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OPPORTUNITIES AND CHALLENGES OF THE PLASTIC RECYCLING INDUSTRY IN THE YANGON REGION

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MDevS – 27 (18th BATCH)

JUNE, 2025

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A thesis submitted in partial fulfillment of the requirements for the Master of Development Studies (MDevS) Degree

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ABSTRACT

This study investigates the current opportunities and challenges confronting the plastic recycling industry within the Yangon Region, a rapidly urbanizing area facing escalating plastic waste generation. . The primary objectives were to identify prevailing obstacles, to evaluate the industry's growth potential, and to propose recommendations for its sustainable development. A descriptive research design was adopted, employing a structured survey method to gather primary data from a diverse range of key stakeholders within the plastic recycling factories. The findings reveal that despite a generally optimistic outlook for growth, the industry faces significant challenges including inadequate waste collection and sorting infrastructure, limited access to advanced recycling technologies, and insufficient governmental policy support. Furthermore, public awareness regarding proper waste segregation and the value of recycling needs substantial improvement. Consequently, sound government intervention through enhanced regulations, increased investment in technological advancements, and widespread public awareness campaigns are crucial for fostering the industry's sustained growth and maximizing its environmental benefits in Yangon.

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LIST OF ABBREVIATIONS

3Rs	-	Reduce, Reuse, Recycle
CBOs	-	Community-based organizations
CDCs	-	City Development Committees
ECD	-	Environmental Conservation Department
EPR	-	Extended Producer Responsibility
HDPE	-	High-Density Polyethylene
IGES	-	Institute for Global Environmental Strategies
LDPE	-	Low-Density Polyethylene
MCDC	-	Mandalay City Development Committee
MRFs	-	Materials Recovery Facilities
MSMEs	-	Micro, Small and Medium Enterprises
NGO	-	Non-governmental Organization
NPAP	-	National Plastic Action Plan
NWMSAP	-	National Waste Management Strategy and Action Plan
OECD	-	Organisation for Economic Co-operation and Development
PET	-	Polyethylene Terephthalate
PP	-	Polypropylene
PS	-	Polystyrene
PVC	-	Polyvinyl Chloride
RCRA	-	United States' Resource Conservation and Recovery Act
SUPs	-	Single-Use Plastics
UNEP	-	United Nations Environment Programme
YCDC	-	Yangon City Development Committee

CHAPTER I
INTRODUCTION

1.1 Rationale of the Study

Worldwide, plastic waste has emerged as one of the most pressing environmental challenges of our time. Despite a dramatic increase in global plastic production, the development of effective recycling systems has not kept pace. Consequently, only approximately 9% of all plastic ever produced has been recycled, highlighting a significant global deficit. This critical situation underscores the growing international momentum towards establishing a circular economy, where recycling is an indispensable component. A comprehensive understanding of both the impediments and opportunities within the recycling sector is therefore essential for effectively addressing escalating pollution and resource depletion.

Asia is the largest global producer and consumer of plastic, with Southeast Asia facing a particularly acute plastic waste crisis, evident in severe river and ocean pollution. Governments and industries across the region are consequently experiencing escalating pressure to enhance recycling rates. However, most nations in this region, including Myanmar, currently lack robust recycling infrastructure and comprehensive policy frameworks. In Myanmar, plastic waste generation has risen sharply, notably in urban centers. Current recycling initiatives remain largely informal, fragmented, and unregulated. While the government has acknowledged the urgency for action, systemic challenges including limited investment, inadequate technology, low public awareness, and weak enforcement continue to impede progress. Nevertheless, strengthening the recycling sector holds significant potential for job creation, pollution reduction, and the promotion of sustainable development.

Yangon, Myanmar's largest city and economic hub, generates an estimated 2,400 tons of waste daily, with plastic constituting a substantial portion. The recycling landscape in Yangon is predominantly characterized by informal recyclers who operate without modern facilities or consistent government support. Despite these challenges, emerging opportunities exist, such as increasing private sector interest and NGO-led

projects. However, the industry continues to grapple with issues like low market demand for recycled products, inconsistent waste collection, and weak regulatory frameworks.

Despite the escalating plastic consumption and mounting waste in the Yangon Region, the plastic recycling industry remains underdeveloped. There is a clear gap between the significant economic, environmental, and social benefits that a robust recycling sector could provide and the current reality, which is marked by inefficiency, informality, and limited scalability. Without a thorough understanding of both the inherent opportunities and the persistent barriers, efforts to improve the sector are likely to remain fragmented and ineffective. Reliable insights are essential for policymakers and investors to design effective interventions. Enhancing recycling efforts is fundamental to reducing environmental pollution and advancing a circular economy. A well-functioning recycling industry holds considerable economic potential, including job creation and the promotion of entrepreneurship. Moreover, as Myanmar's primary economic center, Yangon's waste management practices often set precedents for the entire nation, making the development of its recycling sector particularly significant.

1.2 Objective of the Study

The main objective is to study the current status of the plastic recycling industry in Yangon Region.

The specific objectives are;

(1) To identify the main opportunities for plastic waste recycling factories in Yangon Region.

(2) To examine the major challenges of these factories faced in their operations.

1.3 Method of Study

The study used a descriptive method, combining qualitative and quantitative approach. Primary data were collected with stakeholders including owner, director, manager, supervisors of recycled plastic factories in Yangon by using a simple random sampling method. (200) respondents are selected among total respondents. Secondary data were collected from academic journals, government reports, and case studies of similar contexts.

1.4 Scope and Limitations of the Study

The study focused on opportunities and challenges of the plastic recycling industry in the Yangon Region. This study was conducted on 200 stakeholders including owner, director, manager, supervisors of recycled plastic factories in the study area. The study period is from March to June 2025. Among the 200 stakeholders, only owners, managers, supervisors, and directors from plastic factories were interviewed. Plastic waste collectors, waste gatherers, and sellers were not included. The survey was conducted with large- and medium-sized factories. The 200 respondents were from approximately 50 medium and large-scale factories. The majority of these factories produce semi-products (resins, pellets), while a smaller number produce plastic bags, containers, and packaging materials.

1.5 Organization of the Study

This study is organized into five chapters. Chapter one is the introduction, and includes rationale of the study, objectives of the study, method of the study and scope and limitations of the study. Chapter two provides a literature review. Chapter three presents current state of the plastic waste management in Myanmar. Chapter four consists of a survey analysis. Chapter five is conclusion which provide finding, and suggestions.

CHAPTER II
LITERATURE REVIEW

2.1 Overview of the Plastic Waste and Recycling

The widespread application of plastic across numerous industries, such as packaging and healthcare, has inadvertently led to a global crisis in waste management. Annually, an estimated 400 million tons of plastic are produced worldwide, yet a mere 10% is recycled (OECD, 2022). Consequently, the substantial majority of this material is either deposited in landfills, subjected to incineration, or released into natural ecosystems, where its persistence can span centuries.

(a) Sources and Characteristics of Plastic Waste

Plastic waste is generated from a multitude of sources, with packaging (e.g., food wrappers, bottles) identified as the most significant contributor. Other notable origins include consumer products (e.g., electronics, toys), industrial applications (e.g., construction, agriculture), and medical waste (e.g., personal protective equipment, syringes). A defining feature of this waste stream is the high prevalence of single-use items. The production of plastics is dominated by types such as polyethylene terephthalate (PET), high-density polyethylene (HDPE), and polypropylene (PP). Despite the technical feasibility of recycling these materials, low recycling rates endure, primarily due to issues of contamination, the commingling of diverse materials, and prevailing economic impediments. (PlasticEurope, 2022)

(b) Ecological and Health Impacts

Plastic pollution poses significant adverse effects on ecosystems, frequently resulting in wildlife mistaking plastic debris for sustenance or becoming ensnared, leading to injury or fatality. Of particular concern is the pervasive spread of microplastics- minute fragments originating from the degradation of larger plastic items. These particles have been identified across diverse environments, including marine ecosystems, soil, potable water sources, and even human bloodstreams (Leslie et al., 2022). While the long-term health implications for humans are still under active investigation, they are anticipated to be substantial. Beyond direct physical

contamination, the comprehensive lifecycle of plastic, spanning from its production to its ultimate disposal, constitutes a considerable source of greenhouse gas emissions, thereby contributing to the acceleration of climate change. (India, 2022).

(c) Recycling Methodologies and Barriers

Plastic recycling methodologies are generally divided into three main categories. Mechanical recycling involves physical processes such as cleaning, shredding, melting, and remolding plastic materials; however, the quality of the material typically degrades after multiple recycling cycles. Chemical recycling represents a more advanced approach, in which plastics are depolymerized into their basic monomer units or converted into fuel products. While this method has the potential to restore materials to their original quality, it requires high energy input and significant financial investment. Energy recovery**,** on the other hand, entails incinerating plastic waste to produce energy. Although it helps reduce the volume of waste, it also generates carbon dioxide and other harmful pollutants. (Ragaert et al., 2017)

Despite these various approaches, the effectiveness of contemporary recycling efforts is impeded by several significant obstacles. Economic factors frequently position virgin plastic as a more cost-effective alternative to recycled materials. Furthermore, substantial infrastructure gaps in numerous regions hinder the establishment of adequate collection and processing systems. The inherent material complexity of multi-layered plastics and the presence of diverse additives complicate the separation and recycling processes. Lastly, inconsistent public participation, particularly concerning proper waste sorting practices, often leads to contamination that undermines the overall success of recycling initiatives. (Ragaert et al., 2017)

(d) Advancements and Future Directions

Addressing the multifaceted challenges associated with plastic waste requires a holistic and integrated strategy that incorporates design innovation, robust policy frameworks, and substantial shifts in consumer and industrial behavior. A critical component of this approach is design for recycling, whereby industries strategically redesign products to reduce material consumption and eliminate components that hinder recyclability (Ellen MacArthur Foundation, 2021). Policy instruments such as Extended Producer Responsibility (EPR) further strengthen this framework by imposing legal obligations on manufacturers to assume responsibility for the post-consumer phase of their products, thereby promoting accountability throughout the

product life cycle (OECD, 2021). In parallel, advancements in biodegradable plastics present a promising, though as yet inconclusive, pathway for reducing long-term environmental impacts, as these materials are engineered to degrade under specific environmental conditions (European Bioplastics, 2023). Moreover, recent developments in chemical innovation, including catalyst optimization and process efficiency improvements, are enhancing the technical and economic feasibility of chemical recycling, offering new opportunities for the recovery and reintegration of polymer resources into the production cycle (Rahimi & García, 2017). Collectively, these strategies underscore the necessity of an interdisciplinary and systems-based approach to mitigating the environmental, social, and economic consequences of plastic waste.

Beyond these industrial and policy interventions, behavioral shifts are equally critical. These encompass fostering a reduction in overall plastic consumption, promoting improved waste sorting practices at the consumer level, and encouraging support for broader circular economy models. The challenge of plastic waste and its recycling remains globally complex. Achieving sustainable and effective solutions will unequivocally demand coordinated efforts among governments, industries, and individuals. Without fundamental systemic change, plastic pollution is poised to escalate, leading to severe and enduring repercussions for ecosystems, human health, and the global climate.

2.2 Global Trends in Plastic Recycling

Driven by escalating environmental concerns, evolving policy landscapes, and technological advancements, plastic recycling has emerged as a paramount focus in contemporary waste management strategies. While global plastic recycling rates presently remain modest, innovative strategies and regulatory frameworks are actively reshaping this domain.

As of 2023, only approximately 9% of all plastic ever produced has been recycled (Geyer et al., 2017; UNEP, 2023), with the vast majority ultimately entering landfills, incineration facilities, or natural ecosystems. Significant disparities in recycling rates are evident across regions; for instance, Europe recycles roughly 32% of its plastic waste, whereas the United States manages around 9% (PlasticsEurope, 2022; EPA, 2022). Developing nations, in particular, contend with even lower rates due to insufficient infrastructure.

Several prominent challenges impede comprehensive plastic recycling. These include pervasive contamination of recyclable materials, the inherent economic viability of recycling processes, and the extensive variety of plastic types, many of which present considerable recycling difficulties. Furthermore, the presence of mixed materials and various additives significantly complicates efforts to effectively recycle plastics.

Governments are increasingly implementing policies aimed at bolstering recycling efforts. A notable example is the European Union's Circular Economy Action Plan, which targets the recyclability or reusability of all plastic packaging by 2030 (European Commission, 2020). Similarly, China's "National Sword" policy, enacted in 2018, substantially curtailed the import of contaminated recyclable materials, compelling exporting countries to enhance their waste sorting and processing capabilities (Brooks et al., 2018).

The proliferation of Extended Producer Responsibility (EPR) programs is also a significant development. These programs legally obligate manufacturers to assume responsibility for the end-of-life management of their products. Countries such as Germany, Canada, and South Korea have adopted robust EPR frameworks, leading to increased collection rates and greater investment in advanced recycling technologies.

Technology is a critical catalyst for progress in plastic recycling. While mechanical recycling (involving washing, shredding, and remelting) remains the most prevalent method, chemical recycling is gaining traction. This innovative process breaks down plastics into their fundamental molecular building blocks, enabling the production of new, high-quality plastics (Closed Loop Partners, 2022). Furthermore, the integration of artificial intelligence (AI) and robotics is enhancing sorting efficiency. Both emerging startups and established waste management companies are investing in AI-driven systems to more accurately separate plastics by type and quality, thereby reducing contamination and increasing the market value of recycled materials.

Corporations are also setting ambitious recycling targets. Leading companies, including Coca-Cola, Unilever, and Nestlé, have committed to incorporating a substantial proportion of recycled content into their packaging by 2025. The Ellen MacArthur Foundation's "New Plastics Economy" initiative has galvanized hundreds of businesses to commit to more sustainable plastic utilization practices.

Consumer awareness regarding plastic pollution is also influencing market trends, fostering demand for more recyclable packaging and products. Consequently,

some brands are now prioritizing "design for recycling" principles in their product development processes.

Emerging economies are pivotal to future growth in plastic recycling. Regions such as Southeast Asia, Africa, and Latin America are actively investing in recycling infrastructure, often with support from international organizations and private investors. Importantly, informal waste pickers in countries like India and Brazil continue to play a vital role in the collection and sorting of recyclable materials, despite the precarious nature of their working conditions and economic security (UN-Habitat, 2020).

The broader movement towards a circular economy, which emphasizes the reuse and recirculation of materials rather than their disposal, is fostering new business models and cross-sectoral partnerships. Despite persistently low global plastic recycling rates, the confluence of policy interventions, technological innovation, corporate commitments, and consumer demand is driving substantial change. The forthcoming decade will be instrumental in scaling up solutions to render plastic recycling more efficient, economically viable, and widely implemented.

2.3 Policies and Regulations Related to Plastic Recycling

Governments increasingly rely on plastic recycling policies and regulations as essential instruments to address environmental degradation, manage waste effectively, and combat the escalating plastic pollution crisis. These efforts involve a multi-tiered approach, integrating key international agreements, national legislation, and local ordinances to regulate the management, recycling, and reduction of plastic waste.

(a) International Frameworks

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989) serves as a pivotal global treaty governing the international flow of plastic waste. Significant amendments adopted in 2019 specifically targeted plastic waste, aiming to enhance the transparency and regulation of its global trade (Secretariat of the Basel Convention, 2019). These revisions mandate that exporters secure consent from recipient countries before shipping contaminated, mixed, or non-recyclable plastics.

The European Union (EU) has also established robust regulations through its "European Strategy for Plastics in a Circular Economy" (2018). This strategy prioritizes ensuring that all plastic packaging is recyclable or reusable by 2030, reducing the

prevalence of single-use plastics, and bolstering the economic viability of plastic recycling (European Commission, 2018).

