

PLASTIC WASTE MANAGEMENT, RECYCLING, AND POLICY REFORM IN PUNTLAND:

*An Assessment of Environmental,
Health, and Socioeconomic Impacts*



Research Study

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I. LIST OF ABBREVIATIONS AND ACRONYMS:

EPR	Extended Producer Responsibility
NGO	Non-Governmental Organization
TOoR	Terms of Reference
ME	Monitoring & Evaluation
KIIs	Key Informant Interview
FGDs	Focus Group Discussion
CSO	Civil Society OrganisationOrganization
CBO	Community-Based OrganisationOrganization
DRR	Disaster Risk Reduction
PDRC SOP	Puntland Development and Research Center Standard Operating Procedures
PPPs SPSS	Public Private Partnership Statistical Package for the Social Sciences

II. EXECUTIVE SUMMARY

Puntland is facing a fast-growing plastic waste crisis that is now showing up in daily life—blocked drains, smoky dumpsites, sick households, and livestock losses across grazing areas. Plastic pollution has moved beyond being an environmental concern and is increasingly affecting public health, pastoral livelihoods, urban services, and local governance.

Although Puntland introduced restrictions on plastic bags initially in 2013, later reinforced through newer directives, enforcement remains weak and plastic use continues to expand. Cheap single-use plastics dominate markets, while affordable alternatives and effective waste management systems remain largely absent.

This study assessed plastic waste management practices, environmental and health impacts, enforcement challenges, and recycling potential across three major cities—Garowe, Bosaso, and Qardho. Using a mixed-methods approach, the team conducted a 300 household survey with business women, women headed households etc, 53 key informant interviews with government officials, health and veterinary professionals, traders, and producers, and 3 focus group discussions two in Garowe and one in Bossaso with pastoralists, women's groups, government officers and business owners between 15 August and September 2025.

Key findings show a clear gap between awareness and action. While 86% of respondents acknowledged that plastic bags are unsafe, the same proportion reported not using traditional alternatives such as Dambiiil, Haan, or Dhiil in the past 12 months. Livestock deaths linked to plastic ingestion were reported across pastoral zones. Although comprehensive veterinary surveillance data is limited, senior livestock officials and pastoralists consistently described widespread exposure—particularly among animals grazing near markets, dumpsites, and peri-urban corridors.

Based on business-level estimates collected in this study, combined annual plastic consumption among assessed businesses is estimated at roughly 200–300 metric tons, with plastic bottles contributing over 90% of total plastic weight. This points to a clear priority: recycling systems must address bottles, not only bags. Plastics enter Puntland through both formal import channels and informal trade routes, further complicating enforcement and tracking.

Policy enforcement was widely described as symbolic rather than operational. Institutional fragmentation, lack of clear mandates, political interference, and limited resources continue to undermine compliance. At the same time, open burning of plastics in urban areas is contributing to rising respiratory illnesses, while unsafe reuse of plastic containers for food and water increases chemical exposure risks.

The report proposes a phased intervention strategy:

1. Immediate enforcement and coordination at district level,
2. Medium-term investment in affordable alternatives and sustained public awareness, and
3. Long-term recycling infrastructure and an integrated waste management policy framework.

In short, the crisis is solvable—but only if enforcement, affordable alternatives, and waste systems move together, not one at a time

CHAPTER ONE: INTRODUCTION

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INTRODUCTION

Plastic has become one of the most widely used materials in Puntland over the past two decades. Its affordability, versatility, and convenience have driven a massive increase in usage, particularly in urban centers such as Garowe and Bossaso. Plastic bags and bottles are now pervasive across households, pastoral areas, businesses, and markets. However, this rapid and unregulated expansion has come at a high cost to human health, livestock, and the natural environment.

Puntland's semi-arid ecosystem, characterized by limited vegetation and fragile soils, is especially vulnerable to non-biodegradable waste. Discarded plastics block drainage systems, pollute grazing areas, harm vegetation, and are routinely ingested by livestock, leading to animal deaths and reduced productivity. In coastal areas, although this research was not its primary focus, pollution contributes to the degradation of marine ecosystems and fisheries, a primary source of livelihood for coastal communities. Despite a government law banning plastic use, enforcement remains weak after 14 years, and alternative packaging materials have not been widely adopted or introduced.

This study, conducted in Garowe, Bossaso, and Qardho, provides an in depth, evidence-based assessment of plastic waste risks and management and recycling potential in Puntland. It draws on KIIs, FGDs, and household surveys to capture diverse perspectives — from households, pastoralists, business owners, factory owners, and government officials. The report also explores behavioral, cultural, and economic factors driving the continued reliance on plastics, as well as the decline of traditional, sustainable utensils such as Dambiil (woven basket), Dhiil (milk container), Haan (large gourd for storing liquids such as milk and water), and Haruub-gaal/Gaawe (drinking vessel for camel milk).

The goal is to inform policy, raise awareness, and support practical solutions for a cleaner, healthier, and more sustainable Puntland.

1.1 PROBLEM STATEMENT: PLASTIC WASTE CRISIS IN PUNTLAND

Puntland is facing a severe and rapidly worsening plastic waste crisis with far-reaching environmental, public health, and livelihood consequences. Non-biodegradable plastics are accumulating across grazing lands, urban centers, and coastal zones due to the absence of an effective waste collection and disposal system. Plastic debris clogs drainage networks, degrades soil quality, entangle on trees and threatens Puntland's fragile semi-arid ecosystem. Widespread open burning of plastic waste releases toxic pollutants such as dioxins and furans, while low-quality plastic containers leach hazardous chemicals into food and water, contributing to respiratory illnesses, cancer increased incidence and long-term health risks.

The impacts extend beyond the environment, directly undermining pastoral livelihoods, food security, and cultural heritage. Livestock deaths caused by plastic ingestion are increasingly reported by the pastoral communities, while weak enforcement of the 2013 plastic bag ban—due to limited institutional capacity, poor coordination, and lack of affordable alternatives—has allowed plastic use to expand unchecked. At the same time, the displacement of traditional biodegradable materials such as Dambiil (woven baskets), Haan (gourds), and Dhiil reflects a broader erosion of indigenous sustainable practices. In response to these interconnected challenges, this study aims to systematically assess the scale and drivers of plastic waste in Puntland, evaluate its environmental, health, and livelihood impacts, and identify context-appropriate policy and technical solutions. To achieve these objectives, the study employs a mixed-methods methodology combining field observations, surveys, key informant interviews, focus group discussions, and stakeholder consultations to generate evidence-based recommendations for effective plastic waste management and policy reform.

1.2 BACKGROUND AND CONTEXT

Plastics have revolutionized global consumption patterns, providing affordable and lightweight packaging for virtually every commodity. However, their environmental persistence, with some plastic types requiring 100–1,000 years to fully decompose in aquatic environments (Artan, 2024, Barnes et al., 2009). Dr. Ahmed Artan, Vice Minister of the Ministry of Livestock and Animal Husbandry, emphasized that one of the most pressing waste management challenges worldwide. In developing regions like Puntland, where formal policies of waste collection systems are limited, plastic pollution has escalated rapidly in recent years.

1.3 LOCAL CONTEXT: PLASTIC USE IN PUNTLAND

The increased importation of consumer goods packaged in plastic, the increased use of bottled water, and the widespread use of single-use plastic bags have overwhelmed local waste management capacities. In urban areas such as Garowe and Bossaso, as well as other main cities, plastic litter is visible in markets, drainage channels, and roadside dumps. In Bossaso, plastic debris accumulates along the coastline and fishing zones, endangering marine species and coastal livelihoods, and is gradually filling the small port.

Traditional utensils and containers such as Dambiil (woven basket), Dhiil (milk container), Haan (large gourd for storing liquids), and Gaawe (drinking vessel of camel milk) once played a vital role in household and pastoral life. Their gradual abandonment in favor of disposable plastic alternatives reflects not only modernization but also changing consumer habits driven by affordability, convenience, and, finally, the required skills and knowledge for household use, as well as for the production of traditional containers. This cultural shift, while seemingly minor, has profound implications for health, environmental sustainability, and the preservation of indigenous knowledge and skills.

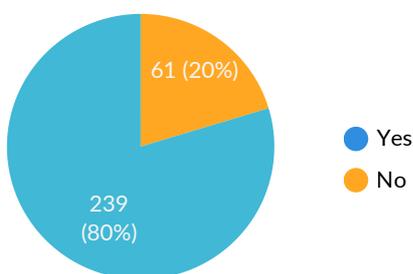
Environmental degradation: Plastic waste accumulates in open dumps, grazing lands, and drainage channels. In pastoral zones, livestock often ingest plastics, leading to intestinal blockages and death. In urban areas, plastic waste clogs drainage systems, worsens flooding during heavy rains, and degrades the overall urban environment.

Health hazards: The open burning of plastics emits toxic gases and fine particulates that contaminate air quality and contribute to respiratory illnesses and chronic health problems. The widespread use of low-quality plastic containers for storing food and water, as well as the serving of hot meals in plastic packaging, further exposes communities to harmful chemicals such as BPA and phthalates, which can cause hormonal imbalances and digestive disorders.

Institutional weaknesses: Despite the Puntland government’s 2013 law banning plastic bags, enforcement remains inconsistent and largely ineffective according to the KII and focus group discussions, as well as the law enforcement officials themselves. Weak institutional capacity, inadequate coordination, low public awareness, and the lack of affordable packaging alternatives have all contributed to undermining compliance and policy effectiveness.

Cultural and behavioral change: The gradual abandonment of traditional, biodegradable materials such as Dambiil (woven baskets) and Haan (liquid containers, gourds) has reinforced a culture of disposability. This shift underscores the importance of integrating environmental protection with cultural revitalization, behavioral awareness, and community-based initiatives. 80% of those surveyed were aware of traditional materials, but despite this, 86% had not used any in the last 12 months, suggesting a deliberate preference for plastic bags.

Do you know about traditional shopping baskets *Figure 1: Source: Primary Data, 2025*



Overall, Puntland’s plastic waste crisis reflects not only an environmental threat but also deeper socio-cultural and governance challenges. Understanding these interlinked dimensions is essential for designing

practical, socially grounded, and culturally sensitive solutions that advance sustainability and public health.

1.4 RATIONALE FOR THE STUDY

Have you used Dambiil, Dhiil or Haan in the past 12 months?

