ (tripled recovery rate).
<b>Goal 3</b>	Cut virgin LDPE imports by $\geq 25\%$ (~100,000 tonnes), reducing emissions by 350,000 tonnes CO <sub>2</sub> /year.
<b>Goal 4</b>	Formalise $\geq 30\%$ of informal LDPE collectors into recognised co-ops and micro-enterprises.
<b>Policy Alignment</b>	Supports National Plastic Policy, NPAP, SDGs (8, 11, 12, 13), and Just Transition goals.



Photo Credit: Mckingtorch Africa



## 2. Baseline and Opportunity Mapping

### 2.1. Material Flow and Loss Patterns (MFA Insights)



**LDPE/LLDPE** represents approximately **21%** of all plastic imports into **Ghana**, with an estimated **360,000 tonnes** per year entering the economy.

LDPE/LLDPE represents approximately 21% of all plastic imports into Ghana, with an estimated 360,000 tonnes per year entering the economy. These polymers are predominantly used for single-use flexible packaging, including black plastic carrier bags, multilayer sachet water pouches, and shrink wrap. Their mass inflow is driven by low cost and versatile applications across retail, food vending, transport, and agriculture.

Approximately 1 in every 3 plastic bags and films used in urban areas is made from LDPE/LLDPE. These items are typically lightweight and thin-walled, resulting in:

- High volumetric litter, especially in stormwater drains and bushes,
- Low economic value per kilogram, making them unattractive to waste pickers,
- Significant collection inefficiencies.

An estimated 15,000-18,000 tonnes per year of LDPE/LLDPE waste is not collected or formally managed, with over 5,000 tonnes—likely more—leaking into the environment or ending up in open dumps, drains, or being openly burned. That's equivalent to over 2,000 refuse trucks' worth of uncollected film annually. The highest loss points occur:

- At the end-of-life, due to informal disposal,
- At the generation, where use is widespread across informal food vendors and low-cost markets,
- In the informal recycling chain, LDPE films are deprioritised due to contamination, volume-to-weight ratio, and market price.

This results in pervasive leakage, particularly in urban and peri-urban low-income zones



An estimated **15,000-18,000 tonnes** per year of **LDPE/LLDPE waste** is not collected or formally managed, with over **5,000 tonnes**—likely more—leaking into the environment or ending up in open dumps, drains, or being openly burned. That's equivalent to **over 2,000** refuse trucks' of uncollected film annually.



## 2.2. Life Cycle Emissions and Environmental Burdens (LCA Insights)

The environmental burdens of LDPE/LLDPE are significant, especially when accounting for their short usage lifespan and poor recovery rates. Key insights include:

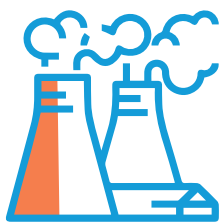
**Table 2. Environmental Burdens of LDPE/LLDPE**

Stage	GHG Emissions	Water Use	Toxicity/Other Burdens
Resin production (imported)	~3.5 tonnes CO <sub>2</sub> per tonne of LDPE	High (process and cooling water intensive)	Emissions from petrochemical refining
Local use and disposal	Minimal during use phase	Negligible	High pollution due to open dumping and burning
Informal burning	Emits dioxins, furans, and black carbon	None	Severe health impacts in dense urban settings
Landfilling/leakage	Methane emissions, when co-mixed with organic waste	Leachate generation (plastic fragments)	Microplastic contamination of soils and waterways

One tonne of LDPE disposed of through open burning emits GHGs equivalent to driving a typical petrol car from Accra to Tamale more than 40 times. Moreover, these emissions often occur in densely populated neighbourhoods, disproportionately affecting low-income groups.

## 2.3. Social Baseline and Inclusion Gaps

LDPE/LLDPE collection is heavily reliant on the informal sector. However, the lightweight nature of the material (e.g. a typical black plastic bag weighs ~5 grams) and its high contamination rate make it less prioritised by informal waste pickers, who favour heavier or higher-value materials like PET and HDPE



**One tonne of LDPE** disposed of through emits GHGs equivalent to driving a typical petrol car from **Accra to Tamale** more than **40 times**. Moreover, these **emissions** often occur in densely **populated neighbourhoods**, disproportionately affecting low income groups.





### Key social features:

- a. **Gendered Dynamics:** Women are estimated to make up 40-60% of those involved in sachet and bag collection, particularly in urban informal settlements.
- b. **Youth Participation:** Youth (under 30s) account for a significant share of street-level collectors but rarely advance into value-added activities due to a lack of capital and equipment.
- c. **Cooperative Membership:** Less than 10% of LDPE pickers are part of any formal cooperative or micro-enterprise group.
- d. **Health Exposure:** Regular exposure to unwashed films, drain waste, and open burning increases vulnerability to respiratory illness and infections.

This signals a major inclusion gap, where large volumes of material pass through a workforce that lacks protection, visibility, or long-term viability.



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## 2.4. Current Circular Practices and Systemic Gaps

Efforts to advance circularity within the LDPE value chain in Ghana remain nascent and unevenly distributed across actors and regions. While some practices have emerged organically—often led by informal sector actors or small-scale innovators—systemic limitations continue to impede scale, consistency, and impact. Table 3 provides an overview of the current circular practices observed within the LDPE stream, assessing their operational status and identifying key gaps that must be addressed to support a more robust circular economy.



**Table 3. Current Circular Practices and Systemic Gaps**

Practice	Status	Observations
<b>Urban informal collection</b>	Active but limited	Focused mainly on high-traffic waste accumulation points (e.g. markets, transit hubs). The collection is volumetrically high but inefficient and low-value.
<b>Washing and pelletising</b>	Emerging	Only 3-5 small-scale actors are active. Output quality is inconsistent; few buyers for recycled LDPE pellets due to quality concerns.
<b>Reuse of LDPE films</b>	Minimal	Black plastic bags are reused 1-2 times before disposal, but sachet wrappers and shrink films are almost always single-use.
<b>Product substitution</b>	Fragmented	Some NGOs have trialled woven bags or starch blends, but adoption is low. No systematic policy support for alternatives.
<b>Aggregation hubs</b>	Scarce	No major LDPE-specific aggregation sites exist. Baling is ad-hoc and manually intensive.

## 2.5. Circular Hotspots Identified

Critical points along the LDPE value chain pose persistent environmental, operational, and economic challenges that undermine circular economy progress. These “circular hotspots” represent areas where leakage, inefficiency, and negative externalities are most concentrated—yet they also present high-leverage opportunities for targeted intervention. Table 4 identifies key circular hotspots within the LDPE system, describes the associated challenges, and proposes actionable opportunities to address them through innovation, infrastructure, and behaviour change, while Table 5 summarises key insights across these areas and outlines the implications for developing scalable circular economy solutions.

**Table 4. Circular Hotspots Identified**

Hotspot	Description	Opportunity
<b>Contamination and cleaning costs</b>	LDPE films are often mixed with organic waste (food, faecal matter), making washing costly and unpleasant.	Pilot decentralised washing stations using water-efficient technologies in market zones.
<b>Lightweight and low-density</b>	Films occupy high volume but provide low mass, making transportation uneconomical.	Introduce community-scale densifiers and film compactors to reduce transport costs.
<b>Open burning</b>	High occurrence in informal settlements and peri-urban areas where collection is absent.	Awareness campaigns and municipal film take-back schemes with incentives.



Hotspot	Description	Opportunity
Poor recyclate quality	Inconsistent pellet quality from informal processors limits the offtake.	Training and support for small-scale processors to improve sorting and extrusion.
Urban drainage blockage	Film bags clog gutters and storm drains, contributing to seasonal flooding in Accra and Kumasi.	Incentivise upstream segregation and redesign street vendor packaging norms.

Table 5. Step 2 - Baseline and Opportunities

Area	Key Insight	Implication
Material Flow	~28,000 tonnes/year LDPE/LLDPE; high leakage (~18,000 tonnes/year)	Needs targeted collection and infrastructure at urban hotspots
Emissions	3.5 tonnes CO <sub>2</sub> per tonne; toxic outputs from burning	Alternatives and safe disposal must be prioritised
Social	Dominated by informal actors, with low cooperative presence	Formalisation and protection are critical for equity
Circular Practices	Active but fragmented, quality remains low	Aggregation and quality control can increase market value
Hotspots	Drain clogging, health risks, and value chain inefficiencies	Targeted pilots can unlock environmental and economic returns



## 3. Prioritisation and Scope Definition

### 3.1. Geographic Scope

The following regions have been prioritised for LDPE/LLDPE circularity interventions based on documented levels of plastic leakage, concentration of informal collection activity, urban flood risk, and presence of recovery infrastructure:

#### a. Greater Accra Region

**Justification:** High volume of LDPE film use (especially plastic bags and sachets), acute urban drainage challenges due to blocked gutters, and presence of key informal waste aggregation nodes (e.g. Agbobbloshie, Mallam Market).

#### b. Ashanti Region (Kumasi Metropolitan and Asokwa Municipal)

**Justification:** Second-largest generator of LDPE film waste, recurring seasonal flooding, and key recycling actors located in Kumasi's Suame Magazine and industrial enclaves.

#### c. Central Region (Cape Coast Municipal)

**Justification:** Coastal pollution risks from LDPE packaging, lack of recovery infrastructure, and active civil society engagement in marine plastics initiatives.

#### d. Bono East Region (Techiman)

**Justification:** Growing use of agricultural mulch films and sachet wrappers in the informal economy, as well as existing engagement through CE pilot planning.

These regions represent both high-pressure leakage zones and entry points for pilot-scale recovery, densification, and reuse interventions.

### 3.2. Value Chain Focus

The roadmap will target three core LDPE/LLDPE product segments that dominate Ghana's flexible plastic pollution profile:



#### a. Plastic Carrier Bags

- Used ubiquitously in retail and informal trade.
- High visibility in urban litter streams and drainage systems.



#### b. Sachet Water Wrappers

- Produced and consumed at volumes exceeding 1.2 billion units/month nationwide.
- Thin films with low recovery value, often discarded in public spaces.





### c. Shrink Wraps and Agricultural Films

- Common in logistics, packaging of consumer goods, and farming applications.
- Often burnt or buried due to a lack of collection pathways.

### 3.3. Prioritised Opportunities

#### a. Opportunity 1: Establish LDPE Film Densification and Aggregation Hubs

Set up low-cost densifiers and community-operated aggregation centres to improve collection efficiency and reduce transport costs of flexible films.

#### b. Opportunity 2: Develop Modular Washing and Pelletising Facilities for LDPE Films

Improve quality and consistency of recycled LDPE output through decentralised washing and extrusion, enabling higher-value applications.