(b) National Regulations

At the national level, the United States' Resource Conservation and Recovery Act (RCRA) (1976) provides a foundational framework for managing both hazardous and non-hazardous solid waste, including plastics. While RCRA does not mandate recycling, it actively promotes recycling initiatives through various grants and guidelines.

China's National Sword Policy (2018) profoundly altered global plastic recycling markets by prohibiting the import of most plastic waste and imposing more stringent contamination standards. This policy consequently compelled countries that had previously relied on exporting plastic waste to China to develop more robust domestic recycling infrastructures (Brooks et al., 2018).

In India, the Plastic Waste Management Rules (2016, amended 2022) introduced the principle of Extended Producer Responsibility (EPR). This framework holds producers, importers, and brand owners accountable for collecting and recycling plastic waste, thereby fostering accountability throughout the supply chain (Ministry of Environment, Forest and Climate Change, 2022).

(c) Local and Regional Actions

Cities and states play a crucial role in plastic waste management. California's Plastic Pollution Prevention and Packaging Producer Responsibility Act (SB 54, 2022) represents one of the most comprehensive legislative efforts in the U.S. This act mandates that by 2032, all packaging in California must be recyclable or compostable and levies producer responsibility fees to fund recycling infrastructure (California State Legislature, 2022).

In Africa, Rwanda's 2008 law banning plastic bags is frequently cited as an exemplary model. The Rwandan government enforces strict penalties for the use, manufacture, and sale of plastic bags, contributing significantly to cleaner cities and promoting the adoption of alternative materials (Republic of Rwanda, 2008).

(d) Persistent Challenges and Future Directions

Despite the increasing array of regulations, substantial challenges persist, including inconsistent enforcement, inadequate recycling infrastructure, and limited market demand for recycled plastics, all of which diminish the effectiveness of many

policies. Moving forward, crucial steps include harmonizing international standards, promoting design for recyclability, and strengthening producer responsibility schemes.

Furthermore, technological innovations, such as chemical recycling, and financial incentives for incorporating recycled content are vital for bridging current gaps in recycling rates. Ultimately, enhanced coordination among international, national, and local regulatory frameworks will be indispensable for establishing a sustainable system for managing plastic waste.

2.4 Opportunities and Challenges Facing in the Plastic Recycling Industry

The plastic recycling industry is a critical component of the global movement towards a sustainable and circular economy. It offers a wide range of economic, environmental, and social benefits, positioning itself as a vital sector in modern waste management. However, despite its potential, the industry faces numerous and complex challenges that hinder its full growth and effectiveness. This chapter will delve into a comprehensive analysis of both the opportunities and the impediments within the plastic recycling sector, examining the factors that drive its growth as well as the constraints that limit its potential.

On one hand, the industry is experiencing significant growth, driven by increasing global demand for recycled plastics, heightened environmental awareness, and a supportive regulatory landscape. Technological advancements, such as chemical recycling and AI-driven sorting systems, are expanding the types of plastics that can be recycled and improving efficiency. The sector also provides considerable economic benefits, including reduced reliance on virgin materials, job creation, and the establishment of new markets. Government policies, such as extended producer responsibility (EPR) schemes and bans on single-use plastics, further accelerate this growth by creating a more favorable environment for investment and innovation.

On the other hand, the plastic recycling industry is confronted with formidable obstacles. Economic constraints, such as the high operational costs of processing contaminated waste and the competition from inexpensive virgin plastics, often make recycled materials less competitive. Technological limitations, including polymer degradation in mechanical recycling and the limited commercial scalability of advanced methods like chemical recycling, also pose significant barriers. Furthermore, issues such as a lack of public awareness and participation, weak enforcement of regulations, and inadequate infrastructure and logistics systems particularly in developing regions

compound these challenges. Addressing these multifaceted issues is crucial for the industry to fulfill its potential as a cornerstone of sustainable waste management.

2.4.1 Opportunities in the Plastic Recycling Industry

(a) Economic Benefits

The plastic recycling industry presents considerable economic advantages. Through the reprocessing of waste plastics, businesses can mitigate their reliance on virgin materials, thereby decreasing production expenses. In 2021, the global market for recycled plastics was valued at over $45 billion, with projections indicating continued expansion. This growth is primarily fueled by increasing demand across the packaging, automotive, and construction sectors (Market Research Future, 2022). Furthermore, recycling operations generate revenue through the sale of processed materials and the establishment of secondary markets for goods manufactured from recycled content.

(b) Employment Opportunities

The plastic recycling industry is notably labor-intensive, thereby facilitating job creation across various operational stages, encompassing collection, sorting, processing, and manufacturing. According to the International Labour Organization (ILO), recycling activities have the potential to generate ten times more employment per ton of waste processed compared to landfilling or incineration (ILO, 2013). This expansion includes the emergence of new roles in research and development, operations, logistics, and plant management, accommodating both skilled and unskilled labor.

(c) Environmental Impact Reduction

Plastic recycling is instrumental in mitigating environmental damage. By diverting plastics from landfills and oceans, it significantly reduces pollution. This process also contributes to lower greenhouse gas emissions when compared to the production of virgin plastics and conserves natural resources, particularly petroleum. The Ellen MacArthur Foundation estimates that transitioning to a circular economy, which includes robust recycling initiatives, could diminish global plastic pollution by as much as 80% by 2040 (Ellen MacArthur Foundation, 2020).

(d) Technological Advancements and Innovation

Technological advancements are profoundly transforming the landscape of plastic recycling. Innovations such as chemical recycling, which deconstructs plastics to their molecular components, enable the recovery of materials that are intractable through conventional mechanical recycling methods. The integration of AI-driven sorting systems, enhanced washing technologies, and the development of biodegradable plastic alternatives are collectively fostering the creation of novel market segments and significantly improving the efficiency and economic viability of recycling operations (Plastics Technology, 2021). Both nascent startups and established corporations are actively investing in these technologies to optimize the entire recycling value chain.

(e) Role of Government Policies and Incentives

Governmental actions are a primary catalyst for expansion within the plastic recycling sector. Regulations that prohibit single-use plastics, mandate specific recycling rates, and implement extended producer responsibility (EPR) schemes actively incentivize corporations to invest in recycling infrastructure. Furthermore, financial stimuli such as tax credits, grants, and low-interest loans provide additional support for industry development. Illustrative policy frameworks that promote recycling and innovation include the European Union's "Plastics Strategy" (European Commission, 2018) and the U.S. "Save Our Seas Act" (U.S. Congress, 2020).

2.4.2 Challenges Facing in the Plastic Recycling Industry

(a) Financial Impediments to Plastic Recycling

The plastic recycling industry is confronted with considerable financial obstacles. The costs associated with recycling processes, particularly for mixed or contaminated plastic streams, often surpass those of virgin plastic production. Furthermore, investments in advanced recycling technologies, such as chemical recycling, necessitate substantial capital, which many recycling enterprises lack. The volatile nature of oil prices can also render new plastic more economically attractive than recycled plastic, thereby diminishing market incentives (Hopewell, Dvorak, & service provision and insufficient investment in facility upgrades**.**

(b) Technological Constraints in Plastic Recycling

Technological limitations present a significant impediment to effective plastic recycling. Plastics encompass a wide array of types, such as PET, HDPE, LDPE, and

PP, each necessitating distinct handling procedures due to their varied melting points and chemical properties. Furthermore, contamination from food residues or non-recyclable materials diminishes both the recyclability and the quality of recovered plastics. Mechanical recycling, the most common method, can lead to the degradation of polymer quality over successive cycles, thereby restricting the number of times plastic can be effectively reused (Ragaert, Delva, & Van Geem, 2017). While nascent technologies like chemical recycling offer the potential for enhanced material recovery, their large-scale commercial viability remains limited.

(c) Lack of Public Awareness and Participation

A significant impediment to effective plastic recycling stems from the generally poor public understanding of recycling guidelines. Many consumers engage in what is termed "wish cycling," whereby non-recyclable materials are inadvertently placed into recycling bins. This practice leads to contamination that can render entire batches of otherwise recyclable materials unusable. Without robust educational campaigns and standardized, clear labeling, public participation in recycling remains inconsistent. Furthermore, widespread misconceptions regarding what materials are recyclable and the appropriate recycling venues exacerbate this issue.

(d) Weak Enforcement of Regulations

Even in jurisdictions with established recycling mandates, enforcement is frequently lax. The application of penalties for non-compliance is often minimal or inconsistent, contributing to widespread disregard among both manufacturers and municipalities. Policies such as Extended Producer Responsibility (EPR), designed to transfer the financial burden of waste management to producers, suffer from uneven implementation, thereby diminishing their overall effectiveness. Furthermore, in the absence of stringent regulations and robust oversight, numerous companies tend to select more economically favorable waste management alternatives, including incineration or landfilling.

(e) Competition with Virgin Plastic Production

The production of virgin plastic typically remains more economical and readily available compared to its recycled counterparts, a disparity particularly pronounced during periods of low oil prices. Newly manufactured plastics also tend to offer superior performance characteristics, aesthetic appeal, and predictability in comparison to recycled materials. Consequently, sectors such as packaging and consumer goods frequently favor virgin materials to ensure stringent quality control. The cost-

effectiveness and abundant supply of virgin plastics therefore disincentive corporate investment in recycled alternatives, thereby impeding the advancement and expansion of recycling initiatives.

(f) Infrastructure and Logistics Issues

A significant impediment to effective plastic recycling is the widespread lack of adequate infrastructure for efficient collection, sorting, and processing of plastic materials. Recycling rates are notably lower in rural and low-income regions, where such facilities are scarce. Furthermore, the transportation costs associated with moving collected plastics to processing plants can be prohibitive, particularly when dealing with low-value, lightweight materials. These inefficient logistics also contribute to an increased carbon footprint for recycling operations, thereby diminishing their overall environmental benefits.

2.5 Reviews on Previous Studies

Industry-focused studies, such as the Building Markets (2019) assessment, revealed the structural weaknesses of Myanmar's recycling sector, particularly in urban centers like Yangon. The sector remains highly fragmented, dominated by informal operators who primarily engage in low-value activities such as collection and basic sorting, with few actors involved in value-added processes like flake production or pelletization. Constraints include limited technological capacity, inadequate occupational health and safety practices, minimal access to finance, and low levels of business formality. These issues limit the sector's ability to scale operations, attract investment, and meet international quality standards. Furthermore, the sector's vulnerability to global policy shifts, as evidenced by the decline of PET exports following China's import restrictions in 2018, underscores the need for diversification and resilience-building. Gender disparities, with women concentrated in low-paying, labor-intensive roles, also indicate that social equity considerations must be integrated into sectoral development strategies.

Carriere, C., & Horne, R. B. (2020) examined the case for a legislated market in minimum recycled content for plastics. The plastic packaging industry is under increasing pressure from shareholders and the public to lower the environmental impact of post-consumer waste. Although the U.S. recycled plastics market is poised for expansion, establishing a steady supply of recycled materials remains costly due to significant recycling market challenges. Heavy dependence on export markets has

hindered investment in local recycling infrastructure, while inconsistencies in collection programs and limited consumer knowledge about recyclable materials further complicate the situation. Additionally, the low production cost of virgin plastics worsens these issues. This study explored both the opportunities and obstacles in implementing laws that require a minimum amount of recycled content in packaging. It first reviews the current supply chain, highlights factors influencing change, and discusses previous market solutions. It then introduces a model legislative approach and evaluates the potential benefits and difficulties of mandating recycled content, along with the prospects for passing related laws at both federal and state levels.

Mo, M. (2021) studied on municipal solid waste (MSW) management within Yangon, Myanmar, an area characterized by its status as an economic center, high population density, and a rapid increase in waste generation. The research highlighted significant challenges in the city's waste management infrastructure, including the absence of a comprehensive collection system, the presence of unorganized recyclable material streams, and the reliance on open dumping sites for approximately 93% of waste disposal. The findings from the life cycle assessment (LCA) revealed that the Business-as-Usual (BAU) scenario results in the most significant environmental impact. The cost-benefit analysis (CBA) results complement these findings by showing that the BAU scenario is the least economically feasible option, while scenario E is the most economically viable. By combining the insights from both the LCA and CBA, the study provided crucial recommendations to guide decision-makers in selecting a sustainable MSW management system for Yangon. The research ultimately aimed to contribute to the National Solid Waste Management Strategy and Master plan of Myanmar by pinpointing a clear pathway for upgrading waste management practices in the municipal area.

Kha Li, (2024) examined the challenges and current practices of solid waste management (SWM) in Myitkyina Township, the capital of Kachin State, Myanmar. As the population grows and plastic waste increases, Myitkyina struggles with effective waste management. A survey of 200 residents in June 2024 evaluated their knowledge, attitudes, and behaviors related to waste handling. Findings revealed strong awareness, with 92% acknowledging the environmental impact of improper disposal and 97% recognizing the health dangers of burning plastic. Although residents showed positive attitudes toward SWM, with an average attitude score of 3.762 out of five, their actual practices lagged behind, averaging a 3.5 score. This gap suggests challenges in

converting awareness into consistent action. The study stresses the need for better waste collection services, improved access to disposal options, and stronger public education initiatives. Overall, it highlights that raising awareness must be paired with practical solutions to improve waste management in Myitkyina.

Phyu Hnin Htay, (2024) examined community actions and attitudes toward plastic waste in Yangon. This study explores public awareness, attitudes, and behaviors regarding plastic waste management and its environmental and health effects in the Yangon Region of Myanmar. Using a descriptive approach, the study surveyed 385 participants across 45 townships with a structured questionnaire. Topics included knowledge of plastic waste, attitudes toward reduction efforts, and perceptions of health risks linked to plastic pollution. Results show high awareness of the harmful impact of plastic waste on ecosystems and human health, along with a strong personal sense of responsibility. While many individuals encourage plastic-reducing habits within their communities, challenges remain that limit consistent sustainable practices. Respondents also voiced concern over health risks and emphasized the need for education and awareness campaigns. The study mentions launching targeted community education programs, improving access to sustainable waste disposal options, and implementing supportive policies to ensure broader, lasting adoption of plastic waste reduction behaviors in Yangon.

The Global Plastic Alliance (2025) studied that the Philippine EPR model demonstrated a multi-pronged strategy combining upstream interventions (e.g., footprint reduction) and downstream mechanisms (e.g., recovery and recycling) to reduce the environmental impact of plastic waste. The case study highlights that over 947 businesses were registered under the EPR scheme in 2023, contributing to the audit and reporting of more than 163 million kilograms of plastic packaging footprint. Despite this, only 9% of plastic was recycled, and 35% continued to leak into the environment, revealing persistent systemic gaps (Global Plastic Alliance, 2025). A distinctive feature of the Philippine approach is its implementation of a plastic credit system**,** which allows producers to offset their plastic footprint through investment in certified recovery and recycling projects. This market-based mechanism not only mobilizes private capital estimated to reach $4.2 billion in annual revenue by 2050 but also fosters local employment and infrastructure development (Global Plastic Alliance, 2025). Projects under this scheme are verified by third-party audits, and credits are recorded in a public registry to ensure transparency and accountability. Despite its

promise, the system faces several implementation challenges, such as high costs for recycled feedstock, technological limitations in sorting and processing, and insufficient public awareness. The case study further notes that the success of EPR depends on stronger government enforcement, greater financing accessibility for MSMEs, and community participation (Global Plastic Alliance, 2025). These insights resonate with broader studies emphasizing the need for integrated approaches combining policy, economics, and education to drive circular economy transitions in developing countries.

Jung Eun Lee et al., (2025) emphasizes the critical need for a reliable recycling platform, particularly for packaging plastic waste. It focuses on mechanical and chemical recycling methods for five common plastics: polyethylene (PE), polypropylene (PP), polyethylene terephthalate (PET), polystyrene (PS), and polyvinyl chloride (PVC). The document also discusses a broader classification of recycling into four categories: primary, secondary, tertiary, and quaternary. The paper suggests that minimizing additives in virgin polymers and labeling products with their chemical composition can significantly aid in the recycling process. A holistic approach that considers the entire lifecycle of a plastic product, from design to disposal, is essential for creating a sustainable and environmentally responsible system. The authors conclude by emphasizing the need for global cooperation and legislation to combat plastic waste mismanagement.