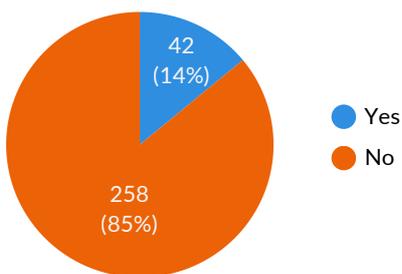


Figure 2: Source: Primary Data, 2025

This study responds to the urgent need for a data-driven understanding of the impacts of plastic waste and potential recycling pathways in Puntland. By examining the issue through economic, health, environmental, and socio-cultural lenses, the research provides a holistic foundation for policy formulation,

public education, and private sector engagement. It also highlights opportunities for innovation, such as small-scale recycling enterprises and community-based collection systems, which align with Puntland’s urban, rural, and pastoral realities.

1.5 RESEARCH OBJECTIVES AND QUESTIONS

Study Objectives

This study aims to provide a comprehensive assessment of plastic waste risks and management in Puntland. The core objectives are:

1. Identify and categorize the economic, health, and environmental hazards caused by plastic bags and bottles.

- II. Explore the cultural and behavioral drivers behind the public preference for plastic bags over traditional alternatives, such as Dambiil, Dhiil, Haan, and Gaawe.
- III. Estimate the annual volume of plastic bags and bottles imported into Puntland, through both formal and informal markets.
- IV. Examine the factors limiting the enforcement and impact of the existing government ban on plastic bags.
- V. Assess public perceptions, awareness levels, and attitudes towards solutions such as bans, recycling, and incentives.
- VI. Evaluate the feasibility of introducing localized plastic recycling systems tailored to Puntland's urban, coastal, and rural realities.

Key Research Questions

The following research questions guide the study:

1. What are the specific environmental, health, and economic consequences of plastic use in Puntland?
2. What social and cultural factors contribute to the continued use of plastic bags, and what barriers exist to reviving traditional practices?
3. What is the estimated volume and source of plastic bags and bottles entering Puntland annually?
4. Why is the plastic bag ban not effectively enforced, and what are the institutional or logistical challenges involved?
5. What do households, business owners, and local leaders perceive as viable solutions to the plastic waste crisis?
6. Is there public support for plastic recycling, and what are the financial and infrastructural prerequisites to implement such systems?

CHAPTER TWO: LITERATURE REVIEW AND METHODOLOGY

2.1 LITERATURE REVIEW

Existing literature on single-use plastics provides critical insights into their far-reaching environmental, economic, and health consequences. Clapp and Swanston (2009) document how public perception of plastics has shifted from convenience to environmental hazard as scientific evidence and media attention revealed plastics' negative externalities. Globally, plastics are now widely recognized as a net negative material, polluting soil, air, and water systems, and disrupting both human and animal health (Yee et al., 2021).

However, much of this research focuses on Western contexts, where capacity, resources, and waste-management infrastructure are significantly more advanced than in developing countries. These assumptions limit the applicability of specific findings to fragile settings like Puntland, where institutional capacity and infrastructure remain weak. Nonetheless, secondary literature serves as a valuable foundation for understanding the structural, policy, and behavioral challenges of plastic waste management and for identifying adaptable practices suitable for low-resource environments.

2.1.2 POLICY INSTRUMENTS AND IMPLEMENTATION APPROACHES

The East African region provides valuable lessons on effective plastic regulation and enforcement. Behuria (2021) highlights the outcomes of plastic bag bans in Rwanda, Kenya, and Uganda, demonstrating that successful implementation depends on political will, social buy-in, and consistent enforcement. Rwanda's experience stands out: following bans enacted in 2007 and strengthened in 2019, the country introduced strict penalties for the production and use of plastics. Danielsson (2017) attributes Rwanda's success to strong governance, community participation, and a multi-sectoral implementation strategy, positioning the country as a continental model for environmental cleanliness.

By contrast, neighboring Kenya and Uganda faced challenges related to policy inconsistency and weak enforcement, issues that resonate strongly with Puntland's own institutional experiences. These comparative cases demonstrate that environmental laws alone are insufficient without the administrative capacity, social mobilization, and political commitment to enforce them effectively.

2.1.3 ENVIRONMENTAL AND HEALTH IMPLICATIONS OF PLASTIC POLLUTION

Scientific evidence on the health effects of plastics further reinforces the urgency of addressing the problem. Yee et al. (2021) demonstrates that microplastics and nanoplastics can affect health at the subcellular and molecular levels, illustrating how deeply plastics can penetrate biological systems. For livestock-dependent communities like Puntland, these findings are particularly relevant. Field observations and testimonies from the Ministry of Livestock and the Vice Minister of Health in Puntland have reported cases of livestock mortality linked to plastic

ingestion and rising respiratory ailments among humans exposed to burning plastics (Field KII, Garowe, 2025). 86% of the people surveyed believed plastic bags were unsafe.

The secondary literature corroborates these field findings, confirming that plastics' toxic components threaten both human and animal health, contaminate food chains, and degrade ecosystems critical for pastoral livelihoods.

2.1.4 CULTURAL TRANSITIONS AND BEHAVIORAL SHIFTS

In Somalia and Puntland, plastics have also altered traditional cultural practices. The Dambiil (hand-woven basket), once used for shopping, and the Gaawe or Haruubgaal (traditional milk storage containers) have been replaced by plastic bags and jerrycans, marking a significant shift from sustainable local traditions to dependency on non-biodegradable products. This mirrors Clapp and Swanston's (2009) observation that societal perceptions of convenience can normalize unsustainable behaviors.

Behavioral Change and Social Norms theories (see Section 2.2.2) further explain this dynamic, suggesting that reversing such trends requires reshaping community norms through education, awareness, attitudes, and cultural revival.

2.1.5 IDENTIFIED GAPS AND RELEVANCE TO PUNTLAND

While global and regional literature provides a strong theoretical foundation, significant contextual gaps persist in understanding how plastic pollution manifests in fragile governance settings such as Puntland. Existing studies rarely capture:

1. The interaction between pastoral livelihoods and plastic pollution, particularly its impact on livestock health and rangeland ecosystems.
2. The role of informal waste actors, including small collectors and recyclers operating outside formal systems.
3. The cultural and behavioral dimensions of plastic dependency, rooted in convenience and affordability
4. The institutional fragmentation between ministries, municipalities, and enforcement agencies.

This research directly addresses these gaps through empirical evidence gathered in Garowe, Bossaso, and Qardho, incorporating perspectives from key informants, including the Ministry of Environment, the Ministry of Livestock, and local councils, businesses, and community voices. The findings are expected to generate locally grounded policy insights that complement global practices and inform Puntland's path toward sustainable waste management.

2.2 CONCEPTUAL AND THEORETICAL FRAMEWORK

This study draws on four interrelated theoretical and conceptual frameworks to analyze the dynamics of plastic waste in Puntland: Waste Management Theory, Behavioral Change and Social Norms Theory, Innovation Diffusion Theory, and the Circular Economy Concept. Together, these frameworks provide multiple perspectives, from individual behavior to institutional systems, to understand how plastic waste persists, how change can occur, and what structural reforms are necessary for sustainable management in Puntland's urban and rural contexts.

2.2.1 WASTE MANAGEMENT THEORY

Core Evidence: Waste Management Theory emphasizes the importance of structured systems for waste generation, collection, reduction, recycling, and disposal. It assumes that sustainable waste outcomes depend on institutional coordination, public participation, and the existence of infrastructure and policy frameworks that guide these processes.

Application in Puntland: Across Bosaso, Garowe, and Qardho, municipal officials and law enforcement actors confirmed that plastic waste management remains largely uncoordinated, reactive, limited, and unsustainable. Urban councils rely on public–private partnerships such as Alla-Aamin, Daryeel Deegaan, and Kaafi Deegaan, but collected waste is typically dumped and burned at designated sites in the vicinity of towns, contributing to air pollution and soil degradation rather than resource recovery.

What do you currently do with plastic bags in your household?

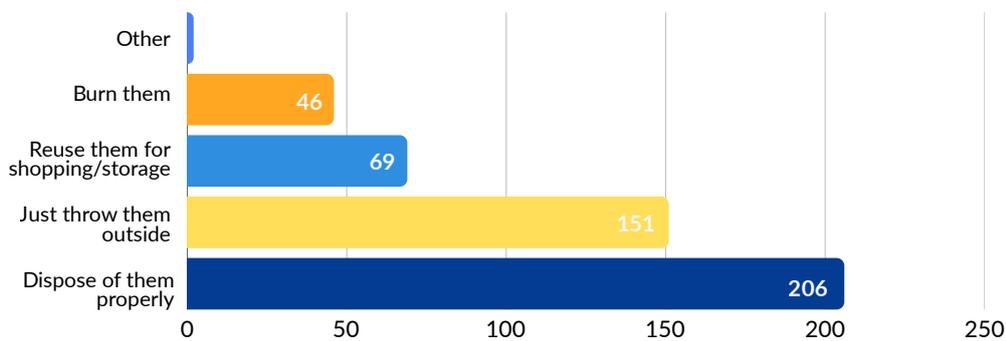


Figure 3, Primary Data 2025.

What do you currently do with the empty plastic bottles in your household?

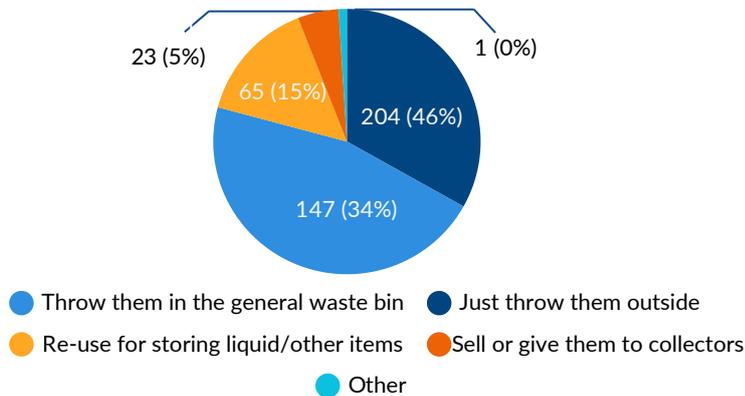


Figure 4: Primary Data, 2025

Officials from the Ministry of Environment, the Customs Department of the Port of Bosaso, and District Attorney's offices further revealed that enforcement of the plastic ban is weak and inconsistent. Plastics continue entering Puntland through unregulated trade routes, often concealed among other goods. Institutional fragmentation, in which ministries, municipalities, and enforcement bodies operate without coordination, has created significant enforcement gaps.