#### c. Opportunity 3: Introduce Incentivised Sachet Wrapper Take-Back Schemes

Pilot take-back systems linked to sachet water producers and vendors, offering micro-incentives for collection and enabling closed-loop recovery.

### 3.4. Feasibility and Impact Assessment

Not all circular economy opportunities offer the same potential for success or scale. It's essential to weigh both feasibility how easily an initiative can be implemented and impact its capacity to generate meaningful economic, environmental, or social outcomes. This ensures resources are directed toward the most promising interventions.

Table 6 presents a comparative assessment of select opportunities, considering their practical feasibility, potential impact, and justification within the Ghanaian LDPE context and Table 7 outlines the geographic and product scope of the roadmap, along with the top interventions and expected high-impact drivers to guide implementation.

**Table 6. Feasibility and Impact Assessment**

Opportunity	Feasibility	Impact	Justification
<b>LDPE Aggregation Hubs</b>	High	High	Basic baling and densification can be operated by informal cooperatives with limited technical barriers. Tackles low-density and high leakage issues.
<b>Modular Washing and Pelletising</b>	Medium	High	Requires moderate investment and training but directly improves recyclate quality, unlocking demand from domestic manufacturers.
<b>Sachet Take-Back Scheme</b>	Medium	Medium-High	Behaviour change is required at the vendor/consumer level, but potential to recover thousands of tonnes annually and integrate informal actors.



Table 7. Prioritisation and Scope Definition

Component	Details
<b>Geographic Scope</b>	Greater Accra, Ashanti (Kumasi), Central (Cape Coast), Bono East (Techiman)
<b>Product Focus</b>	Plastic bags, sachet wrappers, shrink/agricultural films
<b>Opportunity 1</b>	LDPE film aggregation and densification centres
<b>Opportunity 2</b>	Washing and pelletising units for improved recyclate
<b>Opportunity 3</b>	Sachet water wrapper take-back incentives
<b>Top Impact Drivers</b>	Reduced urban flooding, new jobs in micro-enterprises, improved quality of recycled LDPE, reduced plastic leakage to marine and soil systems



Photo Credit: Mckingtorch Africa



## 4. Stakeholder Mapping and Engagement Design

### 4.1. Key Stakeholders and Institutional Roles

The LDPE/LLDPE value chain is shaped by a diverse ecosystem of actors spanning production, use, disposal, and recovery. These stakeholders include policymakers, producers, informal workers, municipal actors, and NGOs. Each plays a distinct role in shaping the transition toward circularity. Table 8 profiles the key stakeholders involved in LDPE/LLDPE circularity, highlighting their specific roles, responsibilities, and potential contributions to roadmap implementation.

**Table 8. Key Stakeholders and Institutional Roles**

Stakeholder	Mandate and Role in LDPE/LLDPE Circularity
Environmental Protection Agency (EPA)	National regulator for environmental pollution and plastics management. Mandated to enforce standards on plastic use and disposal, and co-lead implementation of the National Plastics Management Policy.
Ministry of Environment, Science, Technology and Innovation (MESTI)	Provides national policy direction on plastics and coordinates multi-stakeholder platforms such as NPAP. Key driver of CE transition pathways.
Ministry of Local Government, Decentralisation and Rural Development (MLGDRD)	Oversees Metropolitan, Municipal and District Assemblies (MMDAs), which are responsible for waste collection, sanitation, and integration of CE into District Development Plans.
National Plastics Action Partnership (NPAP-Ghana)	Convenor of the national plastics dialogue. Plays a coordinating role between government, industry, and civil society on circular policy alignment.
Ghana Standards Authority (GSA)	Develops and enforces product and recyclate standards. Plays a pivotal role in certifying recycled LDPE for formal re-entry into manufacturing.
Waste Pickers and Aggregators (Informal Sector)	Core collectors of post-consumer LDPE. Their livelihoods depend on material resale, yet LDPE's low value limits engagement. Women and youth dominate this group.
Plastic Producers and Sachet Manufacturers	Responsible for producing carrier bags, sachet wrappers and other thin films. Many operate without recycled content mandates. Potential contributors to extended producer responsibility (EPR) mechanisms.
Recyclers and Pelletisers	Small-scale recyclers in Accra and Kumasi who process low-grade LDPE films into pellets for low-value products such as trash bags and basin moulds. Require technical upskilling and quality assurance support.



Stakeholder	Mandate and Role in LDPE/LLDPE Circularity
NGOs and Social Enterprises (e.g., Environment360, Trashy Bags)	Active in community collection, education, and upcycling of film waste. Some operate reuse schemes or pilot alternative materials.
Academia and Research Institutions	Institutions such as KNUST and UCC provide analytical capacity for material flow tracking, emissions modelling, and policy research related to plastics and circularity.

The interplay between these actors determines the extent to which LDPE/LLDPE films are viewed as recoverable assets rather than unavoidable urban waste.

#### 4.2. Stakeholder Engagement Platforms

Given the low perceived value of LDPE/LLDPE and its high environmental cost, targeted engagement platforms are necessary to create consensus, trial innovations, and gather user-led insights. The following formats are drawn from the institutional practices and recommendations within the project reports:

##### a. Regional Design Labs

- Multi-stakeholder spaces hosted in Accra, Kumasi, and Techiman to co-create LDPE recovery pilots.
- Participants include waste pickers, MMDA staff, recyclers, retailers, and CSOs.
- Focus areas: sachet take-back system design, film densification prototypes, standards for recycled pellets.

These platforms are designed not just to raise awareness, but to build co-ownership of solutions among those most affected by LDPE pollution. Effective implementation of circular economy initiatives depends not only on identifying key actors but also on engaging them through inclusive and context-appropriate mechanisms. Stakeholder participation is crucial for co-creating solutions, securing local ownership, and ensuring that interventions are both practical and equitable.

##### b. Value Chain Forums

- Periodic gatherings of manufacturers, recyclers, regulators and academia to assess bottlenecks in the LDPE loop.
- Useful for aligning policy incentives (e.g. recycled content mandates) with business models.
- Expected outcomes: knowledge exchange, market linkage facilitation, policy feedback.

##### c. Listening Sessions and Demonstrations

- Localised, community-level forums particularly targeting informal sector participants (women and youth).
- Held in markets, transport hubs, and informal settlements where LDPE pollution is most visible.
- Focus: surface barriers to film recovery (e.g. health risks, poor pay), test micro-incentive schemes, and demonstrate low-tech collection tools.



**Table 9. Stakeholder Mapping and Engagement**

Component	Details
Lead Institutions	EPA, MESTI, NPAP, MMDAs, GSA
Core Value Chain Actors	Informal waste pickers, sachet manufacturers, recyclers
Supporting Stakeholders	NGOs (e.g. Environment360), research institutions, social enterprises
Engagement Mechanisms	Regional design labs (for co-design), value chain forums (for alignment), community listening sessions (for voice and uptake)
Priority Regions for Engagement	Greater Accra, Ashanti, Central, Bono East



## 5. Pillars, Levers and Enablers

In the context of circular economy planning, pillars represent the core areas of intervention, such as sustainable design, efficient collection, recycling, and inclusive livelihoods, that form the foundation of the system. Levers are the strategic actions or mechanisms used to drive change across these pillars, including policies, incentives, technologies, and partnerships. Enablers are the underlying support systems, like data, financing, capacity building, and stakeholder coordination, that make the implementation of levers and pillars effective and sustainable.

### 5.1. Strategic Pillars

The transition to a circular economy for LDPE/LLDPE in Ghana requires structured, interlinked pillars that address the technical, social, and institutional barriers observed across the plastics value chain.

#### 5.1.1. Clean Energy Transition

Reprocessing LDPE films, particularly washing, shredding, and extrusion, is energy intensive. However, most small recyclers currently rely on diesel-powered generators due to unreliable grid access, especially in peri-urban zones like Suame or Weija. Transitioning to solar-assisted systems or hybrid power sources could lower emissions and operational costs. For instance, processing one tonne of LDPE waste requires energy equivalent to that used by a typical Ghanaian household over three

months, highlighting the need for cleaner alternatives.

#### 5.1.2. Waste Valorisation

At present, less than 1 in 10 LDPE/LLDPE products are collected for recycling, and even fewer are transformed into higher-value outputs. Current recycling typically results in low-grade items like bin liners and flowerpots. To drive material circularity, LDPE films must be:

- a. **Aggregated at scale** using densifiers to improve economic transport,
- b. **Washed and pelletised** for improved consistency,
- c. **Matched with off-takers** who can integrate recyclate into new film or pipe production.
- d. Waste valorisation also includes upcycling by social enterprises and trials of remanufacturing flexible tiles or pouches.

#### 5.1.3. Social Capital Strengthening

LDPE/LLDPE recovery is deeply reliant on informal actors, primarily women and youth, who face systemic exclusion from infrastructure, earnings, and decision-making. For example, fewer than 1 in 10 LDPE collectors belong to a cooperative or micro-enterprise structure.



At present, less than **1 in 10 LDPE/LLDPE** products are **collected for recycling**, and even fewer are transformed into higher-value outputs. Current **recycling** typically results in **low-grade items** like **bin liners** and **flowerpots**.



Strengthening social capital involves:

- a. Supporting cooperatives to engage in LDPE densification and washing,
- b. Providing PPE and training,
- c. Facilitating links to MMDAs and buyers for stable market integration.

#### 5.1.4. Inclusive Innovation




Despite the scale of the problem, LDPE solutions remain under-innovated. Few low-tech collection, processing, or reuse models exist. Pilots such as hand-operated film compactors, sachet collection incentive schemes, and film-to-fuel micro-refineries need targeted funding and testing. Inclusive innovation demands:

- a. Field-based co-design labs,
- b. Open competitions,
- c. Support for community-generated ideas.

## 5.2. Policy Instruments




### 5.2.1. Extended Producer Responsibility (EPR) for Flexible Films

While the reports flag the dominance of sachets and plastic bags in LDPE waste, there is little incentive for producers to contribute to post-use recovery.

	<b>a. Policy Tool:</b> Mandate film producers (e.g. sachet manufacturers, retailers) to finance the collection and recycling of equivalent volumes.
	<b>b. Design Considerations:</b> Flexibility for SMEs to comply through collective compliance schemes or in-kind contributions (e.g. subsidising bins or densifiers).
	<b>c. Impact Rationale:</b> Shifts cost burden from informal collectors to upstream actors, reducing leakage and improving collection infrastructure.

### 5.2.2. Mandatory Recycled Content Targets for LDPE Applications

The low-quality output of informal recyclers makes market uptake difficult. At the same time, virgin LDPE dominates the market due to low cost and lack of incentives for reuse.