CHAPTER III
OVERVIEW ON THE PLASTIC WASTE MANAGEMENT SYSTEM IN MYANMAR

3.1 History and Development of the Plastic Waste Management in Myanmar

Plastic waste management in Myanmar has evolved alongside the country's broader economic and urban development. Prior to the 1990s, solid waste disposal was largely informal, with minimal infrastructure dedicated to waste collection or environmental regulation. Plastic materials were not widely used until economic liberalization policies began to increase the import of consumer goods. The rise in urban consumption led to a sharp increase in single-use plastics, particularly in food packaging and household items. Municipal waste collection systems in major cities such as Yangon and Mandalay remained rudimentary well into the early 2000s. Most plastic waste was either burned or dumped in open landfills without segregation. Over time, some community-based waste initiatives began to emerge, especially with support from NGOs and international development agencies (Myint & Ko, 2019). However, a lack of coordination among stakeholders and weak enforcement of environmental policies limited the effectiveness of these early efforts.

Myanmar's journey towards systematic plastic waste management is still in its nascent stages. For many years, waste management was largely rudimentary, with limited collection and disposal primarily through open dumping (IGES, 2017). The formal acknowledgment of environmental conservation, including waste management, gained traction with the enactment of the Environmental Conservation Law in 2012 and the subsequent Environmental Conservation Rules (Logistics Cluster, 2025; IGES, 2016). These legislative frameworks laid the groundwork for a more structured approach to environmental protection.

A significant milestone was the development of the National Waste Management Strategy and Action Plan (NWMSAP) for Myanmar (2017-2030), with a primary focus on solid waste management (Myanmar Water Portal, n.d.; UNEP, n.d.). This strategy, developed with assistance from international organizations like the

United Nations Environment Programme (UNEP) and the Institute for Global Environmental Strategies (IGES), signaled a national commitment to addressing waste issues, including the escalating problem of plastic waste (IGES, 2017). The strategy emphasizes the principles of the 3Rs (Reduce, Reuse, Recycle) and aims to transition from open dumping to more environmentally sound waste management practices (UNEP, n.d.). Despite these advancements, the implementation and enforcement of these policies across the nation, particularly in rural and remote areas, remain challenging (ERIA, 2025). The focus has predominantly been on major urban centers, with a gradual recognition of the need for a more widespread and integrated system.

According to the list of registered factories (2025) from the Department of Industrial Supervision and Inspection, Yangon Region, in Insein district, there are approximately 24 factories, with the majority specializing in the production of plastic bottles and plastic ropes. Dagon Myothit district has about 34 factories, primarily producing plastic sheets and various types of plastic bags. Mayangone district has the highest concentration of businesses, with around 174 factories, most of which focus on making plastic bottles and plastic boxes. Finally, Thanlyin district, with approximately 5 factories, is mainly involved in the production of thin plastic bags and PVC sliding doors.

3.2 Key Players and Stakeholders in Waste Management

Plastic waste management in Myanmar involves a wide array of actors. The primary responsibility lies with municipal governments, particularly the Yangon City Development Committee (YCDC) and the Mandalay City Development Committee (MCDC), which oversee waste collection and disposal services. These agencies, however, often face challenges related to budget constraints, outdated equipment, and limited manpower. The private sector plays a growing role, especially through informal waste collectors and small-scale recyclers. These actors are essential to plastic recycling processes, particularly in the collection and resale of high-value plastic materials such as PET and HDPE. However, their work remains largely unregulated and is often undertaken under precarious conditions (Thant & Thein, 2020). International organizations, including the United Nations Environment Programme (UNEP) and the Japan International Cooperation Agency (JICA), have supported waste management reforms through pilot projects, capacity-building, and technical assistance. NGOs and

community groups have also been instrumental in raising awareness and piloting localized recycling efforts.

The primary governmental body overseeing environmental policies, including waste management, is the Ministry of Natural Resources and Environmental Conservation (MONREC) and its Environmental Conservation Department (ECD) (IGES, 2017). At the municipal level, City Development Committees (CDCs), such as the Yangon City Development Committee (YCDC) and Mandalay City Development Committee (MCDC), are responsible for the practical aspects of waste collection, transportation, and disposal within their jurisdictions (Logistics Cluster, 2025; IGES, 2017). In areas outside the purview of major CDCs, Township Development Committees are tasked with waste management, though often with limited resources and capacity (Logistics Cluster, n.d.). The private sector's involvement is gradually increasing, particularly in collection and transportation in some urban areas, and more significantly in the recycling industry. This includes formal recycling businesses and a vast informal sector (ERIA, 2025; IGES, 2017). Companies involved in manufacturing and importing plastics are also key stakeholders, particularly with emerging discussions around Extended Producer Responsibility (EPR) (G20 MPL, n.d.).

Several local and international NGOs and CSOs are actively involved in raising awareness, implementing community-based waste management projects, conducting research, and advocating for policy improvements. Organizations like Thant Myanmar and Flora & Fauna International (FFI) have been instrumental in highlighting the scale of plastic pollution and promoting solutions (MCRB, 2019; Myanmar Water Portal, 2019).

A significant, yet often overlooked, component of waste management in Myanmar is the informal sector, comprising waste pickers, itinerant buyers, and small-scale junk shops. This sector plays a crucial role in the collection and sorting of recyclable materials, including plastics, thereby contributing to the recycling value chain (IGES, 2017; ERIA, 2025). Entities such as UNEP, IGES, the World Bank, Asian Development Bank (ADB), and various bilateral development agencies provide technical assistance, funding, and capacity building for waste management initiatives in Myanmar (IGES, 2017; MERAL, n.d.).

Universities and research bodies are increasingly contributing to understanding the scope of plastic waste, its impacts, and potential management strategies through research and data collection (MERAL, n.d.; CIL NUS, 2020). The interplay and

coordination among these stakeholders are crucial for developing an effective and sustainable plastic waste management system in the country.

3.3 Current Practices in Plastic Recycling

Plastic recycling in Myanmar is predominantly driven by informal-sector activities. Most recyclables are collected by waste pickers, often operating under harsh and unsanitary conditions, who sell plastic items to middlemen or small-scale recycling plants. The focus is usually on high-value plastics, while low-value or contaminated plastics are discarded or burned.

Recycling facilities are limited in both number and technological capacity. Most plants use basic mechanical recycling techniques, such as washing, shredding, and pelletizing. Chemical recycling and advanced processing technologies are virtually nonexistent in the country. Moreover, there is no formal system of waste segregation at the household or municipal level, which severely hampers recycling efficiency and quality (UNEP, 2021). The absence of national recycling standards further compounds these challenges. Without policy incentives or quality benchmarks, recycling businesses have little motivation to invest in more advanced or environmentally sound practices.

(a) Collection and Sorting

Recyclable plastics are often segregated at the household level and sold to itinerant waste buyers or junk shops (IGES, n.d.). Waste pickers also salvage plastics from communal bins and dumpsites. These collected plastics then pass through a series of intermediaries before reaching larger recycling facilities. The YCDC also operates some small-scale plastic recycling activities (IGES, n.d.).

(b) Types of Plastics Recycled

Common types of plastics recycled include PET (polyethylene terephthalate) bottles, HDPE (high-density polyethylene), LDPE (low-density polyethylene) films, and PP (polypropylene) items. However, the recycling of more complex or contaminated plastics remains limited.

(c) Recycling Technologies and Processes

Recycling facilities, mostly small to medium-sized enterprises, employ basic to intermediate technologies. These typically involve manual sorting, washing, shredding, melting, and pelletizing. The resulting plastic pellets are then sold to manufacturers for producing new products, often of lower value than the original items (downcycling).

There is a growing interest in improving recycling infrastructure and adopting more advanced technologies, but investment and technical expertise are often limiting factors.

(d) Limiting Factors

The plastic recycling sector in Myanmar confronts several notable impediments. A primary issue is the variable supply and inconsistent grade of recyclable plastic materials, largely due to the nature of the widespread informal collection network. Furthermore, the absence of advanced recycling facilities curtails the range and quantity of plastic types that can be efficiently processed, while the volatility in demand and pricing for recycled plastics can undermine the financial sustainability of recycling enterprises. A significant deficiency also exists in defined benchmarks for recycled content and clear regulatory frameworks for recycling activities, which are necessary to uphold environmental protection and product quality. Compounding these issues, despite some progress, widespread understanding and practice of correct waste sorting at domestic and business levels remain inadequate, frequently resulting in the contamination of potentially recyclable plastics (MERAL, n.d.). Notwithstanding these obstacles, pioneering enterprises and community-driven movements are developing, emphasizing the expansion of reuse and repair systems practices historically embedded in Myanmar's culture as a more effective means of addressing plastic pollution (ERIA, 2025).

3.4 Government Initiatives and Support

The Government of Myanmar has increasingly acknowledged the environmental exigencies posed by inadequate plastic waste management and has initiated several measures, often in concert with international development partners, to address this challenge. These initiatives span policy formulation, regulatory frameworks, institutional capacity building, and public awareness campaigns, reflecting a growing commitment to transitioning towards more sustainable waste management practices. A cornerstone of the governmental approach is the National Waste Management Strategy and Action Plan (NWMSAP) for Myanmar (2017-2030). This strategic document, developed with technical assistance from organizations such as the United Nations Environment Programme (UNEP) and the Institute for Global Environmental Strategies (IGES), provides an overarching framework for improving solid waste management, including a significant focus on plastics (UNEP, n.d.; IGES, 2017). The NWMSAP

emphasizes the adoption of the 3R (Reduce, Reuse, Recycle) principles, advocates for the enhancement of waste collection services, and aims to develop environmentally sound treatment and disposal methodologies, moving away from prevalent open dumping practices (GNLM, 2022).

Legislatively, the Environmental Conservation Law (2012) and the subsequent Environmental Conservation Rules (2014) provide the foundational legal basis for environmental protection and pollution control, under which waste management regulations are mandated (NCEA, n.d.; Myanmar Koei International, 2018). The primary government agency spearheading these efforts is the Ministry of Natural Resources and Environmental Conservation (MONREC), through its Environmental Conservation Department (ECD). The ECD is tasked with policy implementation, monitoring, and the enforcement of environmental standards related to waste.

At the sub-national level, municipal bodies such as the Yangon City Development Committee (YCDC) and the Mandalay City Development Committee (MCDC) play a crucial role in the operational aspects of waste management within their jurisdictions. These committees are responsible for waste collection, transportation, and the management of disposal sites. They have also been involved in implementing specific local initiatives, such as campaigns to reduce plastic bag usage and improve waste segregation (ADB, 2017). For instance, YCDC has initiated pilot projects for community-based waste management and has been exploring options for upgrading its landfill sites with international collaboration, such as with the French Development Agency (AFD) (AFD, 2018).

Recognizing the pervasive issue of single-use plastics (SUPs), the government has taken steps towards their regulation. Directives have been issued to phase out certain SUPs in government offices and public events, and there have been national discussions and regional workshops concerning broader SUP bans and restrictions (Tun et al., 2023; The ASEAN Post, 2020). For example, specific notifications have been issued regarding the reduction of plastic production and utilization, and there are ongoing efforts to establish a more comprehensive legal framework for plastic waste management (ClientEarth, 2021).

Furthermore, Myanmar is in the process of developing a National Plastic Action Plan (NPAP), with support from international partners like the World Bank. This plan aims to provide a detailed roadmap for managing plastic pollution across the entire lifecycle of plastics, from production and consumption to waste management and

recycling (World Bank, 2020). The NPAP is expected to align with regional commitments, such as the ASEAN Framework of Action on Marine Debris.

Government support also extends to awareness-raising and capacity-building programs. These initiatives, often conducted in partnership with non-governmental organizations (NGOs) and community-based organizations (CBOs), seek to educate the public on the environmental impacts of plastic waste and promote behavioral changes towards responsible consumption and waste disposal practices. Capacity-building efforts focus on enhancing the technical and managerial skills of personnel involved in waste management at both national and local government levels. For example, projects supported by the Japan International Cooperation Agency (JICA) have focused on improving solid waste management master plans and providing technical training (JICA, 2017).

Despite these initiatives, the government faces significant challenges. These include ensuring consistent enforcement of regulations across all states and regions, securing adequate and sustainable financing for waste management infrastructure, developing comprehensive data collection and monitoring systems, and effectively integrating the significant informal waste sector into formal management strategies (IGES, 2017). The successful implementation of government initiatives will depend on sustained political will, robust institutional frameworks, active stakeholder participation, and continued international cooperation.

3.5 Current Status of Plastic Waste Management in the Yangon Region

(a) Overview of Plastic Waste Generation in Yangon

Yangon Region, home to over 5 million residents and serving as Myanmar's primary economic hub, generates substantial quantities of municipal solid waste (MSW) daily. According to data from the Yangon City Development Committee (YCDC, 2020), the city produces between 2,300 and 2,500 tons of solid waste per day. Plastic waste accounts for an estimated 10% to 15% of this total volume, equivalent to 230–375 tons per day. Most of this plastic waste comes from households, commercial establishments, street vendors, and industrial areas. The composition of plastic waste includes single-use plastic bags, PET bottles, food packaging, polystyrene containers, and multilayer laminates. A lack of comprehensive waste characterization studies at the city level has made it difficult to accurately assess the plastic waste fraction over time,

but field observations and pilot audits indicate an increasing trend driven by urban consumption patterns and lifestyle changes (UN-Habitat, 2020).

(b) Collection and Disposal Practices

The current waste management system in Yangon is largely linear and focused on collection and disposal. YCDC is responsible for primary collection, sweeping, and transfer to landfill sites. Waste is typically collected in mixed form from households and public bins without prior segregation. Plastic materials are thus mixed with food waste, organic matter, and other non-recyclables, making post-collection recycling less efficient. Waste collected is transported to the Htein Bin landfill, the city's main disposal site located on the western outskirts. This landfill, however, is approaching its maximum capacity and is known to suffer from several environmental risks, including groundwater contamination, fire outbreaks, and methane gas buildup due to unmanaged organic decomposition (Hein et al., 2021). Open dumping and occasional open burning are still practiced, especially in peri-urban zones, posing risks to both public health and the environment.

(c) Plastic Recycling Landscape

Plastic recycling in Yangon is mainly informal and decentralized. A significant portion of recyclable plastic is recovered by informal waste pickers and sold to intermediaries or small-scale recycling workshops located in industrial zones such as Shwe Pyi Thar, South Dagon, and Hlaing Tharyar. These enterprises engage primarily in mechanical recycling processes like washing, shredding, and pelletizing. However, they face numerous challenges including inconsistent quality and supply of raw plastic materials, high levels of contamination in feedstock, lack of investment in modern recycling technologies, limited access to affordable finance for equipment upgrades, informal labor practices with little occupational safety regulation. Due to these constraints, the quality of recycled plastic pellets produced often falls short of market requirements, limiting their competitiveness against virgin plastic, which remains cheaper and more consistent in quality.

(d) Institutional and Regulatory Framework

Myanmar's legal framework for waste management includes the Environmental Conservation Law (2012) and subsequent rules and guidelines issued by the Ministry of Natural Resources and Environmental Conservation (MONREC). However, enforcement mechanisms at the municipal level are still weak. Local authorities such as YCDC lack the technical and financial capacity to implement systematic waste

segregation, recycling mandates, or enforce pollution control measures effectively (MONREC, 2015). There is no citywide Extended Producer Responsibility (EPR) policy in force, and plastic manufacturers and brand owners currently bear little to no responsibility for the post-consumer phase of their products. Compared to countries like the Philippines, which have formalized EPR through national legislation and compliance audits (Global Plastic Alliance, 2025), Myanmar remains at an early stage of policy development in this regard.