This situation aligns directly with Waste Management Theory's observation that the absence of integrated systems leads to inefficiency, environmental degradation, and weak accountability. Respondents' calls for a comprehensive solid waste management policy, recycling infrastructure, border controls, and enforcement mechanisms demonstrate awareness of the structural reforms needed to transform the current linear, fragmented system into a functional one.

2.2.2 BEHAVIORAL CHANGE AND SOCIAL NORMS THEORY

Core Evidence: This theory explains how community norms, habits, and social influences sustain certain behaviors even when people understand their negative consequences. Effective change requires transforming social expectations, enabling environments, and peer behaviors.

Application in Puntland: Among households and pastoralists, respondents were aware that plastics harm livestock, degrade soil, and cause respiratory and chemical-related health problems, yet usage persists. Plastics are perceived as cheap, lightweight, and convenient, while traditional utensils such as Haan, Dhiil, and Dambiil are viewed as outdated in both urban and rural settings. This perception has become a social norm reinforced by market supply and the absence of affordable alternatives.

What is the main reason people still use plastic bags instead of Dambiil and Haan/Dhiil or oother reuseable options?

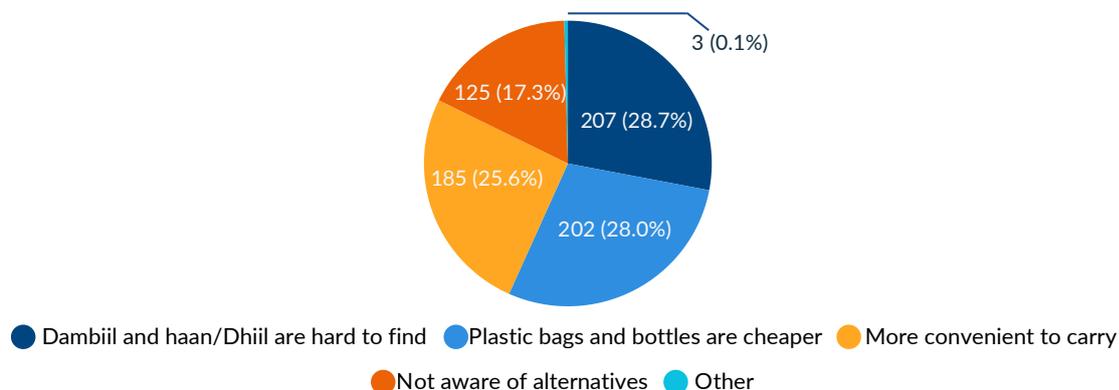


Figure 5, Primary Data 2025.

Law enforcement and local government respondents linked the problem to weak public awareness and the erosion of traditional values that once favored environmental stewardship. Behavioral change efforts have been limited and inconsistent, mainly due to a lack of institutional coordination and resource constraints.

Thus, while awareness exists, collective behavior in Puntland continues to favor plastics, driven by habit, market dependency, and weak behavioral interventions. Applying this theory suggests that progress requires community education, awareness, and integration of cultural and religious values, promoting environmental responsibility.

2.2.3 DIFFUSION OF INNOVATION THEORY

Core Evidence: Innovation Diffusion Theory describes how new ideas and technologies spread through a community over time, influenced by perceived advantages, cultural compatibility, accessibility, and support systems.

Application in Puntland: Findings from both the community and institutional levels indicate a willingness to adopt alternatives such as woven baskets, cloth bags, biodegradable products, and even the revival of traditional containers if these were accessible and affordable. Local councilors and pastoralists supported such transitions, while private actors in Puntland have already experimented with biodegradable production but face challenges of high taxation, limited market support, and a lack of both incentives and production.

At the policy level, officials called for tax exemptions and producer responsibility schemes to encourage investment in eco-friendly alternatives.

These represent early-stage innovation efforts that need enabling policies and social diffusion channels to reach adoption scale. The revival of indigenous craftsmanship, combined with youth and women’s cooperatives promoting sustainable materials, can serve as innovation diffusion hubs, bridging traditional knowledge with modern eco-solutions.

2.2.4 CIRCULAR ECONOMY CONCEPT

Core Evidence: The Circular Economy framework envisions waste as a resource, advocating for design, reuse, and recycling systems that keep materials in continuous use and minimize the extraction of new resources.

Application in Puntland: Puntland’s waste economy remains linear: import, consume, and discard without structured recovery or recycling mechanisms. Municipalities acknowledged that recycling facilities are absent, and prior attempts to reuse plastics for tiles or export failed due to tax burdens and lack of support. The high cost of energy was also listed as a reason for the failure of recycling initiatives. Law enforcement and environmental officials highlighted that no comprehensive recycling or reuse strategy exists, and private investors see little incentive without policy and infrastructure backing. A majority of those surveyed showed receptiveness or indifference (with the possibility of persuasion) to participating in recycling if it were set up in their districts.

If a recycling facility were set up in your town, how likely would you be to participate?

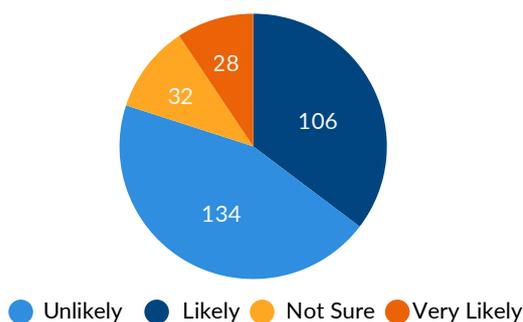


Figure 6: Primary Data, 2025

However, evidence from households, factories, and councilors shows early potential for circular transition. Households reuse plastic containers for milk and water transport, factories have tested biodegradable alternatives, and municipalities are exploring PPP-supported recycling plants. Introducing

“Polluter Pays” and producer responsibility principles could establish the economic feedback loop essential for a circular economy. A national framework promoting waste-to-resource innovation, coupled with tax incentives and enforcement, could transform Puntland’s plastic crisis into an opportunity for green enterprise and local employment.

2.2.5 INTEGRATED APPLICATION TO PUNTLAND’S PLASTIC WASTE PROBLEM

These four theoretical frameworks inform our research design and analysis as follows:

Waste Management Theory guides our assessment of collection infrastructure, disposal practices, and institutional capacity gaps (Research Questions 1, 4). Behavioral Change Theory shapes our exploration of why plastic use persists despite health awareness, informing survey questions about attitudes, perceptions, and barriers to alternative adoption (Research Questions 2, 5). Diffusion of Innovation Theory frames our analysis of traditional practice abandonment and potential for revival, examining early adopters, communication channels, and perceived attributes of alternatives (Research Question 2). Circular Economy Principles underpin our feasibility assessment of recycling systems and sustainable production models suited to Puntland’s economic context (Research Questions 3, 4). Finally, the table below synthesizes how each framework operationalizes into specific research instruments and analytical approaches.

Theoretical Framework	Relevance to Puntland Context	Key Observations and Alignment
Waste Management Theory	Explains systemic and infrastructural weaknesses. Absence of waste policy management in Puntland is the center of the problem.	Ineffective collection, lack of recycling, and absence of policy and institutional coordination among the government bodies.
Behavioral Change and Social Norms Theory	Explains the persistent use of harmful practices. People still use harmful plastics for convenience.	Continued use of plastics due to affordability, weak application of bylaws, weak awareness, and cultural shift from traditional to modern materials.
Innovation Dissemination Theory	Explains adoption barriers to eco-friendly alternatives	Limited innovation uptake due to high costs, lack of incentives, and weak market competitiveness.
Circular Economy Concept	Offers a sustainable waste-to-resource model by creating job opportunities for women and youth.	Need for recycling facilities, PPPs, and enforcement of producer responsibility mechanisms. Most interviewed participants are in favor of recycling and revival of traditional utensils.

Anchored in these frameworks, the research demonstrates that Puntland’s plastic pollution problem is not merely environmental but systemic, rooted in weak governance, behavioral inertia, and economic disincentives. Effective intervention requires a combination of behavioral transformation, institutional reform, support for innovation, and circular economic policies. These frameworks thus serve as both an analytical lens and a practical guide for designing future interventions toward a sustainable and plastic-free Puntland.

2.3 METHODOLOGY

This study adopted a mixed-methods approach to provide a comprehensive assessment of plastic waste risks, management practices, and potential solutions in Puntland. Data was collected from different demographics to capture environmental, social, economic, and cultural dimensions of plastic use.

2.3.1 STUDY AREAS

The research was conducted in key urban, coastal, and rural areas of Puntland, including Garowe, Bossaso, and selected locations in Qardho. These sites were selected to reflect diverse socio-economic settings, population densities, and exposure to plastic waste. According to the Ministry of Planning’s Facts and Figures, the Department of Statistics, and United Nations data, these three towns, together with Galkayo, constitute the most densely populated urban centers of Puntland.

2.3.2 RESEARCH DESIGN

This study employed a mixed-methods convergent parallel design (Creswell & Plano Clark, 2018), collecting and analyzing quantitative survey data and qualitative interview/focus group data simultaneously, then integrating findings during interpretation. The complex, multifaceted nature of plastic waste management requires both statistical representation (prevalence, patterns) and contextual understanding (perceptions, barriers, cultural factors).

2.3.3 QUALITATIVE METHODS

KIs with government officials from the Ministries of Livestock, Environment, Health and Agriculture, factory owners, households, and business owners, as well as community leaders, and FGDs with households and pastoralists, were used to explore cultural and behavioral drivers, perceptions, and barriers to sustainable alternatives.

2.3.4 STUDY POPULATION AND SAMPLING

Geographic Scope: Three purposively selected cities representing Puntland's urban diversity: (i) Garowe (Capital); (ii) Bossaso (Commercial Hub); Qardho (Regional Center).