	<b>a. Policy Tool:</b> Gradually increasing recycled content requirements (e.g. 10% minimum in bin liners or black bags).
	<b>b. Design Considerations:</b> Tiered targets by application (higher for low-risk items, phased for food contact packaging).
	<b>c. Impact Rationale:</b> Creates steady demand for improved recyclate, enabling small processors to upgrade and expand operations.



### 5.2.3. Localised Plastic Bag Levy (District-Level Fee)

The widespread, thinly dispersed leakage of LDPE bags and wrappers, particularly in market hubs, suggests a need for local-level deterrents.



**a. Policy Tool:** Empower MMDAs to introduce modest per-unit levies on single-use plastic bags and sachet wrappers sold in their jurisdictions.



**b. Design Considerations:** Funds ring-fenced for local aggregation hubs, tools for pickers, or drain-cleaning incentives.



**c. Impact Rationale:** Promotes behaviour change while directly funding local circular interventions in hotspots like Agbogbloshie or Techiman.

### 5.2.4. Public Procurement Standards for LDPE-Derived Products

The reports note that most recycled LDPE ends up in low-value, unregulated uses. Yet government institutions (schools, hospitals, sanitation departments) purchase significant quantities of plastic-based products.



**a. Policy Tool:** Establish minimum thresholds for recycled LDPE content in public procurement categories such as:

- Waste bins,
- Floor tiles,
- Piping and conduit casings.



**b. Design Considerations:** Certification to ensure performance standards; incentives for small-scale local suppliers.



**c. Impact Rationale:** Stabilises market for recyclate, signals institutional support for CE goals.

### 5.2.5. Film Import Regulation and Labelling Standards

Many of the most problematic LDPE applications (e.g. multilayer sachets, non-recyclable films) are imported. There's limited labelling or traceability at the point of sale or use.



**a. Policy Tool:** Require importers of LDPE/LLDPE films and products to:

- Disclose polymer composition,
- Include recyclability labelling in local languages.



**b. Design Considerations:** Applied to distributors and wholesalers, with phased enforcement.



**c. Impact Rationale:** Enables better consumer sorting, supports recyclers with cleaner feedstock, and deters import of non-recyclable films.



### 5.2.6. Micro-Investment Guarantee Scheme for Informal Sector Entrepreneurs

As highlighted in the reports, the informal sector is heavily engaged in LDPE waste collection but lacks access to capital and equipment.



	<p><b>a. Policy Tool:</b> Provide government-backed loan guarantees to enable:</p> <ul style="list-style-type: none"> <li>• Purchase of mobile washers or balers,</li> <li>• Lease-to-own schemes for film compactors.</li> </ul>
	<p><b>b. Design Considerations:</b> Administered via local banks or microfinance partners, targeting youth- and women-led enterprises.</p>

Table 10 outlines key policy levers that can support implementation of the roadmap, detailing their intended purposes and the outcomes they are designed to achieve. The table shows that a robust policy framework is essential to accelerate the transition toward circularity in the LDPE/LLDPE value chain. Well-designed instruments can align incentives, create market signals, and remove structural barriers that hinder sustainable practices.

**Table 10. Policy Instruments**

Instrument	Purpose	Target Outcome
EPR for Flexible Films	Shift financial responsibility upstream	Fund recovery and reduce leakage
Recycled Content Mandates	Create demand for local recyclate	Improve processing economics
Local Plastic Bag Levy	Deter single-use plastics at the district level	Fund circular actions and promote alternatives
Public Procurement Standards	Use government buying power	Stabilise demand and signal institutional support
Film Import Labelling Standards	Improve sorting and traceability	Reduce non-recyclables and contamination
Micro-Investment Guarantees	Enable informal sector investment	Improve recovery quality and enterprise viability

### 5.3. System Enablers

To bridge the systemic gaps in LDPE circularity, particularly around coordination, capacity, and data, specific enablers must be mainstreamed into national and district-level CE implementation:

#### 5.3.1. Circular Economy Toolkits for Local Governments:

Guidance notes and decision-making aids for MMDAs on how to:

- Prioritise LDPE in waste plans,
- Design low-cost segregation systems at source,
- Engage waste picker associations.



### 5.3.2. Modular CE Training in Local Languages:

Practical CE modules in Twi, Ga, and Hausa, focusing on:

- a. Film collection techniques,
- b. Basic plastic types and contamination,
- c. Safe handling and micro-enterprise development.

### 5.3.3. Mobile Data Tracking Tools:

Integration of low-cost mobile apps to monitor:

- a. Volume of LDPE collected by zone,
- b. Performance of aggregation hubs,
- c. Price trends for LDPE pellets across key markets.

**Table 11. Pillars, Levers and Enablers**

Component	LDPE/LLDPE-Specific Priorities
Strategic Pillars	Clean energy for processors, better reuse of collected films, cooperative-based recovery, and inclusive micro-scale innovation
Policy Instruments	Tech adoption grants, recyclate quality certification, LDPE-focused innovation challenge fund
System Enablers	CE toolkits for MMDAs, local-language modular training, and mobile tracking tools for informal collection flows

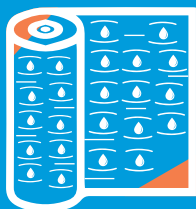


## 6. Pilot Design and Execution

### 6.1 Pilot 1: Sachet Wrapper Take-Back and Reward Scheme (Accra and Kumasi)

#### 6.1.1. Context and Rationale

Sachet water wrappers, composed largely of LDPE, are the single most visible form of plastic pollution in urban Ghana. With over 500 million sachets consumed monthly, and collection rates below 10%, this pilot addresses both the volume and value challenge of thin films. The initiative responds to leakage hotspots in Greater Accra (Agbogbloshie, Chorkor, Mallam) and Kumasi (Aboabo, Asafo), where blocked drains and environmental hazards are linked to discarded wrappers.



**Sachet water wrappers**, composed largely of **LDPE**, are the single most visible form of **plastic pollution** in **urban Ghana**. With over **500 million sachets** consumed monthly, and **collection rates** below **10%**, this pilot addresses both the volume and value challenge of thin films.



#### 6.1.2. Key Activities

- Deploy branded collection bins at water vendor hubs, markets, and lorry parks.
- Offer micro-rewards (e.g. 5-10 pesewas per 100 sachets) via digital or token systems.
- Link collected sachets to pre-identified densification and pelletising hubs.
- Monitor material volumes, participant demographics, and cleanliness levels.
- Motorised horizontal balers (1-2 tonnes/day) to compress film waste for transport efficiency
- Agglomerators with integrated drying (throughput 0.5-1 tonne/hour) suitable for flexible plastic films
- Pelletisers (e.g., single-screw extruders with screen changers) for processing agglomerated flakes into LDPE/LLDPE pellets (~1 tonne/day).

#### 6.1.3. Success Criteria

- At least 3 tonnes/month of sachet wrappers are recovered per city.
- Engagement of over 1,000 informal collectors, particularly women and youth.
- Visible reduction in sachet litter density in targeted drainage areas.

#### 6.1.4. Stakeholders and Roles

- a. EPA, NPAP: Policy oversight and coordination.
- b. Local MMDAs: Waste zoning, site permissions, and behaviour change campaigns.
- c. Water Producers: Co-financing rewards (as part of EPR compliance).
- d. Informal sector groups and NGOs (e.g. Environment360): Mobilisation and logistics.

## 6.2 Pilot 2: LDPE Densification Hubs for Market and Street Waste (Techiman and Cape Coast)

### 6.2.1. Context and Rationale

LDPE bags and wrapping films dominate visible waste in busy trading hubs. Due to their low weight-to-volume ratio, transporting them uncompressed is economically unviable. Establishing community-based densification units helps reduce volume by up to 80%, enabling cost-effective aggregation and movement to be processing centres.

### 6.2.2. Key Activities

- a. Set up manual or motorised balers in key waste hotspots (e.g. Techiman Market, Cape Coast Kotokuraba).
- b. Train 20-30 collectors per site in film sorting, cleaning, and baling.
- c. Link to Accra- and Kumasi-based recyclers with stable off-take agreements.
- d. Track volume, contamination rate, and informal earnings.

### 6.2.3. Success Criteria

- a. Monthly diversion of 2 tonnes/site of LDPE waste from open dumping.
- b. Increased recovery income for pickers (target: minimum GH¢400/month per operator).
- c. Established proof of logistics viability for low-value plastics.

### 6.2.4. Stakeholders and Roles

- a. MMDAs: Hub hosting and community liaison.
- b. Recyclers (e.g. Alpha Plast): Off-take and quality feedback.
- c. Ghana Plastic Manufacturers Association: Standard setting.
- d. Informal cooperatives: Day-to-day operations.



## 6.3. Pilot 3: Mobile LDPE Film Washing and Pelletising Unit (Suame, Kumasi)

### 6.3.1. Context and Rationale

Most recycled LDPE film in Ghana is unwashed, resulting in dark, low-quality pellets with limited reuse options. Pilot 3 targets Suame Magazine (Kumasi), where there is demand for recyclate in pipe and basin moulding, but poor feedstock quality. The goal is to pilot a small-scale, low-water mobile unit for washing and pelletising.

#### 6.3.2. Key Activities

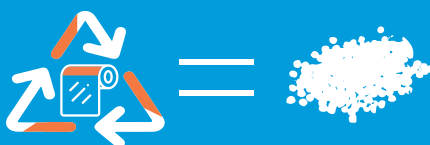
- Deploy a mobile unit capable of washing, drying, and extruding LDPE films.
- Operate on a rotational basis between aggregation sites.
- Conduct hands-on training for 15 informal recyclers on clean processing.
- Record energy, water use, and pellet contamination levels.

#### 6.3.3. Success Criteria

- Production of 1 tonne/month of clean LDPE pellets.
- Rejection rates by buyers fall below 10%.
- Demonstrated viability of decentralised clean processing.

#### 6.3.4. Stakeholders and Roles

- KNUST: Technical monitoring and LCA performance.
- Local recyclers: Host site and operational support.
- SME Development Agency: Investment readiness assessment.



Most recycled **LDPE film** in **Ghana** is unwashed, resulting in dark, **low-quality pellets** with limited reuse options.

## 6.4 Pilot 4: Public Space Plastic Exchange Booths (proposed - Cape Coast and Tamale)

### 6.4.1 Context and Rationale

LDPE films make up a significant portion of plastic leakage in public parks, transport terminals, and coastal zones. Most citizens discard plastic bags due to a lack of collection points and incentives. This pilot tests small booths that allow citizens to exchange sorted LDPE waste for phone airtime, snacks, or transport vouchers.



**LDPE films** make up a **significant portion** of plastic leakage in **public parks, transport terminals, and coastal zones**. Most citizens discard **plastic bags** due to a lack of collection points and incentives.