(e) Public Awareness and Community Participation

Public awareness of the environmental impacts of plastic pollution remains low in Yangon. Household-level waste separation is rarely practiced, and most residents dispose of waste in a mixed format. NGOs such as Thant Myanmar have implemented pilot-scale programs in certain townships to promote plastic waste segregation and source reduction, including educational campaigns in schools and markets. However, these efforts remain localized and lack integration with the city's formal waste system (Thant Myanmar, 2022). The absence of incentives for segregation and the lack of accessible recycling points have contributed to poor participation. Moreover, informal workers in the waste recovery chain are often unrecognized and unsupported, despite their critical role in salvaging recyclable plastics from the waste stream.

(f) Infrastructure and Technology Gaps

Yangon's waste infrastructure remains inadequate for addressing the scale and complexity of plastic waste. The city lacks dedicated material recovery facilities (MRFs), transfer stations, and plastics-specific processing facilities that could support scalable recycling efforts. Most of the recycling machinery used is outdated, imported secondhand, and manually operated, leading to inefficiencies in throughput and quality. Furthermore, key inputs such as reliable electricity, clean water (for washing processes), and affordable transportation are inconsistent, driving up operational costs for recyclers. These infrastructure bottlenecks deter private investment and hinder the growth of formal recycling enterprises.

CHAPTER IV
SURVEY ANALYSIS

4.1 Survey Profile

The study is to examine the key factors influencing the opportunities and challenges depending on the development and performance of plastic recycling enterprises within the Yangon region. The survey was conducted in June 2025. Based on the records obtained from Directorate of Industrial Supervision and Inspection (DISI), there are a total of 258 plastic factories in the Yangon Region, of which approximately 100 are categorized as large- and medium-scale enterprises. A sample of 200 respondents-comprising factory owners, directors, managers, and supervisors was selected for the study. Data were collected using a structured questionnaire administered via Google Forms.

4.2 Survey Design

The survey design for this study was carefully thought out to obtain an in-depth understanding of a study on factors affect that opportunities and challenges for plastic recycling factories in Yangon. Primary and secondary data collection methods were employed to ensure a thorough analysis of the research objective.

Primary data collection involved the use of a structured questionnaire, which was distributed to a sample of 200 respondents. According to Taro Yamane's (1973) formula, the estimated sample size was 200 respondents from a population of 600, with a 5.5% margin of error and a 95% confidence level. In the end, 200 respondents including owners, managers, directors, supervisors, technical staff who answered the survey were included in the study. This slight difference between the calculated and actual sample sizes arose due to practical challenges during data collection, such as non-responses or incomplete answers.

Although this minor difference, a sample size of 200 is statistically sound and sufficient to achieve the required level of accuracy for the analysis. The slight increase in the sample size does not significantly impact the reliability of the result, as the final

sample size remains well within the acceptable range for statistical validity. The sample included activated respondents from plastic recycling industries, surveyed between from May to June 2025, from a total population of approximately 600.

The formula used to determine the sample size is:

$$n = \frac{N}{1 + N(e^2)}$$

Where:

- n = the sample size,
- N = the population size (600),
- e = the acceptable sampling error (assumed to be 5.5% at a 95% confidence level).

Applying the values into the equation:

$$n = \frac{600}{1 + 600(0.055^2)} = 213 \approx 200$$

Based on this calculation, the nearest whole number gives a sample size of 200. Therefore, the calculated sample size for this study was 213 respondents. However, due to certain practical limitations encountered during data collection such as non-responsiveness and time constraints data were successfully obtained from 200 respondents only. Although this number is slightly lower than the calculated sample size, it remains sufficiently close to ensure that the findings are statistically valid and representative. Moreover, the reduction in sample size does not significantly compromise the reliability or generalizability of the results, as the difference is minimal (within a 6% margin of the target).

Secondary data was collected from local and international research papers, relevant journals, published textbooks, survey reports, articles, and websites. The survey questionnaire used a five-point Likert scale to measure the strength of respondents' opinions, with numerical values assigned as Strongly Disagree =1, Disagree = 2, Neutral = 3, Agree = 4, Strongly Agree = 5.

The questionnaire, which was divided into five sections, gathered detailed information on respondents' demographic characteristics, factors that affect opportunities for plastic recycling factories, factors that affect challenges for plastic recycling factories, factors that Affect performance and outcomes for plastic recycling factories, future outlook and suggestions.

The survey included both dependent and independent variables to examine the relationships and influences outlined in the research objectives. The questionnaire was divided into four main parts. Part (A) covered respondent and factory demographics, gathering data on gender, age, education level, years of experience in the plastic sector, number of years operating in plastic recycling, number of employees, type of plastic processed, type of recycling products, type of plastic recycling process, average monthly input (tons) of plastic waste, average monthly output (tons) of recycled material, the source of raw plastic waste, the sold place of products, the status of funding received, and the future plan to expand operation in the next 2 years. Part (B) addressed influencing factors, with sections on market demand and value, technological advancements and innovation in recycling techniques, government support and policy, supply chain and collection, employment opportunities, and environmental impact reduction due to recycling activities using Likert scale statements. Part (C) focused on factors that affect challenges for plastic recycling factories including waste feedstock issues, raw materials quality, infrastructure and technology issues, cost issues, policy and regulatory barriers, public awareness and participation, and logistics issues using Likert scale statements. Part (D) focused on factors that affect performance and outcomes for plastic recycling factories. The structured questionnaire ensured comprehensive data collection, covering all relevant aspects influencing opportunities and challenges for plastic recycling factories.

In addition to the structured questionnaire, In-depth interviews were conducted with officials from the Myanmar Plastics Industries Association, and with owners, directors, managers, and supervisors from plastic factories located in Shwe Lin Pan, War Ta Yar, Shwe Pyi Thar, and Mingalardon Industrial Zones. These interviews were carried out through on-site visits to the respective factories. Field research was conducted to gather data, yielding valuable insights into the plastic recycling sector in Myanmar. The qualitative data collected through on-site visits to factories in Yangon and other parts of the country illuminated the challenges currently faced by the sector, the opportunities that could arise from its advancement, and future prospects for plastic recycling in Myanmar. Additionally, quantitative data was obtained, providing information on the volume of plastic waste utilized by factories and the resulting output of finished products.

4.3 Survey Results

4.3.1 Demographic Characteristics of Respondents

The demographic profile of the respondents is crucial in understanding the sample population and contextualizing the study's findings. The tables below summarize 18 key demographic aspects: on gender, age, education level, years of experience in the plastic sector, number of years operating in plastic recycling, number of employees, type of plastic processed, type of recycling products, type of plastic recycling process, average monthly input (tons) of plastic waste, average monthly output (tons) of recycled material, the source of raw plastic waste, the sold place of products, the status of funding received, and the future plan to expand operation in the next 2 years.

Table 4.1 Demographic Characteristics of Respondents

No.	Item	Description	No of respondents	Percentage (%)
1.	Gender	Male	140	70
		Female	60	30
2.	Age	19 to 28	3	1.5
		29 to 38	60	30
		39 to 48	90	45
		49 to 58	28	14
		59 to 68	19	9.5
		Others	0	0
3	Education Level	Graduated	194	97
		post graduated	2	1
		Master	4	2
		Doctoral	0	0
4	Years of experience in the plastic sector	1 to 10	110	55
		11 to 20	51	25.5
		21 to 30	30	15
		31 to 40	9	4.5
		41 to 50	0	0

Table Continued

5	Your Role/ Position in the Business/ Organization	Owner	27	13.5
		Director	69	34.5
		Manager	44	22
		Supervisor	59	29.5
8	Number of Years Your Business/ Organization has been Operating in Plastic Recycling	1 to 10	104	52
		11 to 20	66	33
		21 to 30	12	6
		Above 30	17	8.5
9	Number of Employees	20 to 40	19	9.5
		41 to 60	48	24
		61 to 70	27	13.5
		71 to 90	30	15
		Above 90	76	38
10	Describe the type of your recycling products.	Semi-products: Resin/ pellets/ tube, etc.,	129	64.5
		Finished goods: bags/ bottles/ packaging materials, etc.	71	35.5
11	What type of plastic recycling process is used in your factory?	Mechanical	68	34
		Chemical	0	0
		Shredding	13	6.5
		Pelletizing	119	59.5
12	What is the average monthly input (tons) of plastic waste?	200 to 400	107	53.5
		400 to 600	31	15.5
		600 to 800	7	3.5
		800 to 1000	46	23
		Above 1000	9	4.5
13	What is the average monthly output (tons) of recycled material?	200 to 400	107	53.5
		400 to 600	31	15.5
		600 to 800	7	3.5
		800 to 1000	46	23
		Above 1000	9	4.5

Table Continued

14	Where do you source your raw plastic waste?	Local	123	61.5
		Foreign	0	0
		Local and Foreign	77	38.5
15	Do you sell your products only within local, or export abroad?	Local	138	69
		Foreign	23	11.5
		Local and Foreign	39	19.5
16	Have you received support or funding from NGOs?	Yes	24	12
		No	176	88
17	Are you planning to expand your operations in the next 2 years?	Yes	171	85.5
		No	29	14.5

Source: Survey data (2025)

According to Table (4.1), demographic analysis of the 200 respondents presents a thorough and comprehensive view of the sample population. The majority of respondents were male, accounting for 70% (n=140) of the surveyed individuals. Female respondents constituted 30% (n=60) of the sample. This distribution indicates a male-dominated demographic within the leadership and management roles surveyed in the plastic recycling sector.

The age profile of respondents indicates a concentration in the middle-aged categories. The largest segment, 45% (n=90), falls within the 39 to 48 age bracket. This is followed by the 29 to 38 age group, representing 30% (n=60) of respondents. Individuals aged 49 to 58 accounted for 14% (n=28), while those aged 59 to 68 comprised 9.5% (n=19). The youngest group (19 to 28) represented a small minority at 1.5% (n=3), with no respondents in other age categories. This distribution suggests that experienced professionals, particularly those in their late thirties to late forties, constitute the core leadership within these businesses.

A substantial majority of the respondents, 97% (n=194), held a bachelor's degree ("Graduated"). A smaller proportion had pursued postgraduate studies, with 1%

(n=2) having a "Post Graduated" qualification and 2% (n=4) holding a Master's degree. No respondents reported having a Doctoral degree. This indicates a highly educated workforce within the managerial and supervisory ranks of the sector, primarily at the undergraduate level.

Experience levels among respondents in the plastic sector were notably varied. The largest group, 55% (n=110), reported 1 to 10 years of experience. Respondents with 11 to 20 years of experience constituted 25.5% (n=51), while those with 21 to 30 years represented 15% (n=30). A smaller segment, 4.5% (n=9), had 31 to 40 years of experience. No respondents reported experience beyond 40 years. This distribution suggests a relatively young but growing sector, with a significant proportion of professionals still accumulating extensive experience.

The respondent pool comprised various leadership and management roles. Directors represented the largest segment at 34.5% (n=69), followed closely by Supervisors at 29.5% (n=59). Managers accounted for 22% (n=44), while Owners constituted 13.5% (n=27) of the respondents. This indicates a balanced representation of strategic, operational, and executive personnel within the surveyed businesses.

The operational longevity of the surveyed businesses in plastic recycling is predominantly concentrated in the earlier stages. A majority, 52% (n=104), have been operating for 1 to 10 years. Businesses with 11 to 20 years of operation accounted for 33% (n=66). A smaller proportion, 6% (n=12), have been active for 21 to 30 years, while 8.5% (n=17) have been operating for over 30 years. This highlights a dynamic and relatively nascent plastic recycling industry, with a substantial number of newer entrants.

The employee count within the surveyed businesses varied, indicating a mix of enterprise sizes. The largest proportion, 38% (n=76), reported having "Above 90" employees, suggesting a notable presence of larger operations. Companies with 41 to 60 employees constituted 24% (n=48), while those with 71 to 90 employees accounted for 15% (n=30). Businesses with 61 to 70 employees represented 13.5% (n=27), and those with 20 to 40 employees comprised 9.5% (n=19). This distribution suggests that while some larger players exist, the sector also accommodates a considerable number of medium-sized enterprises.

The output from the surveyed recycling facilities primarily consists of semi-finished products. A significant majority, 64.5% (n=129), produce semi-products such as resin, pellets, or tubes. Finished goods, including bags, bottles, and various

packaging materials, account for 35.5% (n=71) of the recycling output. This indicates that the sector largely functions as a supplier of raw or intermediate materials for further manufacturing processes.

Mechanical recycling processes are overwhelmingly dominant in the surveyed factories. Pelletizing is the most common method, utilized by 59.5% (n=119) of businesses, often as a final step in mechanical recycling. Mechanical recycling as a broader category was reported by 34% (n=68) of respondents. Shredding, often a preliminary step, was used by 6.5% (n=13) of factories. Notably, chemical recycling was not reported by any of the surveyed businesses (0%). This highlights the current reliance on established mechanical processes and the nascent stage of advanced recycling technologies in the region.

The average monthly input of plastic waste varies among the factories. The largest group, 53.5% (n=107), processes between 200 and 400 tons per month. Companies processing 800 to 1000 tons per month represent 23% (n=46) of the sample. Businesses handling 400 to 600 tons per month account for 15.5% (n=31), while those above 1000 tons per month constitute 4.5% (n=9). The smallest segment, 3.5% (n=7), processes 600 to 800 tons monthly. This demonstrates a wide range in operational scale, with a clear majority handling moderate volumes of waste.

Mirroring the input data, the average monthly output of recycled material also shows a similar distribution. Factories with an output of 200 to 400 tons per month comprise 53.5% (n=107). Those producing 800 to 1000 tons per month account for 23% (n=46). An output of 400 to 600 tons per month is reported by 15.5% (n=31) of businesses, and above 1000 tons by 4.5% (n=9). The 600 to 800 tons per month output range is the smallest at 3.5% (n=7). This consistency between input and output figures suggests relatively stable processing efficiencies within the sector.

The sourcing of raw plastic waste is predominantly local. A significant majority, 61.5% (n=123), source their waste exclusively from local channels. A substantial minority, 38.5% (n=77), utilize both local and foreign sources. No businesses reported relying solely on foreign sources for their raw plastic waste. This indicates a strong reliance on domestic waste streams within Myanmar's plastic recycling industry.

The market for recycled products is primarily domestic. A considerable proportion, 69% (n=138), sell their products exclusively within the local market. Businesses engaged in both local sales and foreign exports account for 19.5% (n=39). A smaller segment, 11.5% (n=23), focuses solely on exporting their recycled products.

This highlights a domestic-oriented market, with some emerging presence in international trade.

The vast majority of surveyed businesses have not received support or funding from government agencies or NGOs. A striking 88% (n=176) reported no such support, while only 12% (n=24) indicated that they had received assistance. This suggests a sector largely operating without direct external financial or institutional backing from these entities.

There is a strong and optimistic outlook for expansion within the sector. An overwhelming majority, 85.5% (n=171), indicated plans to expand their operations within the next two years. Only 14.5% (n=29) reported no such expansion plans. This high propensity for growth suggests confidence in the future of the plastic recycling industry.

4.3.2 Factors that Affect Performance and Outcomes for Plastic Recycling Factories

The performance and outcomes of plastic recycling factories in Yangon were assessed based on six key factors, with respondents rating their level of agreement on a scale. The mean and standard deviation values of these factors provide insight into the current status and challenges of the industry.

Firstly, the factor "The plastic recycling business is currently profitable" yielded a mean score of 3.7 with a standard deviation of 0.59. This indicates that, on average, respondents moderately agree that the recycling business is profitable, with a reasonable level of consensus among them. Similarly, the statement regarding the "Annual growth rate of the business" received a mean of 3.6 and a standard deviation of 0.54, reflecting a general agreement that the business growth rate has increased, though with slightly less unanimity.