Target Populations: (i) Urban Households: Representing primary plastic consumers; (ii) Pastoral Communities: Affected by environmental contamination; (iii) Government Officials: Policy implementers and regulators; (iv) Health Professionals: Medical evidence of plastic-related illnesses; (v) Business Owners: Importers, retailers, potential recyclers, (vi) Civil Society Organizations: Community mobilization actors

2.3.5 DATA COLLECTION TOOLS

- Structured questionnaires for household surveys to quantify plastic usage, disposal practices, and perceptions were 300. One hundred per location.
- Semi-structured interview guides for KIs to capture policy, law enforcement, and institutional insights.
- Urban Households: 10 interviews per town, selected to represent different socio-economic levels.
- Pastoralist Households: 3 interviews per grazing zones of Nugaal and Karkaar regions, emphasizing livestock-dependent livelihoods.
- Business Sector: Importers, wholesalers, factory owners, shop owners, and manufacturers of packaged goods (12 interviews per city). The total of the FGDs participants is 36.
- Government Institutions: Ministries of Environment, Health, Livestock, and Agriculture, plus municipal waste management staff and law enforcement or security staff (15 interviews in total).
- FGD discussions to inform of cultural practices, behavioral drivers, and community perspectives on alternatives and recycling -- Two FGDs in Garowe and one in Bossaso: 6–8 persons per group each (selected by gender, age, and occupation).
- Observation checklists for field visits to assess littering, collection, and recycling practices that exist in target areas.

2.3.6 DATA ANALYSIS

- Quantitative data were analyzed using descriptive statistics to identify patterns in plastic consumption, disposal, and associated hazards.
- Qualitative data from KIs and FGDs were coded thematically to identify key behavioral, cultural, institutional, and policy-related insights.
- Findings were triangulated across data sources to ensure validity and provide a holistic understanding of the plastic waste landscape in Puntland.

2.3.7 ETHICAL CONSIDERATIONS

- Participants were provided with informed consent before interviews or discussions.
- Anonymity and confidentiality were maintained for all respondents.
- The study adhered to ethical standards in data collection and reporting to ensure the safety and dignity of all participants.
- The research ethical standards were reviewed and approved by PDRC.

2.3.8 LIMITATIONS

- Data collection was limited in remote pastoral areas due to accessibility constraints.
- Some estimates of plastic imports and production relied on self-reported figures from businesses, which may introduce minor inaccuracies.
- Coastal areas were partially included, so marine plastic impacts were not comprehensively assessed.

CHAPTER THREE: FINDINGS AND DISCUSSION

3.1 INTRODUCTION

This chapter presents and analyzes empirical findings from a mixed-methods investigation of plastic waste management in Puntland, conducted across three urban centers: Garowe, Bossaso, and Qardho. Drawing on survey data from 300 households, 53 key informant interviews, and 12 focus group discussions, the analysis reveals that plastic waste has evolved from a convenience commodity into a multidimensional crisis affecting environmental integrity, public health, economic productivity, and cultural practices.

The findings are organized thematically, beginning with respondent demographics (Section 3.2), followed by empirical evidence on environmental and health impacts (Section 3.3), policy enforcement challenges (Section 3.4), waste management practices (Sections 3.5-3.6), community awareness (Section 3.7), private sector dynamics (Section 3.8), governance gaps (Section 3.9), and circular economy opportunities (Section 3.10). Section 3.11 provides a comparative stakeholder analysis, while Sections 3.12-3.20 offer an integrated discussion connecting primary findings to theoretical frameworks and secondary literature. The chapter concludes with a synthesis of cross-cutting themes and their implications for policy intervention.

Key Finding Overview: Plastic pollution in Puntland represents a governance failure as much as an environmental crisis. While 88% of respondents are aware of the plastic bag ban and 86% acknowledge plastic's dangers, enforcement remains symbolic, alternatives are unavailable, and institutional coordination is fragmented. This awareness-behavior gap—where knowledge does not translate into action—underscores the need for systemic interventions addressing both supply-side factors (enforcement, alternatives production) and demand-side dynamics (affordability, convenience, cultural acceptance).

3.2 DEMOGRAPHIC PROFILE OF RESPONDENTS

Sample Composition and Representativeness

The study achieved broad demographic representation across urban (Garowe, Bossaso) and peri-urban/rural (Qardho) contexts, ensuring findings capture socioeconomic diversity.

Table 3.1: Demographic Characteristics of Survey Respondents (n=300)

Characteristic	Category	Frequency	Percentage	Notes
Location	Garowe	104	34.70%	Capital
	Bosaso	100	33.30%	Commercial hub
	Qardho	96	32.00%	Regional center

Characteristic	Category	Frequency	Percentage	Notes
Gender	Female	192	64%	Purposive oversampling
	Male	108	36%	
Age group	18-24	45	15%	Youth segment
	25-35	112	37.30%	Primary working age
	36-50	98	32.7	Established households
	51+	45	15%	Elder/ traditional knowledge holders
Education	No formal education	54	18%	Higher in rural/pastoral areas
	Primary	78	26%	
	Secondary	114	38%	Majority
	Tertiary	54	18%	
Occupation	Pastoralist	66	22%	Livestock-dependent livelihoods
	Trader/Business	72	24%	Market actors
	Civil servant	48	16%	Government employees
	Homemaker	54	18%	Household managers
	Student	36	12%	
	Other	24	8%	

Rationale for Gender Distribution:

The deliberate oversampling of women (64% of respondents) reflects their central role in three critical dimensions of plastic consumption and potential solutions:

- **Household Decision-Making:** Women are primary purchasers of food and household goods, making daily choices about packaging and storage materials. Their consumption patterns directly drive plastic demand at the household level.
- **Traditional Knowledge Holders:** Women historically produced and used traditional alternatives (Dambii, Haan, Dhiil) for food and milk storage. Understanding barriers to revival requires engaging those who possess craft knowledge and can transmit skills intergenerationally.
- **Disproportionate Health Impacts:** Emerging evidence suggests women face heightened health risks from plastic exposure, particularly endocrine-disrupting chemicals like BPA affecting reproductive health and increasing endometriosis risk (Salami & Rotimi, 2024). Women's perspectives on health impacts are therefore critical.

- **Agents of Behavioral Change:** Women's groups have demonstrated capacity for community mobilization in other development contexts. Engaging women is essential for household-level waste segregation, alternative adoption, and peer-to-peer awareness campaigns.

3.3 ENVIRONMENTAL AND HEALTH IMPACTS

Plastic accumulation manifests across multiple spatial scales, from household drainage systems to regional grazing ecosystems, with cascading environmental consequences.

Urban Environmental Impacts:

Respondents across all three cities identified flooding and drainage blockage as the most visible environmental consequence of plastic waste. In Garowe, 78% of households (n=81/104) reported seasonal flooding exacerbated by plastic-clogged culverts and water channels. A representative quote captures the phenomenon:

"During the rainy season, plastic bags turn our streets into rivers. The drains are completely blocked, and water stands for days, bringing mosquitoes and disease."

- Female respondent, Garowe

Bossaso faces similar challenges, compounded by coastal location and higher population density. Municipal officials described plastic waste as reducing the city's drainage capacity by an estimated 40-50%, though no formal hydrological assessment exists.

Pastoral and Rural Ecological Damage:

In pastoral zones surrounding Qardho and Garowe's periphery, plastic contamination disrupts grazing ecosystems through multiple mechanisms:

- 1. Vegetation Suffocation:** Plastic bags and sheeting cover vegetation, blocking sunlight and oxygen exchange, leading to localized die-offs of grasses and shrubs critical for livestock forage.
- 2. Soil Degradation:** Buried plastics prevent water infiltration, reducing soil moisture retention and fertility. Pastoralists reported noticeable declines in pasture regeneration in areas with heavy plastic accumulation.
- 3. Livestock Ingestion and Mortality:** The most economically devastating impact. Focus group participants estimated:

"Nearly 80% of urban and peri-urban livestock have ingested plastic at some point. For those in close proximity to dumpsites or market areas, the rate is even higher."

- FGD Participant, Garowe Women's Group

Do you know that discarded plastic bottles and bags cause harm to humans and livestock?

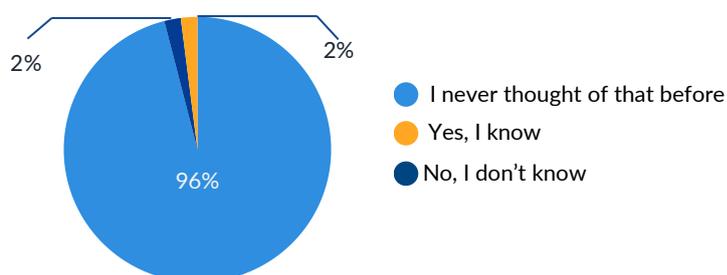


Figure 7, Primary Data 2025.

Are you aware of any health problems in your community that are linked to plastic waste?

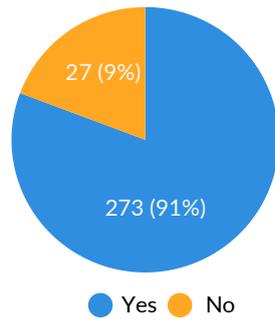


Figure 8: Primary Data 2025

Mechanism of Livestock Mortality:

Veterinary professionals and pastoralists described a consistent pathology:

1. Animals ingest plastic bags while grazing, attracted by food residues or confusing plastics with edible vegetation
2. Plastics accumulate in the rumen (first stomach chamber), forming impermeable masses
3. Blockages prevent digestion, leading to malnutrition, dehydration, and eventual death over weeks to months
4. In severe cases, intestinal perforation causes acute peritonitis and rapid death

The Mayor of Qardho provided stark testimony:

"Livestock deaths from plastic are instant in some cases. We've opened dead animals and found their stomachs completely filled with plastic bags, nothing else."

- Key Informant Interview, Qardho Mayor

3.4 WEAK IMPLEMENTATION OF THE PLASTIC IMPORTATION BAN

Puntland's 2024 plastic bag import ban represents a *symbolic policy* rather than an *enforced regulation*, characterized by high awareness but negligible behavioral modification. The ban's implementation suffered from fundamental communication deficits. Local government officials revealed that:

Garowe: *"The ban was never formally communicated through legal channels. There was no public consultation, no official decree distributed to businesses, and no clear guidelines provided to enforcement officers."*

- Key Informant Interview, Garowe Municipal Official (KII-18)

Qardho: *"The ban was announced only through a Facebook post. That's not how you implement policy. There was no coordination with the municipality, no meetings with traders, no public education campaign."*

- Key Informant Interview, Qardho Mayor (KII-12)

Bossaso: Fines are sporadically imposed on individuals found with plastic bags, but plastic bottles—which constitute the majority of plastic waste—remain completely unregulated. This selective enforcement undermines policy credibility and effectiveness.