### 6.4.2 Key Activities

- Install kiosks staffed by trained attendants in public hotspots.
- Accept only LDPE film (bags, wrappers, sachets).
- Partner with mobile networks and FMCGs for reward integration.
- Run 3-month pilot with performance benchmarking.

### 6.4.3. Success Criteria

- Recovery of over 100,000 plastic bags within the pilot duration.
- Public awareness uptake >60% in target zones.
- At least 50% of users return to participate more than once.

### 6.4.4. Stakeholders and Roles

- Youth groups: Staffing and outreach.
- Private sector (telecoms, FMCG): Co-sponsorship of incentives.
- EPA/NPAP: Data tracking and integration with CE roadmap metrics.



## 6.5. Pilot 5: Community Film-to-Tile Upcycling Micro-Enterprise (proposed - Ashaiman and Sekondi)

### 6.5.1. Context and Rationale

A growing number of community innovators are experimenting with low-tech LDPE film upcycling into products such as interlocking floor tiles. These models face issues with consistency, safety, and market access. This pilot supports two sites to formalise and improve upcycled LDPE tile production for low-income housing or community infrastructure.

#### 6.5.2. Key Activities

- Provide moulds, heating plates, and training to two informal teams.
- Introduce quality control protocols and safety standards.
- Facilitate bulk purchase of upcycled tiles for public infrastructure use.
- Track cost of production vs. revenue generated.

#### 6.5.3. Success Criteria

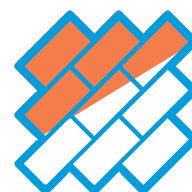
- Production of over 5,000 tiles per site within six months.
- Zero injuries due to improved safety training and tools.
- Secured purchase orders from at least one MMDA or housing partner.

#### 5.4. Stakeholders and Roles

- GSA: Technical assistance on safety and durability standards.
- Housing NGOs: Use cases and advocacy.
- Informal youth groups: Production and enterprise management.



A growing number of **community innovators** are **experimenting** with **low-tech LDPE film upcycling** into products such as **interlocking floor tiles**. These models face issues with consistency, safety, and market access.



**Table 12. LDPE/LLDPE Pilot Interventions**

Pilot Title	Location(s)	Hotspot/Gap Addressed	Target Output
Sachet Take-Back Reward Scheme	Accra, Kumasi	Urban flooding, street litter, and low informal value	3 tonnes/month recovered, 1,000+ collectors
LDPE Densification Hubs	Techiman, Cape Coast	Transport economics, leakage at markets	2 tonnes/month/site, GH¢400+ incomes
Mobile Washing & Pelletising	Kumasi (Suame)	Low-quality pellets, lack of decentralised infrastructure	1 tonne/month of clean pellets
Plastic Exchange Booths (proposed)	Cape Coast, Tamale	Public litter, low public engagement	100,000 bags recovered, 50% repeat users
Film-to-Tile Micro-enterprise (proposed)	Ashaiman, Sekondi	Innovation gaps, unsafe, and informal upcycling	5,000 tiles/site, formal off-take secured

Table 12 presents a snapshot of pilot initiatives targeting LDPE/LLDPE hotspots. To translate the roadmap into tangible results, selected pilot projects are being proposed or implemented in high-impact locations. These interventions are designed to test scalable solutions, address key circularity gaps, and generate learning for broader replication.



## 7. Action Plan and Implementation Pathways

Ghana's LDPE roadmap sets out a sequenced implementation timeline aligned to national CE priorities. It follows a clear phased logic from foundational systems, through demonstration and scaling, to mainstream integration and regulatory consolidation. Each phase directly addresses baseline system gaps, including:

- Extreme thin-film leakage (e.g. ~200,000 tonnes of uncollected plastic film annually).
- Recycling bottlenecks due to a lack of agglomeration and sorting infrastructure.
- Near-total reliance on virgin LDPE resin (~90% of packaging producers use virgin).
- Informal sector exclusion and high health risk among LDPE collectors.

### 7.1. Short-Term Actions (Years 1-2): Foundation and Prototyping

These early actions target visible leakage and lay the groundwork for inclusive recovery.

#### 1. Key Activities:

- Establish 20-30 LDPE-focused community collection hubs across urban markets and malls where thin film accumulation is highest.
- Pilot source segregation schemes in 3 urban districts, targeting densely populated areas with public sachet consumption hotspots (e.g. Accra, Kumasi, Tamale).
- Formalise ~20% of local waste pickers into cooperatives; provide PPE, mobile phones for real-time LDPE tracking, and microgrants.
- Commission first small-scale agglomerator units (1-2 facilities) for LDPE densification in pilot MRFs.
- Launch "Ban the Bag" campaigns promoting enforcement of <math><15\mu\text{m}</math> film bans; introduce community-level enforcement patrols.
- Train MMDA officers, informal collectors, and MRF workers on LDPE handling, agglomeration, and cooperative development.

#### 7.1.2. Rationale:

**This phase addresses three hotspots:**

- The visible leakage of thin films into drains, wetlands, and public spaces.
- Low source-level separation, especially in informal settlements and urban markets.
- Exclusion of informal collectors, especially women and youth, from LDPE recovery value creation.

## 7.2. Medium-Term Actions (Years 2-3): Demonstration and Consolidation

Midstream actions focus on operationalising pilots and regulatory reinforcement.

### 7.2.1 Key Activities:

- a. Expand collection hubs to 50 locations, including peri-urban and rural clusters (especially market catchments).
- b. Fully commission agglomerators and pelletising lines in at least 3 cities, linked to local MRFs.
- c. Enforce Extended Producer Responsibility (EPR) rules for LDPE packaging, requiring fee-based compliance and traceable take-back systems.
- d. Launch tax incentive programmes for manufacturers adopting  $\geq 10\%$  recycled LDPE in new packaging.
- e. Introduce district-level LDPE levies on single-use bags and sachets to finance recovery schemes.
- f. Begin piloting reusable and refill packaging models, e.g. detergent refill stations in 20 shops, cassava-film trials in public institutions.

### 7.2.2. Rationale:

**This phase consolidates foundational activities and:**

- a. Strengthens recycling market linkages by de-risking investment in low-value films.
- b. Activates the EPR mechanism, shifting cost burdens upstream.
- c. Demonstrates business cases for reuse/refill innovation, aligned with leakage reduction and virgin displacement targets.

## 7.3. Long-Term Actions (Years 3-4): Scaling and Institutional Integration

Final phase embeds circular LDPE into Ghana's mainstream industrial and regulatory systems.

### 7.3.1. Key Activities:

- a. Operate 5-10 LDPE recycling facilities with integrated shredders, extruders, and dryers.
- b. Mandate recycled content labelling and minimum thresholds (e.g. 10%) on select LDPE products.
- c. Expand refill station networks and integrate them into public procurement (schools, hospitals).



### 7.3.1. Key Activities:

- d. Implement performance-based financing for informal LDPE cooperatives with digital traceability.
- e. Introduce regional LDPE material flow dashboards, informing enforcement and investment planning.
- f. Conduct a national mid-term policy review, updating CE targets and tightening ban enforcement.
- g. Embed CE curricula in 5 technical and vocational institutions with a focus on flexible plastics.

### 3.2. Rationale:

#### These actions institutionalise success:

- a. Circular LDPE processing becomes financially viable and self-reinforcing.
- b. Behavioural norms shift toward reuse across urban and semi-urban consumer segments.
- c. Regulatory levers align with CE investment flows, unlocking long-term scaling.

Achieving systemic change in the LDPE value chain requires a phased approach, balancing quick wins with long-term structural reforms. Each phase builds on previous milestones to steadily expand infrastructure, policy uptake, and market participation. Proposed implementation timeline, specifying key outputs across short-, medium-, and long-term phases to guide coordinated action and track progress, is presented in Table 13.

**Table 13. LDPE Roadmap Implementation**

Phase	Timeline	Key Outputs
<b>Short-Term</b>	Years 1- 2	20-30 collection hubs, 3 pilot segregation districts, 2 agglomerators, 20% cooperative integration, awareness campaigns launched
<b>Medium-Term</b>	Years 2-3	50 hubs, 3 city-level recycling lines, EPR implemented, reuse pilots, tax breaks for recycled content, district levies activated
<b>Long-Term</b>	Years 3-4	5-10 full LDPE plants, labelling mandates, public procurement of recycled LDPE, refill scaling, policy review, CE curriculum embedded

## 8. Monitoring, Reporting, and Verification (MRV)

The MRV system for LDPE/LLDPE focuses on traceable, high-frequency data that links back to identified value chain bottlenecks: thin-film leakage, informal recovery invisibility, low market value of recyclate, and exclusion of women/youth in processing. Metrics are designed to track progress from pilot to national scale.

All indicators are defined with clear baselines, quantitative targets, and robust methods of verification. The aim is to ensure accountability while enabling learning loops

across stakeholders (MMDAs, recyclers, informal cooperatives, and policymakers).

### 8.1. Environmental KPIs

Tracking environmental progress is critical to ensuring that roadmap interventions are both effective and accountable. By establishing measurable indicators, stakeholders can assess whether efforts are reducing pollution, increasing recovery, and contributing to climate goals. Table 14 presents the key environmental performance indicators for LDPE/LLDPE.

**Table 14. Environmental KPIs**

Indicator	Baseline	Target (by Year 4)	Source/Method
LDPE/LLDPE diverted from open environment	~5,000 tonnes/year nationally (estimated)	≥20,000 tonnes/year	Aggregated collection records; weighbridge logs
Sachet and plastic bag leakage density	>50 units/m <sup>2</sup> in public drain hotspots	≤10 units/m <sup>2</sup> in targeted districts	Transect litter audits in 6 priority zones
Recycled content in LDPE packaging	<1% in low-cost packaging	≥10% in 3 major application areas	Polymer lab tests; producer self-report & audits
GHG savings from LDPE recovery	Negligible currently (informal recovery)	≥25,000 tonnes CO <sub>2</sub> e avoided/year	LCA module with embedded emissions factors
Informal film burning rate	>60% of thin films collected are burnt or dumped	≤15% in intervention zones	Community-level interviews; audit triangulation

### 8.2. Economic KPIs

In Table 15, we define key economic indicators to track changes in value creation, income generation, and market linkages throughout the roadmap's implementation period. A thriving circular economy depends not only on environmental gains but also on strong economic incentives for participation. Enhancing the financial viability of LDPE recovery and processing is essential to sustain engagement especially among informal actors and to attract private-sector investment.