The volume of recycled plastic products over the past year was also reported to have increased, as indicated by a mean of 3.7 and a standard deviation of 0.52. This suggests a positive trend in production output, supported by consistent perceptions among participants. Notably, the factor concerning compliance with environmental standards and regulations recorded the highest mean score of 3.9 and the lowest standard deviation of 0.29. This demonstrates strong agreement and high consensus that

recycling factories adhere to environmental compliance, which is crucial for sustainable operations.

Regarding business expansion, the mean score was 3.5 with a standard deviation of 0.76. While the average response indicates moderate agreement that operations have expanded in the past 12 months, the relatively high standard deviation suggests varying experiences across different factories. Finally, maintaining stable cash flow also received a mean score of 3.5 with a standard deviation of 0.52, showing moderate agreement with some divergence in respondents' views.

In summary, overall mean value (3.65) indicates that, on average, respondents perceive the performance and outcomes of plastic recycling factories to be between "Good" and "Excellent" on the Likert scale. A standard deviation of approximately 0.55 suggests moderate variability in responses, indicating that while most responses are clustered around the average, there is some diversity in perceptions.

Table 4.2 Performance and Outcomes for Plastic Recycling Factories

Sr.	Description	Mean	Standard Deviation
1	The plastic recycling business is currently profitable.	3.7	0.59
2	The Annual growth rate of your business has increased.	3.6	0.54
3	The volume of recycled plastic products has increased over the past year.	3.7	0.52
4	The business has expanded its operations in the past 12 months.	3.5	0.76
5	The business has been able to maintain stable cash flow.	3.5	0.52
Overall Value		3.6	0.55

Source: Survey data (2025)

4.3.3 Factors that Affect Opportunities for Plastic Recycling Factories

(a) Market Demand & Value

The following table 4.3 presents the descriptive statistics for the factor "Market Demand and Value," which assesses respondents' perceptions of market-related opportunities for plastic recycling factories in Yangon. Among the six items, the highest

mean score (M = 3.92, SD = 0.33) was observed for the statement "Consumers are showing more interest in eco-friendly/recycled products," indicating a strong consensus that environmentally conscious consumer behavior is increasing and presents a significant opportunity for the industry. Similarly, the perception that "The value chain for recycled plastic is economically viable" also received a high mean score (M = 3.84, SD = 0.56), suggesting that stakeholders see the collection, processing, and selling of recycled plastics as a feasible business model.

The item "The price of recycled plastic materials offers good profitability" scored a relatively high mean of 3.66 (SD = 0.62), reflecting a general agreement on the financial benefits of operating in the recycled plastic market. Additionally, the statement regarding "Strong and growing local market demand" yielded a mean score of 3.53 (SD = 0.73), showing moderate agreement and suggesting that the domestic market has potential for expansion. The perceived demand for higher-quality recycled plastic products also showed a moderately positive trend (M = 3.31, SD = 0.57), indicating increasing expectations for improved product standards within the market.

In contrast, the lowest mean score (M = 2.51, SD = 0.63) was associated with the statement "There is a growing export market demand for recycled plastic products," implying that international market demand is currently not considered a major opportunity by most respondents. Overall, the results demonstrate that while the export potential remains limited, there is a clear and favorable outlook on the local market dynamics, with strong emphasis on consumer behavior, value chain viability, and profitability. These findings suggest that recycling businesses in Yangon should primarily focus on capitalizing on domestic market opportunities and gradually enhance product quality to meet rising expectations.

Table 4.3 Market Demand & Value

Sr	Description	Mean	Standard Deviation
1	There is a strong and growing local market demand for recycled plastic resin/ pellets/ granules and recycled plastics.	3.53	0.73
2	There is a growing export market demand for recycled plastic products.	2.51	0.63

Table Continued

3	The price of recycled plastic materials offers good profitability.	3.66	0.62
4	There is increasing demand for higher quality recycled plastics.	3.31	0.57
5	Consumers are showing more interest in eco-friendly/ recycled products.	3.92	0.33
6	The value chain for recycled plastic (collection, processing, selling) is economically viable.	3.84	0.56
Overall Value		3.46	0.58

Source: Survey data (2025)

(b) Technological Advancements & Innovation in Recycling Techniques

Table 4.4 outlines respondents' perceptions regarding technological advancements and innovation in recycling techniques, a key factor influencing opportunities for plastic recycling factories in Yangon. The item with the highest mean score (M = 4.06, SD = 0.66) was "New technologies have improved the efficiency of recycling," indicating strong agreement that technological progress is playing a significant role in enhancing operational productivity. This suggests that the integration of newer technologies is perceived as a crucial driver for improving the overall effectiveness of recycling processes.

The second-highest mean (M = 3.62, SD = 0.54) was associated with the statement "Access to affordable and appropriate recycling technology is improving." This implies that respondents are relatively optimistic about the growing availability and affordability of recycling equipment suited to local conditions. Similarly, the availability of "technical support and knowledge for new recycling technologies" received a moderate level of agreement (M = 3.34, SD = 0.88), though the relatively high standard deviation suggests variation in respondents' experiences or access levels.

In terms of quality enhancement, the statement "Modern sorting technologies have improved the quality of recycled plastic" received a mean of 3.31 (SD = 0.84), reflecting moderate agreement with some variability in perceptions. Notably, the lowest mean score (M = 2.57, SD = 0.61) was observed for the item "Opportunities exist to adopt innovative recycling processes (e.g., chemical recycling)," suggesting that

respondents perceive fewer opportunities or readiness for more advanced recycling innovations such as chemical recycling. This may indicate either a lack of infrastructure or limited awareness and adoption of such emerging technologies.

Overall, the data indicate that while respondents recognize the positive impact of existing technologies on recycling efficiency and accessibility, there remains a gap in the adoption and promotion of cutting-edge innovations. Therefore, further investment in technology transfer, capacity building, and access to advanced recycling methods may be essential to fully unlock the sector's potential in Yangon.

Table 4.4 Technological Advancements & Innovation in Recycling Techniques

Sr.	Description	Mean	Standard Deviation
1	Access to affordable and appropriate recycling technology is improving.	3.62	0.54
2	Opportunities exist to adopt innovative recycling processes (e.g., chemical recycling).	2.57	0.61
3	Technical support and knowledge for new recycling technologies are becoming more available.	3.34	0.88
4	New technologies have improved the efficiency of recycling.	4.06	0.66
5	Modern sorting technologies have improved the quality of recycled plastic.	3.31	0.84
Overall Value		3.50	0.72

Source: Survey data (2025)

(c) Government Support & Policy

Table 4.5 presents respondents' views on government support and policy frameworks that influence the growth and opportunities of plastic recycling factories in Yangon. The highest mean score was recorded for the item **"**Public awareness campaigns by authorities are improving waste segregation practices" (M = 4.04, SD = 0.54), suggesting strong agreement among respondents that government-led outreach efforts are having a positive impact on citizen behavior, particularly in terms of source-level waste separation - an essential component of effective recycling systems.

Another area with relatively strong agreement is the statement "Environmental regulations encourage recycling practices" (M = 3.85, SD = 0.48), reflecting the perception that existing laws and guidelines provide an enabling environment for recycling-related activities. Additionally, the statement "Government policies and initiatives are supportive of the plastic recycling industry" (M = 3.60, SD = 0.54) also received favorable responses, indicating that at a policy level, there is a general sense of institutional backing.

However, responses related to more tangible government support mechanisms were notably lower. For example, the statement "Financial incentives, information on permits and legal requirements from the government are accessible" had a relatively low mean (M = 2.50, SD = 1.12), with a high standard deviation indicating inconsistency in the accessibility or awareness of such resources. Moreover, only a few businesses reported actually receiving financial incentives or tax exemptions**,** as reflected by the low mean of 2.27 (SD = 1.00) for that item.

Similarly, the clarity and accessibility of the permit/license application process received a moderate rating (M = 2.92, SD = 0.97), suggesting that bureaucratic procedures may still pose barriers to entry. The statement "We have received training, technical workshops, or seminars facilitated by government departments" had a mean of 3.48 (SD = 1.04), indicating that while some training efforts exist, access appears to be uneven across respondents.

Overall, the findings indicate a positive perception of policy direction and awareness efforts**,** but also reveal gaps in the practical implementation of support mechanisms such as financial incentives, technical assistance, and regulatory clarity. For the plastic recycling sector in Yangon to thrive, enhanced transparency, expanded capacity-building programs, and accessible financial or regulatory support will be critical.

Table 4.5 Government Support & Policy

Sr.	Description	Mean	Standard Deviation
1	Government policies and initiatives are supportive of the plastic recycling industry.	3.60	0.54
2	Financial incentives information on permits and legal requirements from the government are accessible.	2.50	1.12

Table Continued

3	Our business has received tax exemptions or financial incentives from the government for engaging in plastic recycling.	2.27	1.00
4	The process of applying for recycling permits/licenses is clear and accessible.	2.92	0.97
5	We have received training, technical workshops, or seminars facilitated by government departments related to recycling.	3.48	1.04
6	Public awareness campaigns by authorities are improving waste segregation practices.	4.04	0.54
7	Environmental regulations encourage recycling practices.	3.85	0.48
Overall Value		3.24	0.85

Source: Survey data (2025)

(d) Supply Chain & Collection

Table 4.6 illustrates respondents' perceptions of the supply chain and collection-related factors influencing the development of plastic recycling factories in Yangon. Among the three items evaluated, the highest mean score (M = 3.55, SD = 0.51) was recorded for the statement "Investment in better waste collection and sorting infrastructure is increasing." This reflects a positive outlook toward the ongoing development of physical infrastructure, such as waste collection systems, sorting facilities, and processing stations, which are critical for improving input quality and operational efficiency in recycling.

The second-highest score was observed for the statement "Collaboration with informal waste collectors provides a reliable source of materials" (M = 3.24, SD = 0.80). This indicates moderate agreement among respondents that informal sector engagement remains a vital component of the plastic supply chain. However, the slightly higher standard deviation suggests some variability in how consistently these collaborations are experienced across different recycling businesses.

In contrast, the lowest mean (M = 2.51, SD = 0.89) was recorded for the statement "The availability of recyclable plastic feedstock is consistent and sufficient."

This finding highlights a key constraint within the recycling ecosystem: a limited or unstable supply of raw recyclable materials. The relatively high standard deviation further points to significant variation in access to plastic feedstock among factories, which may be influenced by location, collection systems, or competition for materials.

Overall, while there is optimism regarding improvements in infrastructure and the role of informal waste collectors, the data suggest that the inconsistency in feedstock availability remains a major bottleneck for plastic recycling operations in Yangon. Addressing this challenge may require more coordinated material recovery strategies, stronger public-private collaboration, and the integration of informal actors into a more formalized supply chain structure.

Table 4.6 Supply Chain & Collection

Sr.	Description	Mean	Standard Deviation
1	The availability of recyclable plastic feedstock is consistent and sufficient.	2.51	0.89
2	Collaboration with informal waste collectors provides a reliable source of materials.	3.24	0.80
3	Investment in better waste collection and sorting infrastructure is increasing.	3.55	0.51
Overall Value		3.10	0.75

Source: Survey data (2025)

(e) Employment opportunities

Table 4.7 explores the respondents' perceptions of employment opportunities created by the plastic recycling industry in Yangon. Among the items assessed, the highest mean score was observed for the statement "The industry creates jobs for low-income groups" (M = 4.15, SD = 0.57), highlighting a strong agreement that the sector plays a significant role in providing livelihoods for economically disadvantaged communities. This suggests that the plastic recycling industry is seen not only as an environmental initiative but also as a key contributor to poverty reduction and social inclusion.

The second-highest score (M = 4.00, SD = 0.84) was recorded for "Recycling offers long-term employment stability," indicating that respondents generally perceive

recycling-related jobs as relatively secure and sustainable, though the higher standard deviation suggests varied experiences across different firms. This reflects both the potential and challenges of maintaining stable employment within an emerging industry that may face fluctuations in material supply or market conditions.

Meanwhile, "Access to skilled labor for recycling operations is improving" had a slightly lower mean of 3.50 (SD = 0.80), indicating moderate agreement. While there appears to be an increasing availability of skilled workers, the relatively higher standard deviation may point to disparities in labor supply depending on geographic or organizational context.

Overall, these findings highlight the positive socio-economic impact of the recycling industry in terms of job creation, particularly for vulnerable groups, and the potential for long-term employment stability. The results also underscore the importance of strengthening institutional linkages and workforce development to maximize the sector's contribution to employment in Yangon.

Table 4.7 Employment opportunities

Sr.	Description	Mean	Standard Deviation
1	The industry creates jobs for low-income groups.	4.15	0.57
2	Recycling offers long-term employment stability.	4.00	0.84
3	Access to skilled labor for recycling operations is improving.	3.50	0.80
Overall Value		3.88	0.75

Source: Survey data (2025)

(f) Environmental Impact Reduction due to recycling activities

Table 4.8 presents respondents' perceptions regarding the environmental benefits arising from plastic recycling activities conducted by businesses in Yangon. The findings suggest a strong consensus that recycling contributes significantly to environmental impact reduction. The highest mean score (M = 4.12, SD = 0.32) was recorded for the statement "Our recycling operations help reduce the amount of plastic waste sent to landfills in Yangon," indicating a widespread recognition of the role recycling plays in minimizing landfill burden.

A similarly high mean (M = 4.09, SD = 0.33) was reported for "We actively promote waste reduction at the source in collaboration with plastic suppliers and

customers." This suggests a proactive approach by businesses to engage stakeholders across the value chain in source-level waste minimization strategies.

Other highly rated items include "Since starting our recycling activities, we have observed less plastic pollution in our community" (M = 4.05, SD = 0.24) and "Our business follows a waste management plan that integrates Reduce, Reuse, and Recycle (3Rs) principles" (M = 4.01, SD = 0.39), both of which reflect the integration of environmental consciousness into operational and community practices.

Respondents also agreed that "Recycling contributes to reducing the frequency of clogged drains or flooding caused by plastic waste" (M = 3.99, SD = 0.34), emphasizing recycling's role in addressing urban environmental issues, such as drainage blockage - a common problem in Yangon. Additionally, the statement "Growing consumer awareness of environmental issues is driving demand for recycled products" scored a mean of 3.89 (SD = 0.53), suggesting a moderate to high perception that environmental awareness among consumers is translating into market demand for eco-friendly products.

Overall, the findings strongly affirm that plastic recycling operations in Yangon are perceived as having tangible positive environmental impacts from reducing landfill loads and local pollution to supporting more sustainable consumption patterns. This data underscores the dual role of recycling in both environmental protection and stakeholder engagement.

Table 4.8 Environmental Impact Reduction due to recycling activities

Sr.	Description	Mean	Standard Deviation
1	Our recycling operations help reduce the amount of plastic waste sent to landfills in Yangon.	4.12	0.32
2	Since starting our recycling activities, we have observed less plastic pollution in our community.	4.05	0.24
3	Recycling contributes to reducing the frequency of clogged drains or flooding caused by plastic waste.	3.99	0.34
4	Growing consumer awareness of environmental issues is driving demand for recycled products.	3.89	0.53
5	Our business follows a waste management plan that integrates Reduce, Reuse, and Recycle (3Rs) principles.	4.01	0.39

Table Continued

6	We actively promote waste reduction at the source in collaboration with plastic suppliers and customers.	4.09	0.33
Overall Value		4.02	0.37

Source: Survey data (2025)

4.3.4 Factors that Affect Challenges for Plastic Recycling Factories

The opportunities available to plastic recycling factories in Yangon are influenced by a confluence of internal and external factors. This analysis explores six critical domains Market Demand & Value, Technological Advancements & Innovation, Government Support & Policy, Supply Chain & Collection, Employment Opportunities, and Environmental Impact Reduction drawing on a recent survey's descriptive statistics. By scrutinizing the perceptions of industry stakeholders, this examination uncovers both the principal drivers of growth and the formidable challenges requiring attention. The results underscore a propitious local market, propelled by environmentally aware consumers, alongside demonstrable benefits for employment and the environment, and a positive perspective on technological efficacy. In contrast, the data also reveal persistent obstacles, including unstable supply chains, insufficient governmental financial support, and a sluggish uptake of advanced recycling methods. The purpose of this detailed breakdown is to provide a sophisticated understanding of the operational environment for plastic recycling in Yangon.