Furthermore, political interference continues to undermine implementation, as offenders are often released due to pressure from political elites, clan elders or senior government officials. One high-ranking local-level official stated that enforcement attempts were stymied by interference from the upper echelons of government, and another high-ranking enforcement official pointed to both bribery and corruption and a lack of prosecution by police and security forces. This reveals a lack of initiative from the state government in enforcing its own laws.



Sheerbi: Plastic bag invasion in rural area of Boohaaro Valley, Karkaar showing livestock ingesting plastic and drying vegetation.

Despite 88% of respondents saying they were aware of the plastic bag ban, continued widespread use suggests no behavioral change due to a lack of enforcement. Additionally, despite awareness, respondents stated usage continues due to their awareness enforcement being limited, as well as the cost-effectiveness and convenience of plastic bags. This is compounded by 80% of respondents stating they had not witnessed any enforcement efforts.

Are you aware of the ban?

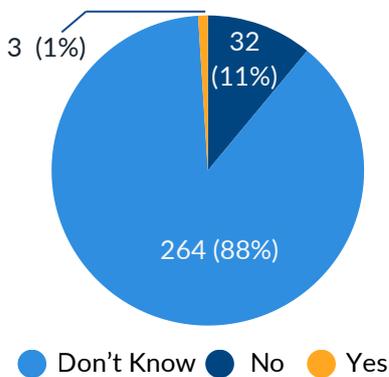


Figure 9: Primary Data, 2025

Are there any efforts ongoing to enforce the plastic bag ban?

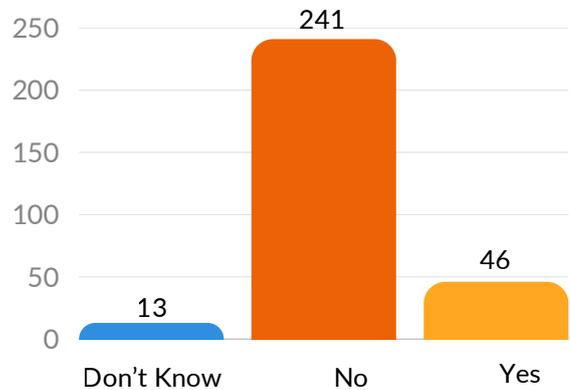


Figure 10: Primary Data, 2025

Law enforcement agencies lack operational tools, clear mandates, and financial support to effectively enforce the ban. Public resistance was reported in Garowe, where shop owners continue to distribute plastic bags due to the absence of affordable alternatives. Additionally, institutional overlap between ministries, municipalities, and environmental agencies leads to poor coordination and weak accountability, further reducing the ban's effectiveness.

Discussions with local officials also found that implementation was weak on a local government level. *The Mayor of Qardho said the ban "has not been enforced" and that implementation was left solely to the Ministry of Environment without coordination or awareness. "The ban was announced only through a Facebook post," he noted, criticizing the absence of formal decrees or consultation among concerned agencies.*

Garowe officials echoed the enforcement gap, citing smuggling through inland borders from southern Somalia and Somaliland, and the need for state cooperation to monitor entry points in Garowe and Bosaso Port.

3.5 WASTE MANAGEMENT PRACTICES

Waste management systems across Puntland remain rudimentary, heavily relying on open dumping and burning. In Garowe, open sites at the outskirts of the town have become dumping grounds for mixed waste, including plastics, animal remains, and medical waste. Household-level segregation is virtually non-existent, and most households dispose of waste in nearby open spaces or drainage canals. Although two private waste collection companies, Daryeel Deegaan and Kaafi Deegaan, operate in Garowe, their coverage and capacity are limited.

Similarly, in Bosaso, private companies like Alla-Aamin and community-organized groups play modest roles in waste collection but lack the infrastructure for sorting or recycling. Burning plastic is a common practice both in factories and at the household level, releasing toxic smoke and worsening air quality. There are currently no engineered landfills or recycling centers in any of the studied districts, and the waste collection remains sporadic, underfunded, and unsupervised. In addition to this lack of infrastructure, there is little reuse of plastics, with most reuse of plastics attributable to pastoralists who reuse plastic to store, transport, and sell milk.

The three municipalities share similar challenges of limited capacity and dependence on basic collection systems.

- In Bosaso, the local government partners with Alla-Amin Company, which collects household waste and disposes of it 7 km outside the city, where it is burned weekly.
- Garowe relies on municipal street cleaning by local government staff plus some private companies such as Kaafi Deegaan and Daryeel Deegaan, which operate under public–private partnership (PPP) arrangements, receiving monthly support and equipment from the municipality.
- Qardho’s municipality lacks sufficient infrastructure and coordination. The mayor noted that “the municipality alone cannot handle the issue” and called for the placement of waste collection bins in streets, homes, and offices.

3.6 LIMITED COMMUNITY AWARENESS AND ENGAGEMENT

Public awareness about the dangers of plastic waste remains minimal and is rarely supported by consistent government efforts. Awareness campaigns are infrequent, short-term, and often donor-driven rather than locally sustained. In Garowe and Qardho, youth and women’s groups are occasionally organized for clean-up drives, but these initiatives lack logistical or financial backing. Communities generally lack access to information on safe disposal methods and the long-term health risks associated with plastics, particularly in rural settings. Civil society organizations and the media also play limited roles, with few actively promoting behavioral change or advocating for plastic alternatives.

A KII Councilor respondent in Garowe stated, *“There has been no effective awareness campaign since the ban was announced.”* Another FGD participant in Garowe said, *“People don’t understand the dangers of plastics; they only see them as convenient.”* *“The municipality should use mosques and schools for public education.”* FGD participant (women’s group), Garowe.

3.7 ROLE OF THE PRIVATE SECTOR

The private sector both contributes to and holds potential to mitigate plastic pollution. Traders and producers continue to rely heavily on imported plastic packaging from the UAE, China, and other Gulf countries because of the lack of affordable local alternatives. Some companies, such as Hubaal Water Company, have shifted toward carton packaging and responsibly manage defective plastics by incinerating them under controlled conditions. However, many bottled water factories in Garowe and Bossaso still use plastic packaging, contributing substantially to waste generation.

In addition to exploring alternative packaging materials, two factories (OPEC in Bossaso and Tawfiq in Garowe) reported that they had initiated efforts to produce biodegradable and environmentally friendly bags as substitutes for the most hazardous single-use plastic bags. However, according to factory management, their attempts to enter the market have largely been unsuccessful. The main obstacles they identified include the low retail price of conventional plastic bags, which makes eco-friendly alternatives commercially uncompetitive, and relatively high government taxes on local manufacturing.

This situation reflects a broader structural challenge in Puntland's plastic policy management landscape, where market incentives and policy frameworks remain misaligned with environmental goals. While the introduction of biodegradable products signals an emerging awareness among private sector actors, the absence of targeted subsidies, tax exemptions, or enforcement of the plastic ban has discouraged sustainable production and innovation. Consequently, environmentally conscious manufacturers struggle to survive in a market dominated by cheap, imported plastics that continue to undermine both local enterprise and environmental protection efforts.

Finally, several private-sector actors, particularly bottled water producers, expressed willingness to engage in recycling initiatives if the government introduced incentives or tax reliefs. Businesses also called for joint initiatives with municipalities to promote eco-friendly packaging, invest in recycling, and conduct public awareness campaigns. Despite this interest, significant barriers remain, including high electricity costs, a lack of recycling equipment, and high import duties on machinery, which collectively hinder innovation and private investment in sustainable alternatives.

3.8 INSTITUTIONAL COORDINATION AND GOVERNANCE GAPS

Institutional weaknesses continue to be a major barrier to effective plastic waste management in Puntland. Local governments lack technical expertise, sufficient budgetary allocations, and policy guidance from the central level. Coordination among ministries, particularly the Environment, Interior, Finance, and Trade ministries, as well as municipalities and enforcement agencies, remains weak, leading to role duplication or the neglect of responsibilities. Environmental legislation is fragmented and loosely enforced, with limited clarity on mandates, obligations, and penalties.

The Polluter Pays Principle is not operationalized due to limited awareness, institutional capacity, and unawareness of its usefulness, allowing importers, traders, and producers to evade accountability for the waste they generate. Moreover, there is no centralized waste management policy, data system, or monitoring framework to track plastic importation, usage, or disposal patterns, leaving enforcement and accountability largely ad hoc.

3.9 RECYCLING AND CIRCULAR ECONOMY OPPORTUNITIES

Although no active recycling initiatives currently exist in Puntland, there is growing recognition of the potential for circular economy models. Respondents across Garowe, Bosaso, and Qardho identified recycling and the revival of traditional utensils as major economic opportunities, especially for youth and women, who could engage in plastic collection, sorting, and repurposing activities. Barriers to these initiatives include power shortages, lack of technical knowledge, limited access to machinery, and insufficient start-up capital. From a pastoralist perspective, there is reuse of plastics used to store, transport, and sell milk, but among the general population, there is little reuse of plastics, a cornerstone of the circular economy approach.

Do you use plastic bottles for other purposes?

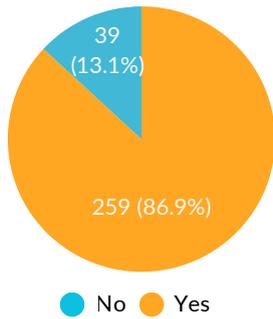


Figure 11: Primary Data, 2025

Several youth groups in Garowe expressed strong interest in projects such as producing recycled plastic bricks or pavement blocks, contingent upon receiving technical training and seed grants. Public-Private Partnerships (PPPs) were widely recommended as a way to

establish small-scale recycling plants and pilot waste-sorting systems at household levels. With donor engagement, technical assistance, and local innovation, Puntland’s plastic waste challenge could be transformed into a green economy opportunity that supports environmental protection, youth employment, and sustainable urban development. Respondents to the survey expressed a willingness to transition to an alternative, even if it came at an extra cost.