**Table 15. Economic KPIs**

Indicator	Baseline	Target (by Year 4)	Source/Method
Unit value of LDPE waste per kg (collector level)	GH¢ 0.10-0.20	GH¢ 0.50-0.80	Daily price logbooks by cooperatives
Local processing capacity (LDPE-specific)	<5,000 tonnes/year	≥15,000 tonnes/year	Capacity utilisation data from recyclers
Informal operator income from LDPE recovery	Average GH¢ 250/month	≥GH¢ 500/month for 60% of actors	Quarterly cooperative earnings surveys
Number of market linkages (processor-collector)	Few formalised; <5 contractual relationships	≥30 signed agreements (recyclers/co-ops)	Signed MOUs, aggregator reports
Revenue from recycled LDPE sales	Low/irregular due to low pellet quality	≥GH¢ 3 million/year across target zones	Sales registers; VAT invoices; tax returns

### 8.3. Social KPIs

Prioritising gender inclusion, youth engagement, social protection, and worker safety ensures that economic and environmental progress translates into meaningful improvements in people's lives. In Table 16, key social indicators are set with measurable goals for participation, protection, awareness, and well-being over the roadmap's four-year timeline.

**Table 16. Social KPIs**

Indicator	Baseline	Target (by Year 4)	Source/Method
Female participation in LDPE recovery	~15-20%	≥40%	Cooperative rosters; gender-disaggregated tracking
Youth (under 35) participation in the value chain	~25%	≥50%	Workforce registry; ID checks during registration
LDPE sector workers accessing social protection	Virtually none (<5%)	≥40% registered for health/SSNIT	Cross-checks with NHIS/SSNIT and cooperatives
Community awareness of LDPE circularity initiatives	Low (~1 in 10 households aware)	≥7 in 10 households (in pilot zones)	Pre/post-intervention household surveys
Work-related health incidents	Not tracked, anecdotal evidence of injuries	≤1 per 100 workers/year (in target areas)	First aid logs, cooperative health monitoring



## 8.4. Data Collection Tools

To ensure traceable, decentralised MRV across all 13 roadmap steps, the following multi-source data collection infrastructure will be deployed:

### 8.4.1. Mobile Logs:

- Real-time digital data capture of film collection volumes, pricing, and site transfers.
- Used by informal collectors via pre-installed apps (with voice or icon interfaces for low literacy).

### 8.4.2. Periodic Audits:

- Biannual external audits of collection hubs, cooperative books, MRF operations.
- Include back-checks of recyclate origin and downstream destination (to prevent data inflation).

### 8.4.3. Household Surveys:

- Conducted in at least 5 intervention zones annually to track awareness, behaviours, and disposal habits.
- Surveys administered via trained enumerators, using standardised forms linked to SDG indicator frameworks.

### 8.4.4. Transaction Receipts & Price Logs:

- Daily transaction records required at all densifications and washing sites (recorded in triplicate).
- Weekly price aggregation reported via community focal persons to district-level CE monitors.

Table 17 summarises the core MRV metrics, specifying the number of KPIs, how frequently they should be measured, and the tools recommended for monitoring LDPE/LLDPE circular economy performance.

**Table 17. MRV Metrics for LDPE/LLDPE Circular Economy Roadmap**

Domain	No. of KPIs	Measurement Frequency	Main Tools
Environmental	5	Monthly/Quarterly	Litter audits, LCA logs, and lab analysis
Economic	5	Monthly	Price logs, earnings surveys, tax records
Social	5	Biannual	Rosters, NHIS/SSNIT cross-checks, surveys
Overall System		Continuous + Periodic	Mobile app, field audits, dashboard review



## 9. Financing Strategy and Investment Mobilisation

Financing the circular transition for LDPE/LLDPE in Ghana requires targeted mobilisation across infrastructure, innovation, and inclusion domains. Given the low unit value of thin films and the capital intensity of pre-processing (e.g. agglomeration, pelletising), a blended financing approach is essential, combining public anchor investments, donor-backed demonstration funds, and private-sector co-investment where feasible.

Across the 3–4-year implementation window, indicative total investment needs for LDPE/LLDPE roadmap interventions are estimated at USD 8.5-10 million, with strategic prioritisation around three fronts: collection & infrastructure, processing & value addition, and innovation pilots & behaviour change.



Across the **3–4-year** implementation window, indicative total investment needs for **LDPE/LLDPE** roadmap interventions are estimated at **USD 8.5-10 million**, with **strategic prioritisation** around three fronts: **collection & infrastructure, processing & value addition**, and **innovation pilots & behaviour change**.

**Table 18. Cost Estimates for Priority Interventions**

Intervention	Estimated Cost (USD)	Notes
Establishment of 50+ LDPE community collection hubs	\$1.2 million	Includes bins, branding, mobile collection carts, signage, and PPE
Procurement & installation of 5 agglomerator + pelletiser units	\$3.5 million	Assumes \$700,000 per full-line setup with washing/drying capability
Capacity-building and safety training for 2,000 informal actors	\$400,000	Modular training, tools, PPE, and facilitation costs across 10 districts
Refill packaging pilot deployment (20 retail clusters)	\$500,000	Includes equipment, incentive subsidies, and data collection tools
Recycled content R&D and producer trial subsidy	\$800,000	Covers formulation testing, equipment retooling, and early subsidy per tonne
Behavioural campaigns + radio, mural, and school activation	\$350,000	Nationwide reach; includes visuals, jingle production, and facilitators
EPR traceability and levy enforcement system	\$900,000	Digital tracking, district-level audits, and compliance capacity

Intervention	Estimated Cost (USD)	Notes
Monitoring, audit, and dashboard systems (MRV infrastructure)	\$400,000	Includes app development, data analytics support, and evaluator contracts
Policy review and CE integration workshops (regional/national)	\$200,000	Covers cross-sectoral engagement, legal drafting, and consultation rounds

## 9.1. Funding Sources

The following blended sources will be strategically mobilised:

### 9.1.1. Public Funding

- c. Ghana's Environmental Protection Agency and MMDA-level budget allocations (e.g. District Development Facility).
- d. Reinvestment of LDPE product levies under the EPR framework (once enforced).
- e. Ghana Infrastructure Investment Fund (GIIF) for recycling infrastructure anchors.

### 9.1.2. Donor Agencies

- a. UNIDO, EU Delegation to Ghana, World Bank Plastic Action Fund, and GIZ.
- b. Green Climate Fund for climate-relevant emissions savings from LDPE recovery.

### 9.1.3. Private Sector Co-Investment

- a. Sachet and bag producers through EPR fees and recycled content adoption.
- b. Informal sector groups contributing in-kind via aggregation, manual pre-sorting.
- c. Local SMEs producing agglomerators, trikes, or refill station hardware.

## 9.2. De-Risking Mechanisms

To attract co-investment and crowd in innovation, the roadmap integrates:

### a. Guarantee Funds

Offered via development banks to underwrite loans to CE-aligned SMEs handling low-value LDPE.

### b. Innovation Prizes

Competitions offering up to \$50,000 per winning concept (e.g. cassava film alternative, refill-pack scaling, digital LDPE traceability).

### c. Pay-for-Performance Contracts

LDPE co-ops that meet verified collection and safety criteria receive tiered bonuses tied to traceable volumes and participation.

### d. Output-Based Subsidies (OBS)

Recyclers are paid per tonne of verified LDPE pellets produced and used in domestic manufacturing.

## 9.3. Investment Instruments

Table 19 presents a high-level investment overview, outlining estimated costs and potential funding sources across thematic areas essential for roadmap execution. To operationalise the financing pathways, the following tools will be developed:

### a. Investment Prospectus (LDPE Circular Cluster Model)

A modular document offering bankable profiles of district-level LDPE systems (collection to processing), backed by data and IRR calculations.



### b. Circular Challenge Fund (Plastic Thin Films Window)

A competitive mechanism disbursing grants of \$50,000-\$200,000 to social enterprises, start-ups, and informal co-ops testing scalable reuse and recycling solutions.

### c. Performance-Based Grant Agreements

Linked to KPIs for co-operatives and aggregators, with monitoring tracked via the MRV framework.

**Table 19. LDPE/LLDPE Investment Overview**

Theme	Estimated Allocation (USD)	Main Funding Streams
Collection & Community Infrastructure	\$1.2 million	Public, EPR levy, donor match
Processing Infrastructure	\$3.5 million	Donor + private sector co-investment
Capacity & Training	\$400,000	Public & donor
Innovation Pilots	\$1.3 million	Challenge Fund, private sector contribution
Behavioural Campaigns & Inclusion	\$350,000	Donor & local government
MRV Systems & Digital Tools	\$400,000	Donor and public ICT budgets
EPR Compliance and Levy Enforcement	\$900,000	Public, EPR funds
Policy & Governance Integration	\$200,000	Donor, cross-ministerial coordination funds
Total Estimated Requirement	~\$8.5-10 million	Mixed (public-private-donor blended)



## 10. Capacity Development and Institutional Strengthening

The LDPE/LLDPE value chain in Ghana is heavily reliant on informal labour, low-skill micro-enterprises, and fragmented technical knowledge. Over 90% of actors involved in film plastic handling, particularly in sachet and retail bag recovery, lack access to formal training, safety equipment, or cooperative organising skills. Closing this capacity gap is essential for enabling circular transitions at scale and for anchoring job creation in waste valorisation and reuse pathways.



Over **90%** of actors involved in **film plastic handling**, particularly in sachet and retail bag recovery, lack access to **formal training, safety equipment, or cooperative organising skills**.

### 10.1. Modular CE Training Curriculum

A nationally harmonised but locally delivered CE curriculum tailored to LDPE/LLDPE is proposed. It focuses on recovery techniques, pre-processing, occupational safety, business skills, and digital traceability.

#### 10.1.1 Actors involved (from shared reports):

- a. **Environmental Protection Agency (EPA):** Oversight of environmental compliance training modules.
- b. **Ministry of Sanitation and Water Resources (MSWR):** Integration of municipal waste actors and sanitation officers.
- c. **Ghana Technical and Vocational Education and Training Service (TVET):** Design and certification of modules for informal and SME actors.
- d. **Waste Recovery Platform (Ghana Recycling Initiative by Private**

**Enterprises - GRIPE):** Coordination of private-sector engagement and tech demonstration.

- e. **Local Assemblies (MMDAs):** Host venues and facilitate participant mobilisation at the district level.
- f. **Plastic producers and aggregators:** Provide in-kind contributions and host trainees for practical experience.

#### 10.1.2. Key module clusters will include:

- a. Safe handling and cleaning of LDPE films.
- b. Agglomeration and basic mechanical processing.
- c. Business and cooperative formation.
- d. Circular design principles (including reuse systems).
- e. Recycled content specification for local packaging industries.



## 10.2. Extension Officer Upskilling

LDPE and LLDPE handling remain invisible in many districts' sanitation plans due to limited knowledge among field officers. Targeted upskilling for ~200 district-level extension officers across 50 MMDAs will include:

- Film plastic identification and classification.
- Mapping hotspots using mobile geo-tracking.
- Support for informal collector group formation.
- Reporting for EPR-related monitoring tools.