(a) Waste Feedstock Issues

Table 4.9 outlines the key challenges related to waste feedstock faced by plastic recycling operations in Yangon. The findings reveal that poor waste segregation at the source, such as from households and businesses, is perceived as the most significant issue, with the highest mean score of 4.12 (SD = 0.42). This reflects a strong consensus among respondents that improper sorting at the point of disposal severely hampers the efficiency and quality of recycling processes, often leading to increased operational costs and lower yield of usable materials.

The next most pressing issue identified is the inconsistent or insufficient supply of recyclable plastic feedstock, which received a mean of 3.88 (SD = 0.39). This highlights a key structural barrier to scaling up recycling operations the inability to reliably access adequate quantities of recyclable plastics. Such supply instability can

limit processing capacity and disrupt planning for both small- and medium-sized enterprises.

Furthermore, respondents also expressed concern over the high levels of contamination in collected plastic waste, with a mean of 3.82 (SD = 0.50). Contamination often from food residues, mixed materials, or non-recyclables -reduces the quality of feedstock and requires additional sorting and cleaning, which adds cost and complexity to recycling operations.

In summary, these results underscore that feedstock-related issues - particularly at the collection and sorting stages remain significant bottlenecks in Yangon's plastic recycling industry. Addressing these challenges will require public education on proper waste segregation, improvements in collection systems, and potentially the introduction of policy mechanisms to incentivize cleaner waste streams.

Table 4.9 Waste Feedstock Issues

Sr.	Description	Mean	Standard Deviation
1	Poor waste segregation at source (households, businesses) significantly impacts operations.	4.12	0.42
2	High levels of contamination in collected plastic waste are a major problem.	3.82	0.50
3	Inconsistent or insufficient supply of recyclable plastic feedstock is a challenge.	3.88	0.39
Overall Value		3.44	0.44

Source: Survey data (2025)

(b) Raw Materials Quality

Table 4.10 summarizes the key challenges related to the quality of raw materials encountered by plastic recycling businesses in Yangon. The highest mean score (M = 4.13, SD = 0.45) was recorded for the statement "The inconsistency in raw material quality leads to higher processing costs and material losses." This indicates strong agreement among respondents that fluctuations in the quality of input plastic significantly affect operational efficiency and profitability, due to increased labor, sorting effort, or unusable waste.

Closely following this, the issue of contamination in collected plastic materials also received high concern (M = 3.98, SD = 0.55). Respondents noted that materials mixed with food waste, dirt, or other residues often become unusable or require extensive cleaning, reducing overall process efficiency. Similarly, the presence of low-grade or damaged plastic (M = 3.85, SD = 0.69) was identified as a major barrier to producing high-quality recycled products, as these materials cannot meet performance or aesthetic standards required by many buyers.

The challenge of non-recyclable materials being mixed with recyclable plastics also ranked high (M = 3.86, SD = 0.37), reflecting inefficiencies introduced during the collection and sorting stages. Another important factor is the lack of access to reliable sources that supply clean and properly sorted plastic (M = 3.84, SD = 0.55), which underscores a supply chain limitation affecting both quantity and quality.

Finally, respondents emphasized that poor input quality directly impacts the final product's integrity**,** as noted in the item "Poor quality of input plastic leads to defects or low strength in the final recycled products" (M = 3.91, SD = 0.29). This reveals how upstream challenges with raw materials cascade into product-level issues, potentially undermining market competitiveness and consumer trust.

In summary, the data show that raw material quality remains a critical constraint in Yangon's recycling industry. Addressing this will require more effective source separation, better public awareness, and stronger collaboration with suppliers to ensure cleaner and higher-grade input plastics.

Table 4.10 Raw Materials Quality

Sr.	Description	Mean	Standard Deviation
1	The plastic waste we collect is often mixed with non-recyclable materials, which reduces processing efficiency.	3.86	0.37
2	Many collected plastic materials are too contaminated (e.g., food waste, dirt) for recycling.	3.98	0.55
3	A significant portion of plastic waste collected is low-grade or damaged, making it unsuitable for high-quality products.	3.85	0.69

Table Continued

4	The inconsistency in raw material quality leads to higher processing costs and material losses.	4.13	0.45
5	We lack access to reliable sources that can supply clean and properly sorted recyclable plastic.	3.84	0.55
6	Poor quality of input plastic leads to defects or low strength in the final recycled products.	3.91	0.29
Overall Value		3.93	0.50

Source: Survey data (2025)

(c) Infrastructure & Technology

Table 4.11 presents the challenges related to infrastructure and technological readiness in the input stage of raw materials for plastic recycling operations in Yangon. The most critical concern identified by respondents is the inadequacy of infrastructure for pre-sorting and cleaning raw plastic waste**,** which received the highest mean score of 3.93 (SD = 0.69). This reflects widespread agreement that the lack of essential processing facilities such as washing units, shredders, or sorting systems hinders the ability of recyclers to efficiently prepare raw plastics for reuse or further processing.

The issue of transportation-related inefficiencies also emerged as a significant challenge. The statement “Raw plastic waste is often collected in places without easy transportation access, causing delays and inefficiency” received a mean of 3.91 (SD = 0.55), highlighting how physical inaccessibility to collection points adds logistical burdens. These inefficiencies may result in delays, higher fuel or labor costs, and lost opportunities due to inconsistent input supply.

Additionally, difficulty in accessing reliable collection centers that provide sufficient quantities of raw plastic waste was also a concern, with a mean score of 3.69 (SD = 0.71). This finding points to gaps in the recycling supply chain infrastructure, where businesses are not adequately connected to consistent feedstock sources or collection hubs.

Overall, the results indicate that infrastructure and technology-related issues at the input stage are key operational constraints for recycling businesses in Yangon. The lack of well-equipped facilities, poor accessibility, and unreliable supply infrastructure

collectively reduce the efficiency, cost-effectiveness, and scalability of recycling operations. Addressing these challenges would require public and private investment in waste processing infrastructure, improved logistics coordination, and government support in building localized collection and sorting hubs.

Table 4.11 Infrastructure & Technology (Raw Materials Input)

Sr.	Description	Mean	Standard Deviation
1	We face difficulties accessing collection centers that can provide sufficient raw plastic waste.	3.69	0.71
2	The infrastructure for pre-sorting and cleaning raw plastic is inadequate.	3.93	0.69
3	Raw plastic waste is often collected in places without easy transportation access, causing delays and inefficiency.	3.91	0.55
Overall Value		3.84	0.65

Source: Survey data (2025)

Table 4.12 highlights the significant challenges faced by plastic recycling factories in Yangon related to infrastructure and technology concerning other essential input sources such as electricity, fuel, and water. Respondents strongly agreed that unstable supply of these inputs disrupts recycling operations, as reflected by a high mean score of 4.02 (SD = 0.49). This indicates that irregular availability of utilities critically affects day-to-day production activities.

Power reliability was identified as a major concern, with frequent power outages causing increased production downtime and reduced operational efficiency scoring a mean of 4.06 (SD = 0.44). This finding underscores the vulnerability of recycling operations to electricity supply interruptions, which can halt machinery and delay processing schedules.

Fuel-related challenges also emerged, as high fuel costs for transporting plastic waste and finished products**,** primarily due to poor infrastructure, were reported with a mean of 3.87 (SD = 0.42). This reflects the additional financial burden recycling businesses face in logistics, which can limit expansion and competitiveness.

Moreover, limited access to essential utilities such as electricity and water was another critical issue, with a mean score of 4.03 (SD = 0.43). The inability to

consistently operate machinery at full capacity due to inadequate utilities constrains productivity and may reduce the quality of recycled products.

Overall, these findings emphasize that infrastructure deficits and unstable supply of basic utilities constitute major operational challenges for plastic recycling factories in Yangon. Addressing these issues through improvements in public infrastructure and reliable utility services is essential to enhance efficiency and sustainability within the sector.

Table 4.12 Infrastructure & Technology (Other Input Sources)

Sr.	Description	Mean	Standard Deviation
1	Unstable Other Input Sources (Electricity, Fuel, Water, etc.) supply disrupts recycling operations.	4.02	0.49
2	Frequent power outages increase production downtime and reduce efficiency.	4.06	0.44
3	Fuel costs for transporting plastic waste and products are too high due to poor infrastructure.	3.87	0.42
4	Limited access to essential utilities (e.g., electricity, water) prevents us from operating machinery at full capacity.	4.03	0.43
Overall Value		3.99	0.45

Source: Survey data (2025)

Table 4.13 presents respondents' perceptions of technological barriers affecting plastic recycling operations in Yangon. The findings indicate that multiple challenges exist across technological capacity, human resource capability, and accessibility to technical support.

The most significant challenge reported was the lack of access to spare parts or technical support for recycling machines**,** with the highest mean score of 4.10 (SD = 0.55). This finding underscores a critical constraint in the maintenance and sustainability of operations, especially when equipment malfunctions or requires upgrades.

Another pressing issue is that high-tech recycling equipment remains unaffordable for small and medium enterprises (SMEs), reflected by a high mean of

4.05 (SD = 0.44). This indicates that cost barriers continue to limit technological modernization and innovation within the sector. In a similar vein, respondents also expressed concern that their current technology cannot process all types of plastic**,** scoring 3.96 (SD = 0.46). This limits the operational flexibility of businesses and prevents them from diversifying their raw material intake.

Furthermore, the study revealed that there is little or no local innovation or research support to advance recycling technology (M = 3.95, SD = 0.53), highlighting a systemic gap in collaboration between industry and academic or technical institutions. This lack of innovation ecosystem impedes progress in adapting technologies to local contexts.

Respondents also noted that technological limitations prevent them from producing high-grade or export-quality recycled materials, with a mean score of 3.80 (SD = 0.44), and staff are inadequately trained to operate or maintain modern recycling technologies (M = 3.71, SD = 0.66). These two factors indicate not only equipment-based limitations but also human resource development challenges that hinder overall efficiency and competitiveness.

In summary, the data clearly shows that technological issues- both in terms of equipment and expertise are major obstacles to the growth and advancement of Yangon's plastic recycling industry. Overcoming these challenges would require strategic investments, technical partnerships, and capacity-building initiatives to enhance both infrastructure and workforce competency.

Table 4.13 Infrastructure & Technology (Technological Issues)

Sr.	Description	Mean	Standard Deviation
1	Technological limitations prevent us from producing high-grade or export-quality recycled materials.	3.80	0.44
2	Staff are not adequately trained to operate or maintain modern recycling technology.	3.71	0.66
3	Spare parts or technical support for machines are hard to obtain in Yangon.	4.10	0.55
4	Our technology cannot process all types of plastic, limiting the scope of our operations.	3.96	0.46

Table Continued

5	High-tech recycling equipment is too expensive for small or medium enterprises to invest in.	4.05	0.44
6	There is little or no local innovation or research support to help improve recycling technology.	3.95	0.53
Overall Value		3.93	0.51

Source: Survey data (2025)

(d) Economic & Market Factors

Table 4.14 outlines key economic and market-related challenges faced by plastic recycling factories in Yangon. Among the three items assessed, the most significant concern is competition from cheap virgin (new) plastic materials, which received the highest mean score of 3.92 (SD = 0.52). This indicates that recycled plastic producers struggle to remain price-competitive due to the availability and affordability of newly manufactured plastics. The market preference for virgin plastics, often driven by consistency in quality and lower bulk prices, limits the competitiveness of recycled alternatives.

Another major concern is difficulty in accessing finance or loans for business expansion or technological upgrades, with a mean score of 3.82 (SD = 0.55). This reflects systemic financial constraints that hinder investment in equipment modernization, capacity enhancement, or product diversification. Limited access to credit and financing opportunities may also prevent small and medium recycling enterprises from achieving economies of scale or improving operational efficiency.

Additionally, price volatility of recycled plastic materials was rated with a mean of 3.75 (SD = 0.51), indicating that unstable pricing in the recycled materials market contributes to financial uncertainty. Fluctuations in input costs and market value make it challenging for businesses to plan long-term investments or maintain stable profit margins.

In summary, the data clearly highlights that economic pressures particularly market competition, financing barriers, and price instability are critical obstacles for recycling businesses in Yangon. These challenges undermine the financial sustainability of recycling operations and reduce the sector's attractiveness to investors.

Addressing them may require a mix of regulatory protection, targeted subsidies, and access to green financing options to support the growth of the recycling industry.

Table 4.14 Economic & Market Factors

Sr.	Description	Mean	Standard Deviation
1	Competition from cheap virgin (new) plastics makes it hard to compete on price.	3.92	0.52
2	Price volatility of recycled plastic materials creates financial uncertainty.	3.75	0.51
3	Difficulty in accessing finance/loans for business expansion or upgrades.	3.82	0.55
Overall Value		3.83	0.53

Source: Survey data (2025)

Table 4.15 provides insights into the cost structure challenges faced by plastic recycling factories in Yangon. The data reveal that inefficiencies in the supply chain, especially at the pre-processing stage**,** are driving up operational costs significantly. The highest-rated issue, with a mean score of 4.01 (SD = 0.38), is the increased cost associated with cleaning and preparing plastic waste due to poor sorting at the source**.** This implies that materials arrive in a contaminated or mixed state, requiring extensive labor and processing to become recyclable, thereby raising the cost burden on factories.

Closely related is the high labor cost associated with manual sorting and cleaning**,** which scored 3.97 (SD = 0.18). The relatively low standard deviation suggests a strong consensus among respondents that labor-intensive processes are a consistent and costly challenge across the industry. Similarly, the high cost of collecting and transporting plastic waste was another key concern (M = 3.88, SD = 0.34), indicating that logistics inefficiencies- likely due to limited infrastructure and scattered waste sources - are affecting profitability.

Moreover, respondents highlighted that a large portion of received raw materials is unusable, contributing to elevated procurement costs (M = 3.67, SD = 0.72). This suggests poor quality control at the input stage, leading to wastage and inefficiencies in material usage. Finally, the inconsistent supply of suitable raw plastic was reported to lead to fluctuating costs and financial instability, with a mean of 3.73 (SD = 0.60). This

irregularity in supply affects production planning and cost predictability, further straining financial management in recycling operations.

In conclusion, the findings from Table 4.15 underscore that cost inefficiencies stem largely from upstream issues such as poor sorting, irregular supply, and infrastructure limitations. Without systemic improvements in raw material quality and supply logistics, plastic recycling businesses in Yangon will continue to struggle with high operational costs and limited profitability.

Table 4.15 Cost Structure

Sr.	Description	Mean	Standard Deviation
1	Due to poor sorting at the source, we spend more money on cleaning and preparing plastic waste for recycling.	4.01	0.38
2	A large portion of raw materials we receive is unusable, increasing our material procurement costs.	3.67	0.72
3	The inconsistent supply of suitable raw plastic leads to fluctuating costs and financial instability.	3.73	0.60
4	The cost of collecting and transporting plastic waste is too high for our business to operate efficiently.	3.88	0.34
5	Labor costs are high due to the need for manual sorting and cleaning processes.	3.97	0.18
Overall Value		3.85	0.48

Source: Survey data (2025)

(e) Policy & Regulatory Barriers

Table 4.16 illustrates the regulatory and policy-related barriers encountered by plastic recycling businesses in Yangon. The most significant challenge identified is that obtaining a business license for plastic recycling is a complex and time-consuming process, which recorded the highest mean score of 4.10 (SD = 0.33). This finding reflects widespread industry frustration with bureaucratic inefficiencies and regulatory

opacity, which delay business registration and hinder new entrants into the recycling sector.