Willingness to pay for Alternatives

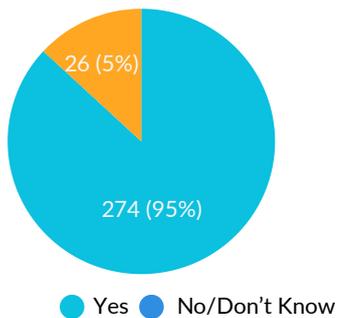


Figure 12: Primary Data, 2025

Integrated Conclusion: Plastic pollution in Puntland is not merely an environmental issue. It represents a cross-cutting challenge that affects governance, public health, economic livelihoods, and social well-being. Addressing it demands coordinated action across

government institutions, the private sector, and civil society, supported by a robust legal framework, awareness campaigns, recycling investments, and enforcement of the plastic ban. Puntland now faces a pivotal opportunity to transition from a plastic-dependent model to sustainable resource management through a circular-economy approach.

Table 2. Comparative Summary of Findings and Emerging Trends Across Stakeholder Groups

Thematic Area	Households (Urban & Peri-Urban)	Pastoralists (Rural & Semi-Rural)	Professionals (Health & Veterinary)	Community Stakeholders (FGDs)	Institutions (Government & Enforcement)
Environmental Impacts	Report visible plastic accumulation in streets and drainage; frequent flooding and loss of urban aesthetics.	Observe degraded grazing land and livestock deaths due to plastic ingestion.	Confirm severe environmental contamination affecting both urban and rural ecosystems.	Identified plastics as a primary environmental threat harming vegetation and water sources.	Acknowledge waste buildup but cite limited waste management systems and lack of engineered landfills.
Health Impacts (Human & Animal)	Note respiratory problems from open burning; food and water contamination from low-quality plastic containers.	Livestock deaths from plastic ingestion lead to economic losses.	Highlight microplastic exposure, toxic fumes, and possible cancer links.	Recognize community health risks, but have a limited understanding of long-term effects.	Admit lack of monitoring systems and inter-sectoral health-environment coordination.
Economic Consequences	Increased cost of cleaning and replacing containers; loss of income due to health issues.	Loss of livestock reduces household income and food security.	Note indirect costs through reduced productivity and higher medical/veterinary expenses.	Emphasize waste burden on households and municipalities.	Cite lack of recycling infrastructure and weak municipal budgeting.
Cultural & Behavioral Drivers	Shift from traditional utensils (dhiil, haan) to plastic for convenience and affordability.	Younger generations abandon traditional milk containers; plastics are seen as modern.	Encourage revival of traditional alternatives as safer and sustainable.	Support community-led campaigns to reintroduce traditional and reusable materials.	Recognize cultural change as an enforcement challenge; advocate for awareness programs.
Awareness & Public Perception	Limited knowledge of chemical hazards; concern mainly about visible litter.	Moderate awareness, focused on livestock harm.	High awareness among professionals; call for science-based education.	Growing awareness and willingness to engage in local cleanup efforts.	Acknowledge weak public education and limited outreach.
Governance & Enforcement	Weak enforcement of plastic ban; lack of clear public communication.	Little enforcement in rural areas; waste seen as an urban problem.	Recommend unified policy linking health, livestock, and environment ministries.	Describe enforcement as symbolic; demand accountability and collaboration.	Admit lack of coordination, resources, and legal clarity across agencies.

Table 2. Comparative Summary of Findings and Emerging Trends Across Stakeholder Groups

Thematic Area	Households (Urban & Peri-Urban)	Pastoralists (Rural & Semi-Rural)	Professionals (Health & Veterinary)	Community Stakeholders (FGDs)	Institutions (Government & Enforcement)
Community Response & Participation	Occasional neighborhood cleanup activities without municipal support.	Express need for waste control near grazing lands.	Advocate cross-sector partnerships and national waste policy.	Women and youth groups promoting reusable materials and awareness drives.	Propose multi-agency coordination and engagement of private waste firms.
Private Sector Role	Dependence on cheap imported packaging materials.	Limited engagement but potential role in waste reduction near markets.	Identify opportunity for recycling and eco-friendly packaging.	Call for private-sector participation in recycling and awareness.	Support PPP models and incentives for local eco-innovation.
Recycling & Circular Economy Opportunities	Willingness to participate in recycling initiatives if supported.	Interest in plastic collection for income generation.	Recommend small-scale recycling, research, and training.	Support youth- and women-led recycling startups.	Propose PPPs, tax incentives, and donor collaboration to pilot recycling plants.
Emerging Trends	Gradual shift in perception as health and environmental effects become visible.	Heightened awareness among pastoralists as livestock deaths increase.	Growing advocacy for scientific monitoring and policy reform.	Increased grassroots mobilization toward cleanups and local solutions.	Recognition of plastic pollution as a governance and development challenge requiring coordinated policy action.

Analytical Overview: Converging Themes:

All stakeholder groups identify plastic waste as a critical environmental and health hazard. There is consensus on weak enforcement, lack of awareness, and the need for coordinated action.

Diverging Perspectives:

- Households and Pastoralists emphasize livelihood and direct health impacts.
- Professionals focus on scientific and systemic health consequences.
- Community groups stress mobilization and behavioral change, while institutions highlight policy and enforcement limitations.

Emerging Opportunities:

- Growing interest in recycling, women’s involvement, and public–private partnerships (PPPs).
- Recognition that the plastic crisis can be turned into an economic opportunity through a circular economy approach.

Respondents identified several problems that plastic can cause, all of which have disastrous effects. This highlights the multifaceted nature of the plastic waste problem and the urgent need for a solution.

What is the most serious problem that plastic waste causes in your community?

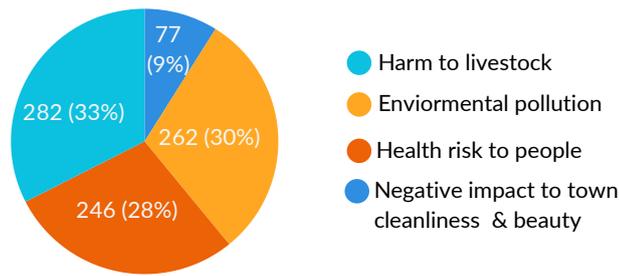


Figure 13: Primary Data, 2025

3.10 DISCUSSION OF FINDINGS

Plastic waste in Puntland emerges as a multidimensional challenge, affecting environmental quality, human and livestock health, household and community economies, and traditional cultural practices. The combined insights from urban households, pastoralist communities, local councils, and law enforcement officials illustrate both the pervasiveness of the problem and the structural constraints limiting effective management. Despite this, many respondents felt that the use of plastic is the only option in Puntland, with nearly 70% of those surveyed agreeing, suggesting a lack of alternatives.

Is the use of plastic bags and plastic bottles the only option available for the public?

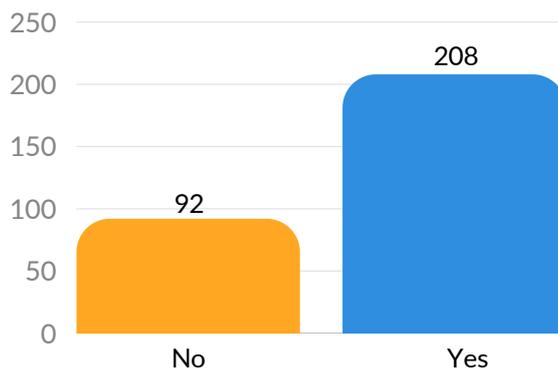


Figure 14: Source: Primary Data 2025

3.10.1 ENVIRONMENTAL AND ECOLOGICAL IMPACTS

Across urban and rural settings, plastic accumulation is reported as a significant environmental concern. Women in Bossaso described how *“Plastic bags block drains, kill planted trees, and during rains, the streets turn into rivers of plastic,”* while a Garowe participant emphasized that *“Plastic piles up in open spaces and valleys, tangling vegetation and stopping water flow.”* Pastoralists echoed these observations, highlighting that plastics entangle grass and trees, obstruct drainage, and degrade grazing lands. Abdulqadir Mohamed Noor (Yaka Village) explained that plastic residues suffocate plants and reduce pasture quality, with a knock-on effect, while Muuse Jama Gar-asse (Midigar, Nugal Valley) noted that plastic accumulation contributes to erosion and the spread of disease among livestock.

Local government officials recognized these ecological threats and their implications for urban management. Councilors from Bossaso and Garowe noted that plastics reduce aesthetic value, spoil public spaces, and intensify fire risks when burned. Across stakeholder groups, it is evident that plastic waste is not merely unsightly but disrupts ecosystem services, compromises livestock feeding grounds, and increases vulnerability to urban flooding and soil degradation. These observations align with secondary literature highlighting the environmental hazards posed by plastic accumulation and the global transition from convenience to pollution concern (Clapp & Swanston, 2009; Danielsson, 2017).

3.10.2 HEALTH IMPACTS

Plastic use has direct and indirect consequences for human and livestock health. Household respondents reported concerns about chemical leaching from reused plastics, particularly when containers are used for hot food or liquids. A woman from Bossaso observed: *“Reusing plastic containers for hot food or milk can make chemicals leak into what we eat and drink.”* At the same time, another participant in Garowe described the respiratory hazards of burning plastics at home: *“The smoke makes everyone cough and gives headaches.”* Pastoralists reported similar concerns regarding livestock health, noting that ingestion of plastic by goats and sheep leads to slow, painful deaths, reduces milk production, and diminishes herd productivity.

Scientific literature confirms these risks: micro plastics and Nano-plastics can affect human and animal health at subcellular and molecular levels, potentially disrupting endocrine function and contributing to metabolic and reproductive disorders (Yee et al., 2021). Bisphenol A (BPA), present in many plastic utensils, has been shown to mimic estrogen, raising risks for hormonal imbalances, obesity, diabetes, and certain cancers (WHO; FDA). Additionally, BPA can have a severe impact on both female and male fertility and can cause endometriosis in women (Salami & Rotimi, 2024), suggesting a greater risk of plastic on women.

The convergence of community observations and secondary research data both underscores the serious health implications of reliance on plastic in Puntland for both humans and livestock.

3.10.3 ECONOMIC IMPLICATIONS

Plastic pollution imposes high economic costs on households and pastoralists. Urban households reported increased labor and financial burdens associated with cleaning neighborhoods and unclogging drains. Women in Garowe highlighted losses from livestock consuming plastic waste, which reduces milk and meat production and directly impacts household income. Pastoralists quantified the effects on herd productivity, with Abdulqadir Mohamed Noor estimating that approximately 30% of livestock are affected by plastic ingestion or contaminated grazing land.