## 10.3. Vocational Partnerships

The report identifies a critical opportunity to link circular LDPE recovery with employment schemes. These include:

- Partnership with the National Youth Employment Programme for recruiting and training youth collectors and sorters.
- Engagement of the Ghana Federation of the Urban Poor (People's Dialogue on Human Settlements) for community-level plastic entrepreneurship incubation.
- Collaboration with Pentecost Vocational Training Centre and Suame Magazine

Industrial Development Organisation (SMIDO) for local machinery assembly and repair training (agglomerators, choppers, pellet extruders).

## 10.4. Institutional Integration

Partnerships with vocational bodies, public agencies, and local authorities can ensure that capacity-building efforts are sustained and scaled. To secure long-term uptake of LDPE-related capacity-building efforts, the following institutional mainstreaming steps are proposed: Table 20 outlines key institutional components and actors involved in training, curriculum development, and systemic integration of circular practices across the LDPE/LLDPE value chain.

- Embed CE modules (especially LDPE/LLDPE reuse and recovery) into the National Technical and Vocational Education and Training Qualifications Framework (NTVETQF).
- Add circular waste recovery skills into the Ghana Jobs and Skills Project (GJSP) competency frameworks.
- Integrate LDPE handling into the Municipal Environmental Health Officer Toolkit.
- Link training participation to EPR compliance requirements for producers and recyclers.

**Table 20. Institutional Integration**

Component	Key Actors	Focus Area
Modular CE Curriculum	EPA, MSWR, TVET, GRIPE, MMDAs, Plastic Producers	Recovery, safety, cooperative skills
Extension Officer Upskilling	District Sanitation & Environmental Health Officers	Plastic mapping, digital tools, group support
Vocational Partnerships	GJSP, SMIDO, TVET, Youth Employment Agency, Pentecost VTC	Processing, repair, reuse
Institutional Integration	NTVETQF, GJSP, Local Assemblies, Waste Units	Formal system embedding

## 11. Governance and Integration Framework

Institutional leadership for LDPE/LLDPE circular transition is currently fragmented, with multiple overlaps across environment, sanitation, local government, and trade domains. The reports highlight the need for an integrated, multi-level governance mechanism that builds on the National Plastics Management Policy while strengthening district-level accountability.

### 11.1. Multi-Level Governance Structure

#### 11.1.1. National Level:

- a. **National Plastic Action Partnership (NPAP):** Lead agency for aligning national targets and policy integration for plastic circularity, including LDPE.
- b. **Ministry of Environment, Science, Technology and Innovation (MESTI):** Anchors regulatory and policy oversight, linked to the SDGs and NDCs.
- c. **Environmental Protection Agency (EPA):** Provides monitoring, licensing, and emissions tracking functions.
- d. **National Development Planning Commission (NDPC):** Integrates CE targets into Ghana's medium-term planning framework.

#### 11.1.2. Regional Level:

- a. **Regional Coordinating Councils (RCCs):** Serve as coordination and reporting hubs across districts for plastic recovery plans.
- b. **GRIFE and AGI Chapters:** Facilitate business engagement and EPR roll-out regionally.

#### 11.1.3. District Level:

- a. **Municipal and District Assemblies (MMDAs):** Implement local CE roadmaps and monitoring of LDPE-specific interventions.
- b. **Waste Management Departments:** Deploy community collection systems and interface with informal actors.

### 11.2. Integration into National Planning and Policy Systems

The following integration routes are already signposted in the reports:

- a. LDPE/LLDPE roadmap alignment with Ghana's Medium-Term National Development Policy Framework (2022-2025).
- b. Inclusion of LDPE waste in Sanitation Performance Contracts (SPCs) at the MMDA level.
- c. Alignment with Ghana's EPR implementation framework under the Plastic Levy Scheme.
- d. Integration into SDG 12 indicators (especially 12.4 and 12.5 on waste and material footprint reduction).



### 11.3. Institutionalisation and Oversight

Effective circular economy implementation depends on clearly defined institutional responsibilities across governance levels. Aligning national strategy with district-level execution ensures coherence, accountability, and sustained momentum. Table 20 delineates the key institutional actors and their respective mandates at the national, regional, and district levels.

Oversight mechanisms include:

- Quarterly Plastic Governance Forums led by MESTI and EPA to evaluate progress on CE roadmap KPIs.
- LDPE/LLDPE Sub-Committee under the National Plastic Steering Committee, focused on thin film-specific strategy coordination.
- District EPR Compliance Taskforces supported by EPA and MSWR to track local enforcement and stakeholder participation.

**Table 21. Institutions and Responsibilities**

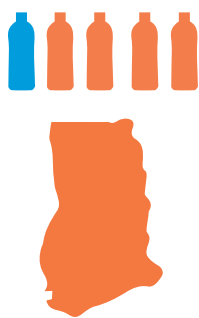
Level	Lead Institutions	Responsibilities
<b>National</b>	NPAP, MESTI, EPA, NDPC	Strategy, compliance oversight, and integration into national policy frameworks
<b>Regional</b>	RCCs, AGI/GRIPE chapters	Coordination, business mobilisation, technical support
<b>District</b>	MMDAs, Waste Departments, Local Assemblies	Execution of LDPE CE plans, data collection, and informal sector engagement.



## 12. Communications, Behavioural Change and Cultural Shifts

Despite accounting for over 1 in every 5 kilogrammes of plastic imported into Ghana, LDPE and LLDPE have remained among the most mismanaged polymers due to their thinness, low unit value, and persistent association with informal consumption (e.g. sachets, carrier bags). Both the PlasticsWaste2Wealth and LDPE\_CERM reports highlight that social norms, poor public understanding of plastic sorting, and stigma associated with waste recovery activities have severely hindered inclusive uptake of circular models.

An effective transition, therefore, hinges on reshaping collective behaviour, increasing cultural visibility of plastic champions, and embedding recognition systems that reward circular action across communities.



Despite accounting for over **1 in every 5 kilogrammes** of **plastic imported** into **Ghana**, **LDPE** and **LLDPE** have remained among the **most mismanaged polymers** due to their thinness, low unit value, and persistent association with informal consumption (e.g. **sachets**, **carrier bags**).



### 12.1. Storytelling and Recognition

**National and Community-level narratives and visibility campaigns** are essential to normalise the participation of informal actors and elevate positive examples of LDPE/LLDPE innovation. Suggested interventions include:

- a. **Community Videos:** Documentaries or short-form video clips showcasing local innovators, plastic aggregators, and women-led reuse enterprises. Footage to be shot in informal recovery hubs, schools, and plastic reuse cooperatives.
- b. **Annual Plastic Champions Awards:** Held at the district level to honour exceptional actors in sorting, collection, or recycling of LDPE-based materials.
- c. **“My Bag, My Value” Campaign:** Personalised storytelling campaign, in which schoolchildren name their plastic bag or water sachet and track how many they reuse, clean, or return through school-based incentive schemes.
- d. **Radio Testimonies:** First-person interviews with waste workers and community leaders, sharing stories of environmental transformation and economic benefit from circular plastic practices.
- e. **A national recognition and awards scheme** will be introduced to highlight MMDAs that demonstrate excellence in plastic waste management. The initiative will promote visibility and accountability by rewarding local governments that implement effective collection systems, support public education on segregation and recycling, engage informal sector actors, and reduce plastic leakage.



These campaigns will be deployed through the existing community radio and market announcer systems already mapped in the plastics stakeholder ecosystem.

## 12.2. Local Language and Low-Literacy Messaging

Given that a significant proportion of informal actors engaged in LDPE recovery operate in peri-urban and rural zones with limited formal education, low-literacy and linguistically diverse outreach is essential.

- a. **Radio Campaigns in Twi, Ga, Ewe, and Hausa:** Tailored segments on the environmental impact of film plastics, segregation tips, and informal sector rights. Anchored in storytelling and dramatisation.
- b. **Visual Murals and Market Signage:** Large-format artwork painted on school walls, community centres and sanitation block enclosures, illustrating the life of a plastic bag from litter to product.
- c. **Pictorial Sorting Guides:** Distributed via schools and MMDA outreach teams; illustrate correct sorting of LDPE films (e.g. sachets, shrink wrap) from harder polymers like PET.
- d. **LDPE Theatre Troupes:** Community drama groups (e.g. Asafo Cultural Ensembles) commissioned to perform skits that show “a day in the life of a sachet” from pollution to reuse.

## 12.3. Community-Led Channels

Behavioural change gains strongest traction when interventions are embedded into trusted community systems. From both shared documents, the following have emerged as high-potential community channels:

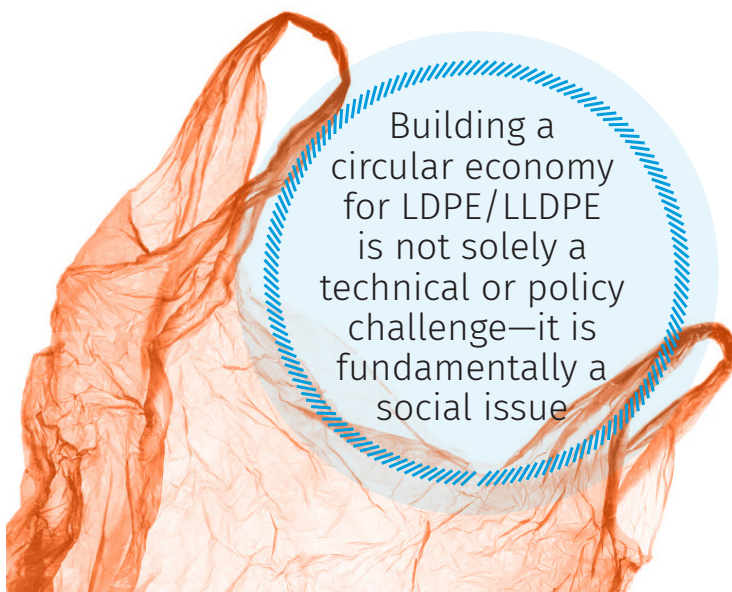
- a. **Faith-Based Institutions (FBOs):** Engage religious leaders to integrate messages of stewardship and cleanliness into sermons and public messaging, with tailored messaging around plastic reuse and collective responsibility.
- b. **Schools as Hubs of Circular Culture:** Plastic clubs in Junior High Schools (JHS) to run “Bring Back Your Bag” weeks and inter-school recycling competitions.
- c. **Market Women Associations and Sachet Retailers:** Mobilised as ambassadors for clean LDPE segregation and responsible distribution (e.g. giving out thicker, labelled bags with return instructions).
- d. **Youth-Led Environmental Movements (e.g. Green Africa Youth Organisation):** Engaged to run peer-to-peer behavioural workshops and clean-up data tracking using mobile tools.