Another critical barrier involves limited flexibility for foreign currency transfers, which scored a mean of 3.94 (SD = 0.46). Given the import-dependence of many recycling operations (particularly for machinery and raw materials), this restriction poses a substantial operational challenge. Similarly, weak implementation of Extended Producer Responsibility (EPR) schemes was noted with a high mean of 3.91 (SD = 0.50), indicating a lack of effective mechanisms holding producers accountable for plastic waste management. The absence of robust EPR frameworks limits upstream incentives for recycling and reduces the volume and quality of feedstock reaching recycling firms.

Furthermore, respondents reported difficulties in import licensing for machinery and plastic raw materials (M = 3.82, SD = 0.57), and strict restrictions on importing certain types of plastic feedstock, such as post-consumer waste (M = 3.88, SD = 0.50). These regulatory barriers affect the availability of essential inputs and undermine the sector's ability to scale or adopt new technology. Adding to the complexity, the lack of clear procedures and guidance for plastic recycling business registration (M = 3.86, SD = 0.46) leads to confusion and discourages formalization of informal players in the sector.

Lastly, frequent changes in government regulations without proper consultation (M = 3.76, SD = 0.60) create an unstable policy environment. Businesses often face uncertainty when navigating licensing, import/ export, or operational compliance requirements, making long-term investment and planning more difficult.

In summary, the data from Table 4.16 point to significant policy and regulatory obstacles that limit growth and innovation in Yangon's plastic recycling industry. Without streamlined procedures, predictable policy frameworks, and supportive import-export regulations, the sector's potential to contribute to environmental sustainability and circular economy goals will remain constrained.

Table 4.16 Policy & Regulatory Barriers

Sr.	Description	Mean	Standard Deviation
1	Obtaining a business license for plastic recycling is a complex and time-consuming process.	4.10	0.33
2	We face delays or difficulties when applying for import licenses for plastic raw materials or machinery.	3.82	0.57
3	The lack of clear procedures and guidance for plastic recycling business registration causes confusion.	3.8	0.46
4	There are strict restrictions on importing certain types of plastic feedstock (e.g., post-consumer plastic waste) even when needed for recycling.	3.88	0.50
5	Government regulations often change without proper notice or consultation with businesses in the industry.	3.76	0.60
6	There is limited flexibility for foreign currency transfers, which creates challenges when importing raw materials or machinery.	3.94	0.46
7	There are weakness of effective Extended Producer Responsibility (EPR) schemes	3.91	0.50
Overall Value		3.90	0.49

Source: Survey data (2025)

(f) Public Awareness and Participation

Table 4.17 presents findings related to public awareness and participation in plastic waste management within Yangon. The data reveals a significant deficit in public involvement and knowledge regarding recycling practices. The highest-rated issue, with a mean score of 4.10 (SD = 0.33), indicates that most people in Yangon do not separate plastic waste from other types of waste before disposal**.** This reflects a fundamental gap in everyday waste-sorting behavior, which is a critical barrier to efficient recycling.

Additionally, there is a lack of public understanding about the importance of recycling plastic**,** as shown by a mean score of 4.05 (SD = 0.39). Such insufficient awareness undermines efforts by recycling industries and the government to build an effective waste management system. Closely related to this is the problem that many people are unaware of how and where to dispose of recyclable plastic properly**,** which received a similarly high mean of 4.08 (SD = 0.29). These findings point to a need for clearer public communication and the establishment of accessible disposal facilities.

The data also suggests that public motivation to sell or donate recyclable plastic remains low (M = 3.92, SD = 0.34), implying that existing incentive mechanisms are either weak or nonexistent. Without active public participation in material recovery, recycling facilities will continue to suffer from inconsistent feedstock supply. Moreover, the lack of emphasis on recycling education in schools or youth programs (M = 4.06, SD = 0.66) represents a missed opportunity to instill sustainable waste practices from a young age.

Overall, the results strongly highlight that limited public awareness, inadequate education, and low motivation to participate in plastic recycling are key social barriers**.** Addressing these issues through targeted public campaigns, integration of recycling into the education system, and community-level incentives is essential for fostering a culture of sustainability and ensuring the long-term success of the recycling industry in Yangon.

Table 4.17 Public Awareness and Participation

Sr.	Description	Mean	Standard Deviation
1	Most people in Yangon do not separate plastic waste from other waste before disposal.	4.10	0.33
2	There is a lack of public understanding about the importance of recycling plastic.	4.05	0.39
3	People are unaware of how and where to dispose of recyclable plastic properly.	4.08	0.29
4	There is low motivation among the public to sell or donate recyclable plastic.	3.92	0.34

5	School or youth programs do not emphasize the importance of recycling and plastic waste reduction.	4.06	0.66
Overall Value		4.00	0.40

Source: Survey data (2025)

(g) Logistics & Other

Table 4.18 highlights key logistical and infrastructure-related challenges facing plastic recycling operations in Yangon. The results show that logistical inefficiencies and lack of infrastructure pose significant operational constraints for recycling businesses. The most critical issue identified is the inadequate number of collection or sorting centers in the city, with the highest mean score of 3.96 (SD = 0.43). This shortage directly affects the ability of businesses to source and process recyclable plastic materials effectively and at scale.

Additionally, limited space for recycling operations and storage presents another significant bottleneck (M = 3.74, SD = 0.74). In urban environments like Yangon, space constraints can limit the capacity for on-site sorting, storage, and processing of plastic waste, thereby reducing operational efficiency and scalability. This issue may be particularly problematic for small and medium-sized enterprises (SMEs) that lack the financial resources to expand or relocate.

Moreover, the data shows that transportation and logistics systems are inefficient (M = 3.57, SD = 0.81) for both the collection of plastic feedstock and the distribution of recycled products. Inefficiencies in this area can lead to increased operational costs, delays in processing, and missed market opportunities. Poor road conditions, traffic congestion, and lack of dedicated collection routes may contribute to these logistical challenges.

Overall, the findings underline the need for investment in recycling infrastructure, better logistics planning, and the establishment of more collection/sorting hubs across Yangon. Addressing these logistical and spatial constraints is essential to enabling a more resilient and scalable plastic recycling ecosystem in the region.

Table 4.18 Logistics & Other

Logistics & Other		Mean	Standard Deviation
1	There are inefficient transportation and logistics for collecting feedstock and distributing products.	3.57	0.81
2	There are limited space for recycling operations and storage in Yangon.	3.74	0.74
3	There are not enough collection or sorting centers in Yangon.	3.96	0.43
Overall Value		3.76	0.66

Source: Survey data (2025)

4.3.5 Overall Mean Values

Table 4.18 summarizes the overall mean values of various factors that influence both the opportunities and challenges faced by plastic recycling factories in Yangon. The data is categorized into two primary domains: factors affecting opportunities and those contributing to challenges.

Among the opportunity-enhancing factors**,** Environmental Impact Reduction has the highest overall mean score of 4.02, indicating that plastic recycling operations are widely perceived to play a significant role in environmental preservation, such as reducing landfill waste and improving public cleanliness. This is closely followed by Employment Opportunities (M = 3.88), suggesting that the sector offers substantial job creation potential, particularly for low-income groups. Technological Advancements and Innovation also show a relatively high mean (M = 3.50), reflecting optimism about the accessibility and utility of new recycling technologies. However, Government Support & Policy (M = 3.24) and Supply Chain & Collection (M = 3.10) scored the lowest among the opportunity factors, indicating gaps in policy facilitation and infrastructure that may hinder industry growth.

On the other hand, challenges to plastic recycling operations in Yangon are perceived as more prominent. Public Awareness and Participation received the highest mean among all challenge factors (M = 4.00), highlighting low levels of public engagement in plastic segregation and recycling practices. Other high-scoring challenge areas include Waste Feedstock Issues (M = 3.94), Raw Materials Quality (M

= 3.93), and Technological Issues (M = 3.93), suggesting that operational difficulties such as contamination, inconsistent quality, and technical limitations significantly affect recycling efficiency. Additionally, Other Input Sources such as electricity, water, and fuel also present substantial barriers (M = 3.99), indicating infrastructural instability. Policy & Regulatory Barriers (M = 3.90) further exacerbate operational challenges due to complex licensing procedures and unclear government guidance.

Table 4.19 Overall Mean Values

Variables		Overall Mean
Factors that Affect opportunities for plastic recycling factories		
1	Market Demand & Value	3.46
2	Technological Advancements & Innovation in Recycling Techniques	3.50
3	Government Support & Policy	3.24
4	Supply Chain & Collection	3.10
5	Employment opportunities	3.88
6	Environmental Impact Reduction due to recycling activities	4.02
Overall Value		3.53
Factors that Affect challenges for plastic recycling factories		
1	Waste Feedstock Issues	3.94
2	Raw Materials Quality	3.93
3	Raw Input Sources	3.84
4	Other Input Sources (Electricity, Fuel, Water, etc.)	3.99
5	Technological Issues	3.93
6	Economic & Market Factors	3.83
7	Cost Structure	3.85
8	Policy & Regulatory Barriers	3.90
9	Public Awareness and Participation	4.00
10	Logistics & Other	3.76
Overall Value		3.90

Source: Survey data (2025)

(a) Most Significant Factor (Highest Overall Mean Value)

The most significant factor, with an overall mean value of 4.02, is "Environmental Impact Reduction due to recycling activities." This finding suggests that stakeholders and respondents strongly agree that reducing environmental impact is a major opportunity and a key driver for plastic recycling businesses. The high mean value indicates that this factor is perceived as a primary motivation and a significant positive outcome of recycling efforts.

(b) Most Insignificant Factor (Lowest Overall Mean Value)

The least significant factor, with an overall mean value of 3.10, is "Supply Chain & Collection." This low mean value, when considered as an "opportunity," suggests that the current state of the supply chain and collection system is not perceived as a strong or readily available opportunity for business growth. This could indicate significant challenges or a general lack of a well-developed, efficient collection infrastructure that would make recycling operations easier and more profitable**.**

(c) Overall Mean Comparison

A comparison of the overall mean values for opportunities and challenges reveals a critical insight into the plastic recycling sector in Yangon. The overall mean for factors affecting opportunities for plastic recycling factories is 3.53, indicating a moderate level of perceived opportunity among respondents. However, the overall mean for factors affecting challenges is notably higher at 3.90. This significant difference suggests that, while stakeholders acknowledge existing opportunities particularly in areas like employment and environmental impact reduction. They perceive the challenges to be more pronounced and impactful. The data therefore imply that the growth of the plastic recycling industry is more significantly hindered by its challenges than it is propelled by its opportunities. To foster sustainable development, efforts should prioritize overcoming these formidable challenges, such as feedstock issues and regulatory barriers, to fully capitalize on the existing market potential and positive social impacts.

CHAPTER V
CONCLUSION

5.1 Findings

The study examined the current landscape, opportunities, and challenges within the plastic recycling sector in Yangon. Survey responses from 200 factories provided quantitative and qualitative insights into performance metrics, institutional frameworks, market dynamics, and operational barriers. The findings highlight both positive developments and systemic limitations affecting the sector.

5.1.1 Performance of Plastic Recycling Factories

The performance of recycling factories in Yangon is generally positive. Respondents agree that the plastic recycling business is moderately profitable (M = 3.7), experiencing annual growth (M = 3.6), and showing increased production volumes (M = 3.7). The highest rated factor was compliance with environmental standards (M = 3.9), indicating a strong alignment with sustainable practices. However, performance in terms of business expansion and stable cash flow received lower scores (M = 3.5), pointing to variability in financial and operational consistency.

5.1.2 Opportunities in the Recycling Sector

The findings highlight significant opportunities in environmental and social contributions while underscoring substantial challenges in policy, technology, and the supply chain. From an Environmental and Social Value perspective, the study identifies Environmental Impact Reduction as the most significant opportunity (M = 4.02), indicating a strong recognition of the sector's positive role in waste management and sustainability. Concurrently, the creation of Employment Opportunities (M = 3.88) demonstrates the sector's vital contribution to job creation, particularly for low-income communities.

The analysis of Market and Technological Prospects reveals a moderate level of optimism. Market Demand and Value (M = 3.46) and Technological Advancements (M = 3.50) are viewed as moderate opportunities. Although there is growing consumer

interest, the export market for recycled products remains nascent. While technological efficiency is a recognized enabler (M = 4.07), barriers such as the high cost of high-end equipment and a lack of local innovation hinder broader adoption.

Finally, the assessment of Policy and Supply Chain Limitations points to critical areas needing improvement. Government Support and Policy (M = 3.24) received a modest rating, suggesting that while awareness campaigns are appreciated, concrete measures such as financial incentives and policy clarity are lacking. The most significant limitation was found to be the Supply Chain and Collection systems (M = 3.10), indicating that an underdeveloped infrastructure for raw material collection is a major constraint on the sector's scalability and operational efficiency.

5.1.3 Challenges Faced by Recycling Businesses

The findings reveal that challenges are pervasive across the operational spectrum, yet a statistical analysis highlights the greater influence of opportunities on overall business performance.

Challenges for plastic recycling businesses are widespread across all operational levels, but a statistical analysis shows that opportunities have a greater impact on business performance than challenges. The primary challenges are related to raw material quality (M = 3.94), raw input sources (M = 3.93), and infrastructure (M = 3.84). These difficulties arise from poor waste segregation, contamination, and logistical inefficiencies. Furthermore, the unstable supply of essential utilities like electricity and fuel also affects operational stability (M = 3.99). Technological limitations (M = 3.93) are another major concern, caused by the high cost of advanced equipment, a lack of spare parts, and low-skilled labor. These factors restrict businesses from processing diverse plastic types and producing high-quality products, which in turn limits their competitiveness. Financial barriers, such as difficulty accessing loans and vulnerability to price volatility (M = 3.83–3.85), also impede business growth. Policy and regulatory barriers (M = 3.90) are evident in delays in obtaining licenses and a lack of clear procedural guidance. The highest mean value among all challenges (M = 4.00) is found in the area of public awareness and participation, which highlights critical weaknesses in household-level waste sorting and recycling education.

5.2 Suggestions

This study underscores that while Yangon's plastic recycling industry holds substantial potential, particularly in environmental and employment domains, its growth is hindered by systemic limitations. The imbalance between policy direction and practical implementation, alongside infrastructure and feedstock constraints, suggests the need for a more integrated approach involving government, private sector, and civil society.

Key enablers for future performance include improving public awareness, enhancing technical capacity, stabilizing input supply chains, and institutionalizing financial and policy support mechanisms. Furthermore, increased investment in innovation especially in advanced sorting and chemical recycling could position the sector for both domestic and international market competitiveness.

Based on the data, the responses reveal a strong consensus among stakeholders regarding the key challenges and opportunities within Yangon's plastic recycling industry. One of the most frequently cited priorities was the need to improve and strengthen the waste collection and sorting system. This reflects a recognition that the foundational infrastructure for plastic recycling remains insufficient and requires urgent investment. Respondents also emphasized the importance of expanding both domestic and international market access for recycled products, as well as enhancing government policy support particularly through tax incentives, land allocation, and streamlined regulations. Other important suggestions include raising public awareness and attracting foreign technology and investment to bolster the industry's capabilities.

In terms of actions needed to maximize the environmental benefits of recycling, two major strategies were overwhelmingly supported: promoting the use of environmentally friendly recycling technologies and launching public campaigns to reduce the consumption of single-use plastics. These responses point to a desire to transition the sector toward more sustainable practices, while also changing consumer behavior at the societal level.

When asked about their outlook for the next five years, the majority of respondents indicated a "moderately optimistic" view of the future of plastic recycling in Yangon, followed by a significant number of neutral responses. Only a small percentage expressed pessimism, suggesting cautious hope in the industry's direction though further confidence-building measures are needed.