Local councils similarly identified economic inefficiencies arising from weak waste management infrastructure. While municipalities contract private companies for waste collection, both Bossaso and Garowe rely on dumping and burning, which temporarily clears public spaces but does not prevent continued environmental accumulation. Failed attempts at recycling, including tile production and plastic exportation, demonstrate the structural and financial barriers to sustainable waste solutions. These insights reinforce the dual economic and environmental dimensions of plastic pollution, consistent with global literature emphasizing the cost of unmanaged plastic waste (Van der Doelen, 1998; Bernstein, 1991).

3.10.4 SOCIAL AND CULTURAL DRIVERS

A recurring theme is the replacement of traditional Somali utensils by plastics. Women and pastoralists consistently reported that containers such as Dhiil, Haan, Haruub-gaal, Dambiil, and Sellad, once durable and environmentally friendly, have been largely abandoned. Convenience, affordability, and market availability, as well as the induced demand of business owners, were cited as primary drivers. As one Bossaso participant noted: *“Our children don’t know how to make and use the old milk containers. Plastics are easier and lighter.”* A Garowe respondent added: *“People prefer plastics because they are cheap and easy to carry, and do not require the old craftsmanship or materials, even if they harm the environment and health.”*

This generational shift, coupled with the decline of camel caravans and nomadic mobility, has eroded traditional skills and environmental knowledge. The transition illustrates a profound cultural change where modern convenience overrides sustainable practices, a pattern documented in global studies

of plastic adoption. (Clapp & Swanston, 2009; Behuria, 2021) Despite this, a nostalgic and practical appreciation for Dambiiil remains, suggesting opportunities to reintroduce them through women’s cooperatives and awareness programs. This is evidenced by the receptiveness of respondents towards the replacement of plastic by traditional materials encountered during the field surveys.

If plastic bags were banned, what would you use?

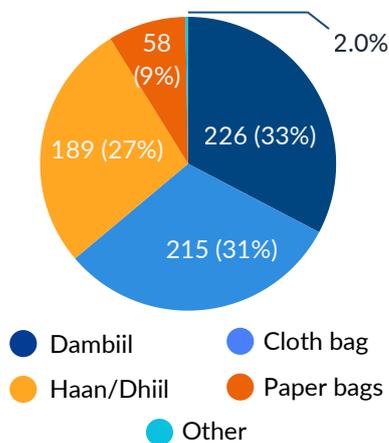


Figure 15: Source: Primary Data, 2025

3.10.5 AWARENESS AND ATTITUDES TOWARD THE PLASTIC BAN

Awareness of Puntland’s 2024 plastic ban varies significantly across communities. Some pastoralists, including Abdulqadir Mohamed Noor, were unaware of the legislation, while others, such as Abdinuur Khalif Mohamed, acknowledged the ban but criticized weak enforcement. Urban residents expressed a similar mix of knowledge and skepticism regarding effective implementation. Local councils highlighted challenges in aligning enforcement with community behaviors, citing continued inflow of plastics through informal trade routes and inadequate inter-institutional coordination.

Law enforcement officials confirmed these gaps, noting that “you cannot entrust responsibility to someone who is already struggling” (Director General, Ministry of Agriculture). Agencies often lack financial and human resources, coordination mechanisms are absent, and prosecution is rare due to political interference and incomplete legal frameworks.

The discrepancy between formal legislation and practical enforcement underscores the need for integrated governance approaches that combine awareness campaigns, community engagement, and institutional strengthening (Bell & Russell, 2002; Eskeland & Jimenez, 1992).

3.10.6 GOVERNANCE, INSTITUTIONAL, AND LEGAL CONSTRAINTS

Both municipal and national officials emphasized that weak governance structures hinder effective waste management. Councils depend on private contractors for collection, while law enforcement relies on confiscation and ad hoc fines, with little legal follow-through. Cross-border smuggling and regulatory loopholes further undermine national plastic bans. The absence of a comprehensive solid waste management policy, limited recycling infrastructure, and lack of implementation of the “Polluter Pays Principle” compound the challenges. Councilors from Garowe and Bossaso advocated for coordinated directives, border controls, and structured recycling facilities, emphasizing that municipal-level enforcement cannot succeed in isolation. They reinforced survey findings that most plastic in Puntland is either imported from outside the country or smuggled in through neighboring Somali regions.

Where do you think most plastic bottles and bags in your area come from?

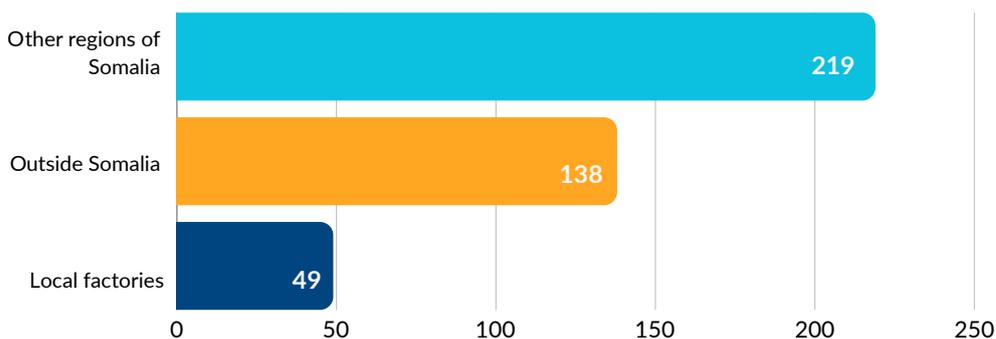


Figure 16: Source: Primary Data, 2025

3.10.7 PUBLIC SUPPORT AND LOCAL SOLUTIONS

Despite challenges, communities demonstrate a willingness to adopt alternatives. Households expressed readiness to use woven baskets and cloth bags if affordable and accessible. Pastoralists and women reported grassroots recycling and reuse initiatives, though these remain informal. Local officials highlighted the need for awareness campaigns targeting traders, households, and children, alongside incentives for producers of eco-friendly alternatives. The combined findings suggest that successful mitigation of plastic pollution will require a hybrid approach: regulatory enforcement, community engagement, economic incentives, and the revival of traditional materials, consistent with global recommendations for developing countries (Van der Doelen, 1998; Bernstein, 1991).

As established, due to the greater risk of plastic on women's health, the cooperation of women will be significant in producing alternatives and solutions, particularly when considering the role of women in Somali households. This will catalyze the use of alternatives and enable awareness of the risks of plastic. Alongside this, it will require both top-down and bottom-up approaches to work simultaneously, as the public is receptive to challenging plastic but believes this should be initiated by the government.

Which group do you think should take the primary responsibility for managing plastic waste?

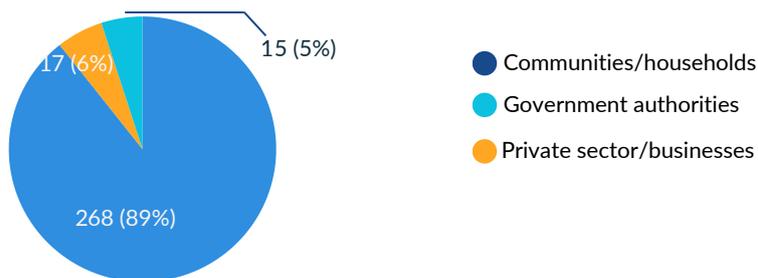


Figure 17

Source: Primary Data, 2025

3.10.8 INTEGRATED REFLECTIONS

Across all stakeholder groups, a clear pattern emerges: plastic pollution is simultaneously an environmental, health, economic, and cultural problem. Urban and rural communities experience distinct yet interconnected impacts, with urban households bearing the immediate burden of clogged drains and chemical exposure, while pastoralists face livestock mortality and pasture degradation. Governance gaps, enforcement challenges, and cultural shifts exacerbate these impacts, highlighting the need for coordinated policy, education, and infrastructure interventions. Secondary literature provides useful models and lessons from countries such as Rwanda, Kenya, Bangladesh, and Ireland, illustrating that plastic bans can succeed when enforcement, incentives, and public awareness converge. (Danielsson, 2017; Clapp & Swanston, 2009; Behuria, 2021)

Ultimately, addressing plastic pollution in Puntland will require multi-level strategies that integrate local knowledge, community participation, and institutional strengthening, supported by sustainable alternatives that respect cultural practices while mitigating environmental and health risks.

Table 3. Summary of Key Discussions on Plastic Waste in Puntland

Dimension	Key Findings	Emerging Trends / Challenges	Opportunities / Notes
Environmental	Accumulation of plastics in urban areas, grazing lands, and water channels; soil degradation; blocked drainage; flooding risk	Persistent pollution due to open dumping and burning; lack of engineered landfills	Adoption of circular economy, recycling initiatives, and public-private partnerships
Health	Livestock deaths from ingestion; respiratory issues from open burning; chemical leaching from plastic food/water containers; suspected cancer cases	Low public awareness of health risks; limited monitoring of contamination	Public education campaigns, promotion of safer alternatives, reduction of open burning
Economic	Financial losses from dead livestock, clogged drainage, environmental degradation; plastics cheaper than alternatives	High reliance on imported plastics; local eco-friendly alternatives uncompetitive due to costs and taxes	Incentives for local biodegradable production; market support for eco-friendly alternatives
Social & Cultural	Decline of traditional utensils (Dambiil, Haan); convenience drives plastic use; women as key actors in household storage decisions	Low but emerging awareness; isolated community clean-up drives; resistance to change without affordable alternatives	Revive traditional craft-based solutions; integrate awareness campaigns with gender engagement; community-led initiatives
Governance & Institutional	Weak enforcement of plastic ban; fragmented policy; poor coordination between ministries, municipalities, and enforcement bodies; political interference	Inconsistent regulation; lack of monitoring and accountability; unclear mandates	Strengthen institutional coordination; implement Polluter Pays Principle; legal frameworks for enforcement and incentives
Private Sector & Circular Economy	Some factories producing biodegradable plastics; high potential for youth and women employment in recycling	Market barriers (high taxes, low demand for alternatives); lack of technical capacity and equipment	Public-private partnerships, donor engagement, training, and seed funding for small-scale recycling and green initiatives

CHAPTER FOUR: CONCLUSIONS AND RECOMMENDATIONS

4.1 CONCLUSION

This study demonstrates that plastic pollution in Puntland has evolved into a systemic challenge that cuts across public health, pastoral livelihoods, urban management, and environmental governance. While communities clearly understand the risks associated with plastic waste, the absence of affordable alternatives, weak enforcement, and fragmented institutional responsibility prevent meaningful behavioral change.