Table 22 highlights selected entry points through which communication and cultural engagement can catalyse long-term behavioural shifts and foster inclusive social norms around plastic reuse and recovery.

**Table 22. Communication, Behaviour Change and Cultural Shifts**

Component	Description	Intended Outcome
Storytelling and Recognition	Community videos, Plastic Champions Awards, student campaigns, radio testimonies	Shift cultural attitudes and valorise informal actors.
Local Language & Low-Literacy	Radio in local dialects, murals, sorting guides, drama groups	Reach underserved audiences and clarify LDPE-specific roles
Community-Led Channels	FBOs, schools, market associations, youth groups	Embed behavioural change into existing trusted institutions

Building a circular economy for LDPE/LLDPE is not solely a technical or policy challenge—it is fundamentally a social issue. It requires shifting public perceptions of plastic waste from nuisance to resource, empowering local storytellers, and dismantling stigma around informal labour. Strategic communication in this context must move beyond awareness-raising to activate pride, responsibility, and participation. This includes leveraging local languages, lived experiences, and trusted community institutions to make circular practices visible, relatable, and repeatable.




## 13. Circular Business Model Incubation and Scaling

LDPE and LLDPE plastics, which collectively account for around 21% of Ghana's total polymer imports (~28,000 tonnes annually), are associated with the highest levels of visible leakage and the lowest levels of recovery and reuse. Less than 1 in 10 items made from these films are recycled due to poor segregation, contamination, low material value, and lack of tailored infrastructure. However, several pilot pathways and hotspot interventions outlined earlier offer a foundation for scalable circular business models.


### 13.1. Circular Business Models Identified

Transitioning from fragmented recycling efforts to viable enterprises requires more than technical fixes—it demands business

model innovation tailored to the realities of LDPE/LLDPE value chains. This section outlines promising models that not only recover value from low-grade films but also reimagine informal sector roles, consumer behaviour, and packaging norms. These models exemplify how circularity can be localised, gender-inclusive, and economically scalable, even in the face of logistical and material constraints. Table 23 summarises three circular business models that illustrate different pathways. Table 24 highlights the projected economic, environmental, and social benefits of each circular model. These insights can guide investment decisions, inform policy incentives, and prioritise capacity-building efforts where the return on inclusion is highest.



**LDPE and LLDPE plastics**, which collectively account for around **21% of Ghana's total polymer imports (~28,000 tonnes annually)**, are associated with the highest levels of visible leakage and



the lowest levels of recovery and reuse. Less than **1 in 10 items** made from these films are recycled due to **poor segregation, contamination, low material value, and lack of tailored infrastructure.**

**Table 23. Circular Business Model**

Business Model	Typology	Problem Addressed	Core Opportunity
Sachet-to-Sheet Micro factories	Localised Reprocessing	Informal sector collection lacks nearby processing points; sachets are not economically viable to transport.	Deploy decentralised agglomerator lines in peri-urban hubs to convert sachets into roofing sheets and panels.

Business Model	Typology	Problem Addressed	Core Opportunity
LDPE Reuse Retail Innovation	Product-as-a-Service	One-use culture for bags and wraps; retailers have no incentive to promote returns.	Branded, thicker LDPE bags distributed through sachet vendors and grocers with small deposit-return schemes.
Circular Packaging Co-ops	Cooperative Manufacturing & Sales	Fragmented female-led recycling efforts lack legal registration, market access, and machinery.	Group informal recyclers into co-ops, providing shared pelletisers, business training, and B2B supply links.

**Table 24. Projected Returns by Model**

Model	Economic Return	Environmental Return	Social Return
Sachet-to-Sheet Micro factories	\$5,000/month gross revenue per unit from roofing sheets.	~60 tonnes/month diverted from drains and open burning.	15-20 jobs per facility; includes women in processing and youth in aggregation.
LDPE Reuse Retail Innovation	10-15% increase in retailer margins through deposit incentives.	Reduction of ~200,000 single-use bags per month in pilot districts.	Normalises reuse culture; stimulates consumer awareness and informal bag cleaning services.
Circular Packaging Co-ops	Collective earnings up to \$50,000/year per co-op (5-7 members).	Enables upcycling of 30-50 tonnes/month of film plastics into trays and liners.	Formalisation, skill-building, and income for women-led recovery networks.

### 13.2. Readiness Pillars and Support Needs

Successful implementation of circular business models depends not only on good ideas but on the enabling conditions that allow those ideas to thrive. Across the LDPE/LLDPE value chain, entrepreneurs especially those in informal or early-stage ventures face hurdles that span technology gaps, financing barriers, regulatory ambiguity, and unpredictable markets. Addressing

these constraints is critical to scaling up innovations from pilot projects to resilient businesses. Table 25 outlines the foundational pillars needed to assess and strengthen circular business readiness, and identifies the specific types of support technical, financial, policy, and market. Table 26 outlines the foundational pillars needed to assess and strengthen circular business readiness, and identifies the specific types of support technical, financial, policy, and market.



**Table 25. Readiness Pillars and Support Needs**

Readiness Pillar	Support Needs
Technical Readiness	Mobile pelletisers, shredders, agglomerators; design templates; durable LDPE blend guides.
Financial Viability	Seed grants of \$100k-\$250k per model; working capital for informal actors; microcredit access.
Policy & Regulatory Fit	Inclusion in MMDA procurement lists, EPR scheme linkage, and cooperative registration fast-tracking.
Market Development	Offtake agreements with housing boards, agro-packers, and municipal cleaning units.

### 13.3. Incubation Support Mechanisms

- a. **Demo Days:** Bi-annual showcases in Accra and Kumasi for each model to pitch to anchor buyers and investors.
- b. **Innovation Roundtables:** Quarterly discussions between MESTI, GEA, and circular SMEs to unlock bottlenecks in approvals and licensing.
- c. **Pre-Incubation Training:** Delivered by GRATIS Foundation, GIMPA, and Women in Recycling Ghana; covering costing, negotiation, digital traceability, and health and safety.
- d. **Access to Makerspaces and Shared Tooling:** Partner with vocational schools and rural polytechnics to offer workshops and shared fabrication tools for moulds and product prototyping.

### 13.4. Scaling Path

The success of circular business models depends not just on their innovation but on a clear, phased approach to scale. Moving from pilot to replication requires more than technical validation it hinges on building institutional trust, anchoring demand, and embedding models in broader policy frameworks. This roadmap prioritises early traction in target districts, consolidation through public-private partnerships, and eventual mainstreaming across regions. Strategic alignment with local authorities, cooperatives, and national EPR structures will be critical to long-term impact. Table 26 outlines a three-phase scaling strategy for the proposed LDPE circular business models, with milestones tied to venture rollout, policy uptake, and geographic expansion.

**Table 26. Scaling Path**

Phase	Timeline	Key Outputs
Proof-of-Concept	2025-2026	6 ventures operational (2 per model), linked to Step 6 pilots and 4 districts.
Institutional Partnerships	2026-2027	Co-op MoUs with MMDAs; 3 anchor buyers signed; models validated by EPR Council.
Regional Replication	2027-2028	Expansion to 8-10 districts; integration of models into the national CE roadmap.

To complement this, **Table 27** maps each business model to its corresponding hotspot, intervention, and key performance indicators (KPIs). This linkage ensures that each solution is outcome-driven and aligned with both environmental and socio-economic returns. The summary reinforces that scalability is not just about growth in numbers but also about depth of impact and system transformation.

**Table 27. Summary Table**

Component	Linked Hotspot/Pilot/Action	Measured KPI(s)
Sachet-to-Sheet Micro factories	Hotspot: High sachet litter; Pilot: Cluster-level processing hubs	Monthly plastic diverted (tonnes), Jobs created, Roofs produced
LDPE Reuse Retail Innovation	Hotspot: Short product lifespan; Pilot: Deposit-return retail partnerships	Reuse rate (%), Retailer income change, Plastic bag volume reduced
Circular Packaging Co-ops	Hotspot: Low-value plastic underutilisation; Action: Cooperative formation	Income per actor, Production yield, Gender inclusion ratio

### 13.5. Alignment to the Project M&E Strategy

This roadmap for LDPE/LLDPE is structured not only to address material hotspots and circular opportunities but also to ensure that each intervention contributes meaningfully to the wider project's Monitoring and Evaluation (M&E) framework. The roadmap aligns closely with the established results chain, from inputs and activities to outputs, outcomes, and long-term impacts, enabling clear tracking of progress across environmental, economic, and social dimensions.

### 13.6. Environmental Tracking

Several indicators within the M&E system directly relate to LDPE outcomes. For example:

- a. Volume of plastic waste recovered is a central metric. The roadmap's pilots, particularly sachet-to-sheet processing

hubs, target diversion of over 1,500 tonnes annually by Year 3. This is equivalent to removing the plastic weight of 100 million water sachets from unmanaged waste streams each year.

- b. Drainage clearance linked to LDPE hotspot zones such as Ashaiman, Madina, and Ablekuma will be tracked as a proxy for environmental stress reduction, with a projected 40% reduction in reported blockages by Year 3.
- c. Recycled content in new products will also be monitored, especially in products emerging from new co-operatives (e.g. plastic tiles, panels), helping reduce virgin material dependency.

All these links directly to the roadmap's Pillar 2 on waste valorisation and Pilots 1 and 2, ensuring that progress can be tracked against both volume and quality of circular outcomes.





Volume of **plastic waste** recovered is a **central metric**. The roadmap's pilots, particularly **sachet-to-sheet processing hubs**, target diversion of over **1,500 tonnes** annually by Year 3. This is equivalent to removing the **plastic weight** of **100 million water sachets** from unmanaged waste streams each year.



### 13.7. Economic Inclusion

The roadmap contributes to several economic indicators defined in the M&E file:

- a. Income increase for informal workers is targeted at 30% within two years for those engaged in LDPE aggregation, cleaning, and light processing. This will be tracked using structured enterprise and cooperative surveys.
- b. Cost-efficiency in recovery will be measured through a reduction in
- c. Finance mobilisation is another key metric. The roadmap's intervention costing and investment prospectus are designed to crowd in at least \$450,000 in blended finance through grants, CSR, and SME co-investment.

the average cost per tonne of LDPE processing, aiming to fall below \$180 per tonne by the end of Year 2, enabled by decentralised technologies like mobile agglomerators.



**Income increase** for informal workers is targeted at **30%** within two years for those engaged in **LDPE aggregation, cleaning, and light processing**. This will be tracked using structured enterprise and cooperative surveys.

These indicators map directly to pilots 3 and 5, as well as the financing strategy outlined in Step 9.