The evidence reveals a persistent awareness–action gap: people know plastics are harmful, yet continue to use them because safer options are scarce, enforcement is inconsistent, and waste systems are largely non-functional. As a result, plastic pollution continues to accumulate in grazing lands, drainage systems, and residential areas, undermining livestock health, increasing disease risks, and placing growing pressure on municipal services.

At the same time, the findings point to a clear opportunity. Communities, private actors, and local authorities expressed willingness to adopt alternatives, participate in recycling, and revive traditional practices if the right conditions are created. With coordinated leadership, practical incentives, and phased investment, Puntland can turn the plastic crisis into an opportunity for improved public health, green livelihoods, and more credible environmental governance.

The recommendations that follow outline a phased and multi-level pathway to achieve this transition—starting with immediate enforcement and coordination, moving toward viable alternatives and public engagement, and culminating in long-term recycling infrastructure and integrated waste management systems.

4.2 RECOMMENDATIONS

General Strategic Recommendations

1. Plastic regulation must combine enforcement, affordable alternatives, and functional waste systems—implemented together rather than sequentially.
2. Enforcement should prioritize high-volume actors (importers, wholesalers, large producers) rather than small retailers or low-income consumers.
3. Immediate action should focus on stopping the most dangerous practices, particularly open burning and unsafe reuse of plastic containers.
4. A phased approach is essential: short-term stabilization, medium-term system building, and long-term institutionalization of recycling.
5. Solutions should be anchored in livelihoods and culture, particularly for women and youth.
6. Clear coordination, leadership, and accountability mechanisms are required to restore public trust.

FOR PUNTLAND STATE GOVERNMENT (STATE-LEVEL MINISTRIES & CABINET)

Short term

- Issue a formal legal instrument and enforcement Standard Operating Procedures(SOPs), clearly defining restricted plastics, penalties, and agency responsibilities.
- Establish a State Plastic Taskforce bringing together Environment, Interior, Finance/Customs, Trade, Health, Livestock, and municipal representatives.
- Target the supply chain, focusing inspections on Bosaso Port, major entry corridors, wholesalers, and large distributors—not only small retailers.
- Roll out immediate public health risk messaging, prioritizing the dangers of open burning, unsafe reuse of plastics for hot food, and reuse of chemical containers.

Medium term

- Introduce incentives for alternatives: tax relief on biodegradable inputs, reduced fees for local producers, and public procurement of alternatives for schools and markets.
- Pilot district-level recycling and collection models in at least 2–3 cities, including household sorting and bottle buy-back points.
- Launch women and youth livelihood tracks linked to alternative production and community collection systems, supported through microgrants and cooperatives.

Long term

- Adopt a Puntland Integrated Solid Waste Management Policy covering plastics, medical waste separation, landfill standards, and enforcement.
- Establish Extended Producer Responsibility (EPR) mechanisms requiring importers and producers to fund collection and recycling.
- Invest in engineered disposal and recycling infrastructure, including at least one engineered landfill and one scalable recycling facility through PPPs.

FOR DISTRICT & MUNICIPAL GOVERNMENTS (GAROWE, BOSASO, QARDHO, OTHERS)

Short term

- Establish District Environmental Protection Committees (DEPCs) with clear membership and authority.
- Develop waste hotspot action plans targeting clogged drains and dumpsites with regular cleanups and visible signage.
- Place waste bins where waste is generated—markets, bus stops, slaughter areas, schools, and main streets.

FOR FEDERAL / NATIONAL-LEVEL ROLES (COORDINATION & STANDARDS)

Short term

- Harmonize national import standards (bag thickness, labeling, restricted plastics).
- Strengthen inter-state coordination to address smuggling routes.

Medium term

- Issue national guidance on EPR and plastic reporting, including standard import and recycling templates.
- Support customs modernization with risk profiling and documentation requirements.

Long term

- Develop and operationalize a national waste and plastics framework law setting minimum standards for cities, landfills, recycling, and public health protection.

FOR COMMUNITIES, CIVIL SOCIETY, RELIGIOUS LEADERS, AND SCHOOLS

Short term

- Use mosques and schools as primary behavior-change platforms with simple, repeated messages.
- Stop the most dangerous practices first, especially open burning near homes and reuse of chemical containers.

Medium term

- Support women's cooperatives producing Dambiiil and cloth bags, and youth groups for bottle collection.
- Institutionalize monthly cleanups with public recognition.

Long term

- Revive traditional utensil-making as a skills-based livelihood, not only as cultural heritage.

FOR PRIVATE SECTOR (IMPORTERS, WHOLESALERS, BOTTLED-WATER FACTORIES, RETAILERS)

Short term

- Adopt a voluntary code of conduct: reduce free plastic bag distribution, introduce bag charges.
- Pilot factory take-back schemes for bottles in 1–2 cities.

- Invest in collection partnerships and buy-back systems.
- Shift packaging where feasible to cartons, refillable, or reusable options.

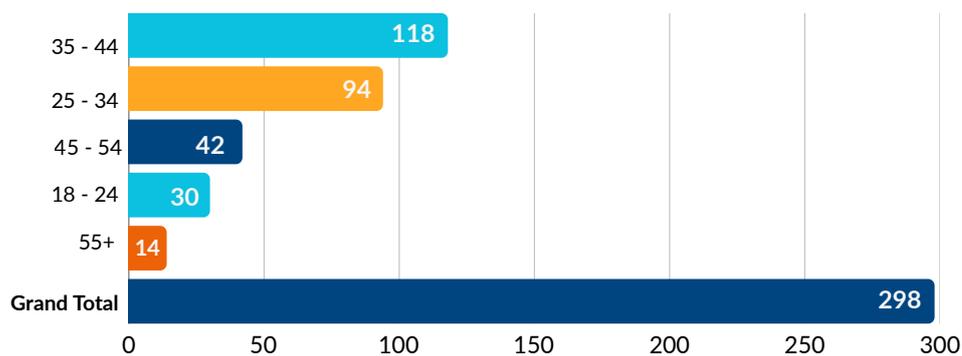
Long term

- Comply with EPR requirements and co-finance recycling infrastructure through PPPs.

4.3 ANNEXES

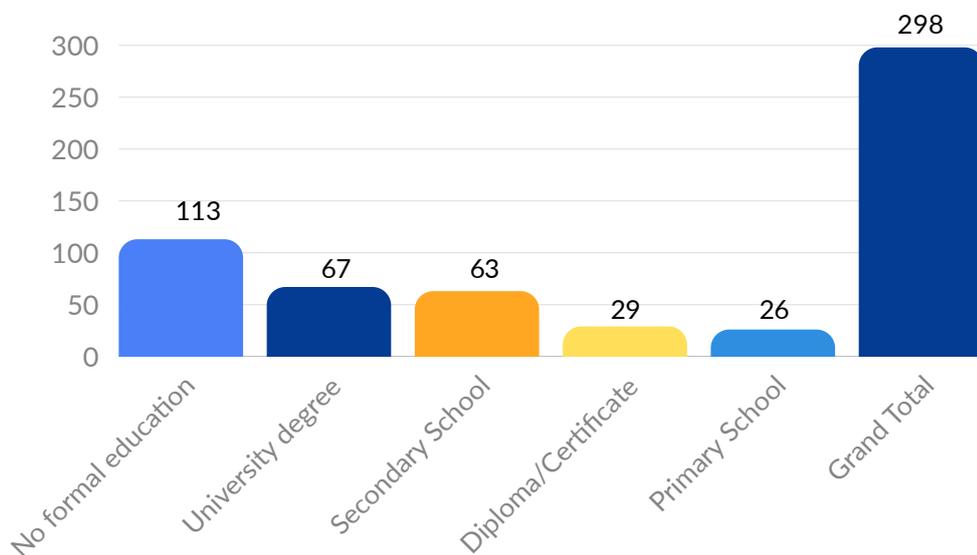
Appendix A:

Age of respondents

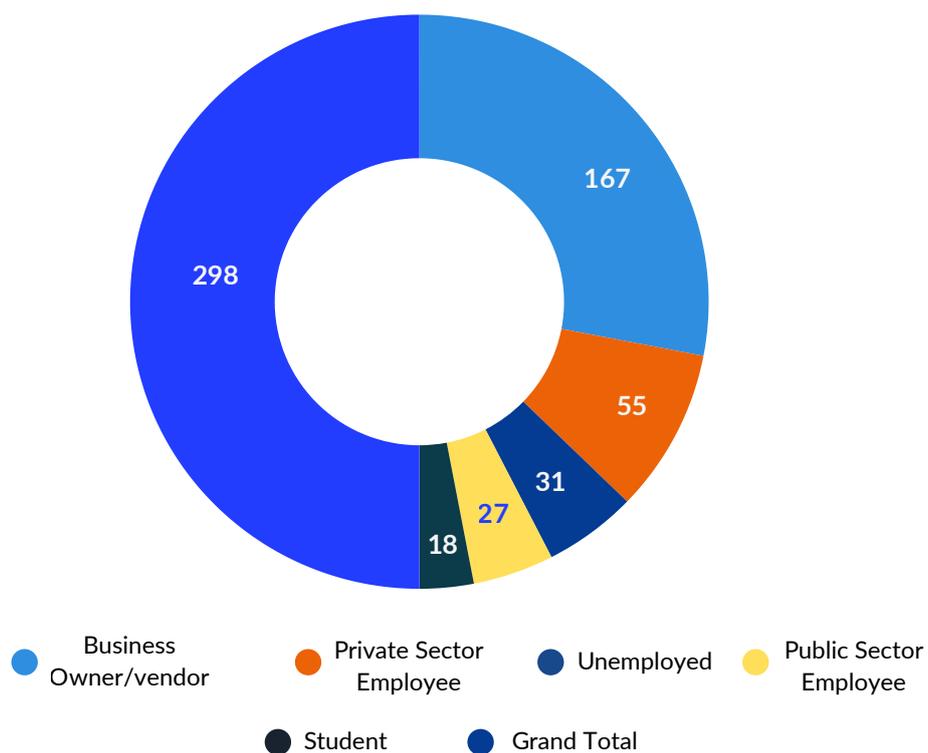


Appendix B:

Respondents Level of Education



Respondents Employment Sector



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