### 13.8. Social Inclusion and Cultural Change

The M&E framework also includes strong social dimensions:



- a. Women's participation in new circular enterprises is a tracked outcome, with a minimum target of 60% female involvement in LDPE cooperatives and training programmes. This aligns with Step 10 of the roadmap.



- b. Youth training under the modular CE curriculum is measured by total enrolment and completion. The roadmap aims to train at least 1,000 youth by Year 3, with a focus on informal settlements and transition areas.



- c. Behavioural change indicators, including uptake of reusable bags and community-led collection, will be monitored through structured household surveys and pre-/post campaign assessments, especially in areas served by Pilots 2 and 4.

These provide a comprehensive picture of how circularity in LDPE is contributing to equity, empowerment, and mindset shift.

### 13.9. Tools and Verification Methods

The roadmap supports and integrates the following data collection tools already outlined in the M&E plan:

- a. Mobile logging tools for informal collectors and processors, enabling real-time recording of volumes and locations.
- b. Quarterly performance audits to assess the functioning of reprocessing hubs, training centres, and cooperative output.
- c. Community and household surveys, particularly in hotspots and pilot zones,

to track reuse habits, social attitudes, and livelihood outcomes.

These tools will allow triangulation between operational data, community perceptions, and actual environmental results, ensuring credibility and accuracy.

### Learning Loops and Adaptive Management

Finally, the roadmap contributes to adaptive learning. Built-in reflection mechanisms, such as quarterly stakeholder review sessions, annual CE learning forums, and pilot-level performance triggers, ensure that interventions can be adjusted based on what the data shows.



## 14. Conclusion

The challenges presented by LDPE and LLDPE plastics in Ghana are clear: widespread use, low recovery, and high environmental leakage. These materials, used in sachets, bags, films, and wraps, are among the most visible in public spaces and the least effectively managed at end-of-life. Yet, they also represent one of the most actionable segments for circular economy transformation.

This roadmap offers a focused, data-driven pathway to address the structural inefficiencies across the LDPE/LLDPE value chain. It brings together baseline evidence, hotspot diagnostics, and stakeholder inputs to identify targeted interventions, from decentralised aggregation and reuse schemes to low-tech recycling pilots and inclusive enterprise incubation.

Implementation is phased, realistic, and aligned with national development planning cycles. Each action, from policy instruments to capacity development and business model support, is designed to deliver measurable results, reduce plastic leakage, improve livelihoods, and increase material recovery.

If executed with commitment and coordination, this roadmap can significantly reduce the environmental burden of LDPE/LLDPE waste while unlocking local economic value. It sets out not only what needs to be done, but how, where, and by whom, providing a clear, actionable blueprint for shifting flexible plastics from a linear to a circular system in Ghana.



Photo Credit: Mckingtorch Africa



## 15. Appendix: Roadmap KPI Matrix

Table 28 presents all identifiable KPIs categorised as either vertical (function-specific) or horizontal (crosscutting). Each entry includes:

- a. **Baseline metric:** Value or condition at the roadmap start.
- b. **KPI:** The measurable target or output to be achieved.
- c. **Action required:** The intervention/activity that drives change.
- d. **Broader CE indicator:** Overarching theme the KPI contributes to.
- e. **KPI Category:** Vertical or horizontal.
- f. **TBL Score:** Triple Bottom Line impact (Economy, Environment, Social), each rated out of 5.

**Table 28. Roadmap KPI Matrix**

Baseline Metric	KPI	Action Required	Broader CE Indicator	Category	TBL Score (Econ. Env. Soc)
8,000 tonnes/year LDPE use	≥30% recycled content in products	Support recycled LDPE adoption by 2028	Material Circularity	Horizontal	2.4.3
~3,200 tonnes/year LDPE informal waste	≥50% reduction in informal disposal	Expand formalised collection and recycling networks	Waste Reduction	Horizontal	2.2.3
1 LDPE sorting hub (Accra)	3 new hubs are operational	Establish hubs in Kumasi, Tamale, and Takoradi by 2027	Infrastructure Expansion	Vertical	2.2.4
10% LDPE collection rate	≥50% LDPE collection by 2028	Partner with MMDAs and private sector collectors	Collection Efficiency	Horizontal	2.5.4
2 informal baling centres	≥5 formal baling facilities	Formalise and equip informal balers in urban hotspots	Technology Upgrade	Vertical	3.5.4
0 CE-focused public campaigns on LDPE	3 multi-channel campaigns run	Develop radio, school murals, and market activations	Behavioural Change	Horizontal	4.4.3



Baseline Metric	KPI	Action Required	Broader CE Indicator	Category	TBL Score (Econ. Env. Soc)
0 CE indicators in District Plans	≥4 DMTDPs integrate CE KPIs	Engage NDPC and District Planners	Policy Mainstreaming	Horizontal	5.1.2
0 Modular CE Training curricula	3 CE modules piloted	Co-develop with TVET institutions	Skills Development	Vertical	3.1.2
<2% recycled LDPE content	≥30% recycled LDPE in key applications	Incubate eco-design packaging solutions	Eco-Design	Vertical	5.1.5
~70% sachet films uncollected	≥60% sachet films recovered	Launch targeted sachet film recovery schemes	Leakage Prevention	Horizontal	5.2.3
No dedicated CE business support	5 start-ups are incubated annually	Launch CE incubator with private partners	Entrepreneurship	Horizontal	4.5.3
GH¢0 earned from LDPE reuse	Track LDPE-based CE revenue	Enable M&E for CE value creation tracking	Value Chain Revenue	Horizontal	2.5.3
0 innovation showcases	Annual CE Demo Days	Deliver showcase events with innovators and investors	Innovation Visibility	Horizontal	2.5.5
0 digital tracking tools	Mobile CE logging piloted	Deploy tools to 10 collection SMEs	Digital MRV	Vertical	5.4.4
0 CE vocational schemes	2 vocational CE partnerships	Integrate CE into vocational curricula	Youth Skills Pipeline	Vertical	3.1.4
No formal LDPE recycling jobs	≥200 CE jobs created	Train and engage workers via CE hubs	Green Job Creation	Horizontal	3.5.4
Informal youth-led collection	≥100 youth formalised	Form youth CE co-operatives	Youth Inclusion	Horizontal	2.1.4
0 LDPE eco-certifications	≥2 certified recycled products	Facilitate EPA compliance process	Sustainability Standards	Vertical	3.3.5
20% women in LDPE value chain	≥50% women in CE pilots	Target recruitment and upskilling of women	Gender Mainstreaming	Horizontal	3.2.3



Baseline Metric	KPI	Action Required	Broader CE Indicator	Category	TBL Score (Econ. Env. Soc)
3,200 tonnes/year unmanaged LDPE	Reduce by 60%	Launch reuse/recycling pilots	Pollution Prevention	Horizontal	3.4.4
1 innovation roundtable/year	Quarterly CE policy roundtables	Institutionalise intersectoral dialogues	Policy Co-Design	Horizontal	2.5.5
0 makerspaces available	2 CE tooling hubs are operational	Equip and operationalise shared CE hubs	CE Fabrication Infrastructure	Vertical	3.4.5
0 district CE focal points	≥10 CE officers trained	Embed CE in MMDA structures	Institutional Capacity	Horizontal	5.1.5
0 data logs from collectors	≥80% collectors use digital tools	Roll out CE mobile logging	Monitoring System	Vertical	3.1.3
Untracked post-consumer waste flows	Stage-wise material traceability is in place	Adopt digital traceability mechanisms	MFA Compliance	Horizontal	2.1.2
0 recovered LDPE-to-product links	≥3 upcycled product pathways	Support new LDPE-derived product ventures	Product Valorisation	Vertical	5.5.5
1 in 5 markets are visibly littered with sachets	Hotspot litter rate reduced by 50%	Deploy 'Clean Market' CE campaigns	Public Space Sanitation	Horizontal	2.2.3
Limited CE language in planning tools	CE glossary embedded in DMTDPs	Produce CE planning guides	Terminology Standardisation	Horizontal	2.4.5
Uncertified LDPE processing firms	≥3 firms certified	Guide SMEs to compliance	Processor Legitimacy	Vertical	4.5.3
No CE KPIs disaggregated by gender/youth	All KPIs tracked by the inclusion lens	Adopt CE M&E templates	Inclusion Monitoring	Horizontal	2.5.4
0 LDPE-specific research outputs	5 studies commissioned	Fund CE-focused operational research	Evidence Base	Horizontal	4.3.3



Baseline Metric	KPI	Action Required	Broader CE Indicator	Category	TBL Score (Econ. Env. Soc)
No CE-trained local artisans	≥50 artisans up-skilled	Conduct tooling and repair workshops	Circular Repair Economy	Vertical	4.5.5
LDPE collected but not sorted	≥80% sorted at source	Train waste handlers and provide bins	Segregation Quality	Vertical	5.2.2
0 CE integration in schools	≥20 schools engaged	Run CE education initiatives	Early CE Awareness	Horizontal	4.1.4
No CE business clusters	2 CE business networks formed	Connect SMEs and recyclers	Industry Coordination	Horizontal	5.4.5
1 pilot in place	≥5 pilots implemented	Scale LDPE-focused CE pilots	Demonstration and Learning	Horizontal	4.3.4
No LDPE MRV baseline	LDPE MRV framework adopted	Build out baseline and reporting template	Monitoring Readiness	Horizontal	4.2.5
Limited LDPE economic data	LDPE CE value-added tracked	Use M&E logs to track earnings	Economic Contribution	Horizontal	3.2.5
0 private co-financing	≥2 private co-investors secured	Leverage roadmap investment proposals	Finance Mobilisation	Horizontal	5.5.3
Unassessed social impact	Composite social score developed	Apply the TBL rating across CE activities	Impact Accounting	Horizontal	2.3.4
Uncoordinated LDPE actor roles	Actor registry and mandates mapped	Create stakeholder directory	Stakeholder Clarity	Horizontal	4.4.2
0 CE diagnostic tools	CE diagnostics applied in 5 districts	Deploy toolkits during rollouts	Implementation Readiness	Horizontal	2.5.3
No post-pilot support	≥3 ventures supported post-pilot	Provide incubation, funding linkage	Pilot-to-Scale Transition	Horizontal	5.1.5
Unscalable pilot designs	Pilots benchmarked for scalability	Review and refine pilot KPIs	Scalability Planning	Horizontal	5.3.4



Baseline Metric	KPI	Action Required	Broader CE Indicator	Category	TBL Score (Econ. Env. Soc)
0 school mural campaigns	≥10 CE murals completed	Commission murals in schools	Visual Behavioural Change	Horizontal	4.4.5
Unrecorded CE tool use	All tools logged per use	Introduce tool sign-out tracking	Asset Management	Vertical	5.5.5



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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



### Value Chain Leads



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