Regarding the single most important action needed to sustain long-term growth, the top response was the development of a strong market for recycled products. This was closely followed by calls for stronger government policy enforcement and increased investment in technology and infrastructure. These responses highlight that private sector growth will be driven by reliable policies, targeted investments, and stable demand for recycled materials.

Based on the insights gained, several key recommendations are proposed to ensure the sustainable development of the plastic recycling sector. First, it is imperative to establish a more effective policy and regulatory framework with stricter enforcement. The government should provide incentives such as tax breaks, improved access to land, and capital subsidies to build trust and encourage long-term investment. This should be complemented by targeted financial support for technology and infrastructure, with a focus on upgrading recycling technologies and expanding operational capacity. Mechanisms such as low-interest loans and public financing for small and medium-sized enterprises (SMEs) would be particularly effective. Furthermore, developing a strong local market for recycled products is essential, which can be achieved by implementing mandatory recycled content requirements in manufacturing and construction, as well as by reducing trade and export barriers for these materials. Second, public awareness and engagement must be prioritized. National and community-level campaigns are needed to promote source separation of waste and reduce single-use plastic consumption, as grassroots behavior change is critical for long-term success. Finally, international collaboration is vital for attracting foreign technology and investment. Strategic public-private partnerships (PPPs) and cooperation with international development agencies can provide the necessary expertise and funding to accelerate sectorial growth and enhance overall efficiency.

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APPENDIX

QUESTIONNAIRES

PART (A): Respondent and Factory Demographics Questionnaire

Please provide some general information about yourself and your business/ organization.

No.	Respondent and Factory Demographics Questionnaire
1.	Gender • Male • Female • Other
2.	Age • 18 to 28 • 29 to 38 • 39 to 48 • 49 to 58 • 59 to 68 • Other
3.	Education Level • graduated • post graduated • master • doctoral
4	Years of experience in the plastic sector • 1 to 10 • 11 to 20 • 21 to 30 • 31 to 40 • 41 to 50
5	Your Role/Position in the Business/Organization • Owner • Director

	• Manager • Supervisor
6	Name of Business/Organization (Optional):
7	Factory Location (name of industry zone/ Township) (optional):
8	Number of Years Your Business/Organization has been Operating in Plastic Recycling: • 1 to 10 • 11 to 20 • 21 to 30 • Above 30
9	Number of Employees: • 20 to 40 • 41 to 60 • 61 to 70 • 71 to 90 • Above 90
10	Type of Plastic Processed: • PET • HDPE • LDPE • PP • PS • PVC • Others
11	Describe the type of your recycling products. • Semi-products: Resin/ pellets/ tube, etc., • Finished goods: bags/ bottles/ packaging materials, etc.
12	What type of plastic recycling process is used in your factory? • Mechanical • Chemical • Shredding

	• Pelletizing
13.	What is the average monthly input (tons) of plastic waste? • 200 to 400 • 400 to 600 • 600 to 800 • 800 to 1000 • Above 1000
14.	What is the average monthly output (tons) of recycled material? • 200 to 400 • 400 to 600 • 600 to 800 • 800 to 1000 Above 1000
15.	Where do you source your raw plastic waste? • Local • Foreign • Local and Foreign
16	Do you sell your products only within local, or do you also export them abroad? • Local • Foreign • Local and Foreign
17.	Have you received support or funding from NGOs? • Yes • No
18.	Are you planning to expand your operations in the next 2 years? • Yes • No

PART (B)

Factors that Affect opportunities for plastic recycling factories

What is your level of agreement or the extent to which you perceive the following as opportunities for your plastic recycling business in Yangon? Please provide your opinion on a scale ranging from (1) strongly disagree to (5) strongly agree. Please √ the column to enter your answer.

1. Market Demand & Value		1	2	3	4	5
1	There is a strong and growing local market demand for recycled plastic resin/ pellets/ granules and recycled plastics.					
2	There is a growing export market demand for recycled plastic products.					
3	The price of recycled plastic materials offers good profitability.					
4	There is increasing demand for higher quality recycled plastics.					
5	Consumers are showing more interest in eco-friendly/recycled products.					
6	The value chain for recycled plastic (collection, processing, selling) is economically viable.					

2. Technological Advancements & Innovation in Recycling Techniques		1	2	3	4	5
1	Access to affordable and appropriate recycling technology is improving.					
2	Opportunities exist to adopt innovative recycling processes (e.g., chemical recycling).					
3	Technical support and knowledge for new recycling technologies are becoming more available.					
4	New technologies have improved the efficiency of recycling.					
5	Modern sorting technologies have improved the quality of recycled plastic.					

6	Up-to-date machinery helps reduce waste and increase yield.					

3. Government Support & Policy		1	2	3	4	5
1	Government policies and initiatives are supportive of the plastic recycling industry.					
2	Financial incentives (e.g., subsidies, tax breaks), information on permits and legal requirements from the government are accessible.					
3	Our business has received tax exemptions or financial incentives from the government for engaging in plastic recycling.					
4	The process of applying for recycling permits/licenses is clear and accessible.					
5	We have received training, technical workshops, or seminars facilitated by government departments related to recycling.					
6	Public awareness campaigns by authorities are improving waste segregation practices.					
7	Environmental regulations encourage recycling practices.					

4. Supply Chain & Collection		1	2	3	4	5
1	The availability of recyclable plastic feedstock is consistent and sufficient.					
2	Collaboration with informal waste collectors provides a reliable source of materials.					
3	Investment in better waste collection and sorting infrastructure is increasing.					

5. Employment opportunities		1	2	3	4	5
1	The industry creates jobs for low-income groups.					
2	Recycling offers long-term employment stability.					

3	Access to skilled labor for recycling operations is improving.					

6. Environmental Impact Reduction due to recycling activities		1	2	3	4	5
1	Our recycling operations help reduce the amount of plastic waste sent to landfills in Yangon.					
2	Since starting our recycling activities, we have observed less plastic pollution in our community.					
4	Recycling contributes to reducing the frequency of clogged drains or flooding caused by plastic waste.					
5	Growing consumer awareness of environmental issues is driving demand for recycled products.					
6	Our business follows a waste management plan that integrates Reduce, Reuse, and Recycle (3Rs) principles.					
7	We actively promote waste reduction at the source in collaboration with plastic suppliers and customers.					

PART (C)

Factors that Affect challenges for plastic recycling factories

What is your level of agreement or the extent to which you perceive the following as challenges for your plastic recycling business in Yangon? Please provide your opinion on a scale ranging from (1) strongly disagree to (5) strongly agree. Please √ the column to enter your answer.

1. Waste Feedstock Issues		1	2	3	4	5
1	Poor waste segregation at source (households, businesses) significantly impacts operations.					
2	High levels of contamination in collected plastic waste are a major problem.					
3	Inconsistent or insufficient supply of recyclable plastic feedstock is a challenge.					

2. Raw Materials Quality		1	2	3	4	5
1	The plastic waste we collect is often mixed with non-recyclable materials, which reduces processing efficiency.					
2	Many collected plastic materials are too contaminated (e.g., food waste, dirt) for recycling.					
4	A significant portion of plastic waste collected is low-grade or damaged, making it unsuitable for high-quality products.					
5	The inconsistency in raw material quality leads to higher processing costs and material losses.					
6	We lack access to reliable sources that can supply clean and properly sorted recyclable plastic.					
8	Poor quality of input plastic leads to defects or low strength in the final recycled products.					

3. Infrastructure & Technology		1	2	3	4	5
3.1 Raw Input Sources						
1	We face difficulties accessing collection centers that can provide sufficient raw plastic waste.					
3	The infrastructure for pre-sorting and cleaning raw plastic is inadequate.					
4	Raw plastic waste is often collected in places without easy transportation access, causing delays and inefficiency.					
3.2 Other Input Sources (Electricity, Fuel, Water, etc.)		1	2	3	4	5
1	Unstable Other Input Sources (Electricity, Fuel, Water, etc.) supply disrupts recycling operations.					
2	Frequent power outages increase production downtime and reduce efficiency.					
3	Fuel costs for transporting plastic waste and products are too high due to poor infrastructure.					
4	Limited access to essential utilities (e.g., electricity, water) prevents us from operating machinery at full capacity.					

	3.3 Technological Issues	1	2	3	4	5
1	Technological limitations prevent us from producing high-grade or export-quality recycled materials.					
2	Staff are not adequately trained to operate or maintain modern recycling technology.					
3	Spare parts or technical support for machines are hard to obtain in Yangon.					
4	Our technology cannot process all types of plastic, limiting the scope of our operations.					
5	High-tech recycling equipment is too expensive for small or medium enterprises to invest in.					
6	There is little or no local innovation or research support to help improve recycling technology.					

	4. Economic & Market Factors	1	2	3	4	5
1	Competition from cheap virgin (new) plastics makes it hard to compete on price.					
2	Price volatility of recycled plastic materials creates financial uncertainty.					
3	Difficulty in accessing finance/loans for business expansion or upgrades.					
	4.1.Cost Structure					
1	Due to poor sorting at the source, we spend more money on cleaning and preparing plastic waste for recycling.					
2	A large portion of raw materials we receive is unusable, increasing our material procurement costs.					
3	The inconsistent supply of suitable raw plastic leads to fluctuating costs and financial instability.					
4	The cost of collecting and transporting plastic waste is too high for our business to operate efficiently.					

5	Labor costs are high due to the need for manual sorting and cleaning processes.					

5. Policy & Regulatory Barriers		1	2	3	4	5
1	Obtaining a business license for plastic recycling is a complex and time-consuming process.					
2	We face delays or difficulties when applying for import licenses for plastic raw materials or machinery.					
3	The lack of clear procedures and guidance for plastic recycling business registration causes confusion.					
4	There are strict restrictions on importing certain types of plastic feedstock (e.g., post-consumer plastic waste) even when needed for recycling.					
5	Government regulations often change without proper notice or consultation with businesses in the industry.					
6	There is limited flexibility for foreign currency transfers, which creates challenges when importing raw materials or machinery.					
7	There are weakness of effective Extended Producer Responsibility (EPR) schemes					

6. Public Awareness and Participation		1	2	3	4	5
1	Most people in Yangon do not separate plastic waste from other waste before disposal.					
2	There is a lack of public understanding about the importance of recycling plastic.					
3	People are unaware of how and where to dispose of recyclable plastic properly.					
4	There is low motivation among the public to sell or donate recyclable plastic.					

5	School or youth programs do not emphasize the importance of recycling and plastic waste reduction.					

7. Logistics & Other		1	2	3	4	5
1	There are inefficient transportation and logistics for collecting feedstock and distributing products.					
2	There are limited space for recycling operations and storage in Yangon.					
3	There are not enough collection or sorting centers in Yangon.					

PART (D)

Factors that Affect performance and outcomes for plastic recycling factories

What is your level of agreement or the extent to which you perceive the following as performance and outcomes for your plastic recycling business? Please provide your opinion on a scale ranging from (1) strongly disagree to (5) strongly agree. Please √ the column to enter your answer.

performance and outcomes for plastic recycling factories		1	2	3	4	5
1	The plastic recycling business is currently profitable.					
2	The Annual growth rate of your business has increased.					
3	The volume of recycled plastic products has increased over the past year.					
4	The business has expanded its operations in the past 12 months.					
5	The business has been able to maintain stable cash flow.					

Part (E): Future Outlook and Suggestions (Multiple Choice Questions)

Please √ the column to enter your answer.

1.	In your opinion, what is the most critical action that should be taken to enhance the market value and demand for recycled plastic products in Yangon?	
		(a) Establishing quality standards and certification for recycled products.
		(b) Raising public awareness about the environmental benefits of recycled plastic products.

		(c) Providing government incentives (e.g., tax breaks) for businesses that purchase and use recycled plastics.
		(d) Implementing regulations that encourage the use of domestically produced recycled plastic raw materials.
2.	What kind of support or initiatives do you believe are needed from the government or private sector to improve access to advanced recycling technologies (e.g., sorting, cleaning, shredding, pelletizing)?	
		(a) Providing low-interest loans or financial grants for technology procurement and installation.
		(b) Conducting technical skills training and workshops.
		(c) Encouraging technology transfer and investment from foreign countries.
		(d) Providing funding for research and development in recycling technology.
3.	Please describe one specific government policy or form of support that would significantly benefit your business. (This question is primarily open-ended, but options like the following can be considered)	
		(a) Policy for regular electricity supply and affordable tariff rates.
		(b) Facilitating land allocation for recycling plants.
		(c) Establishing a Government Procurement Policy for recycled products. (d) Strict enforcement of plastic waste management regulations.
4.	What are the main challenges you face in relation to licensing, permit acquisition, or legal/regulatory compliance?	
		(a) The licensing/permit acquisition process is lengthy and complicated.
		(b) Environmental regulations and standards are too stringent.
		(c) Frequent changes in policies and regulations create uncertainty.
		(d) Inconsistent procedures by authorities in enforcing regulations.
5.	What measures or partnerships do you think could help the plastic recycling industry to generate more sustainable employment opportunities?	
		(a) Collaborating with vocational training schools to produce skilled workers.
		(b) Promoting occupational safety and health programs.

		(c) Providing financial and technical support to small and medium-sized recycling enterprises.
		(d) Creating formal employment opportunities throughout the recycling chain (collection, sorting, reprocessing).
6.	What practical solutions would you suggest to address issues related to poor-quality raw plastic materials?	
		(a) Improving source segregation of waste plastics.
		(b) Investing in cleaning and sorting technologies to enhance raw material quality.
		(c) Creating incentives for suppliers of high-quality plastic raw materials.
		(d) Providing education on sorting and collection according to plastic type standards.
7.	What improvements do you think are necessary in infrastructure (e.g., electricity, water, transport/logistics) to support efficient recycling operations?	
		(a) Ensuring a stable and affordable electricity supply.
		(b) Improving water supply and wastewater disposal systems in industrial zones.
		(c) Enhancing transportation and logistics networks for raw materials and products.
		(d) Systematically establishing waste collection and intermediate storage facilities.
8	What strategies or programs should be implemented to increase public awareness and community participation in plastic waste segregation and recycling?	
		(a) Conducting extensive educational programs through schools and community-based organizations.
		(b) Implementing reward and penalty systems for proper waste disposal and recycling.
		(c) Conducting awareness campaigns through social media and mass media.
		(d) Enhancing the effectiveness of collection programs through collaboration between municipal authorities and private businesses.

9.	How could import/export restrictions, licensing procedures, or Extended Producer Responsibility (EPR) schemes be improved to better support the recycling industry?	
		(a) Streamlining procedures for importing recyclable plastic waste.
		(b) Implementing policies that encourage the export of recycled plastic products.
		(c) Effectively implementing an EPR system where producers are responsible for collecting and recycling waste from their products.
		(d) Designating special economic zones for recycling industries and providing tax incentives.
10.	What challenges are you facing in the plastic recycling business?	
		a) Difficulty in collecting raw materials (plastic waste) (e.g., not segregated, contaminated)
		b) Scarcity of high-quality plastic waste
		c) Weakness in technology or equipment (for recycling)
		d) High capital requirement for investment
		e) Unsupportive government policies or laws
		f) Social perception (e.g., low acceptance of recycled products)
		g) Unstable market demand
		h) Difficulties in electricity supply
		i) Labor shortage / skilled labor shortage
11.	What measures do you think are necessary to overcome the above-mentioned challenges?	
		a) To improve and strengthen the waste collection and sorting system
		b) To upgrade recycling technologies and machinery
		c) To access low-interest financing or loans for investment
		d) To enhance government policy support (e.g., tax incentives, land allocation)
		e) To raise public awareness and promote behavioral change regarding plastic waste separation and disposal
		f) To expand domestic and international market access
		g) To attract foreign technology and investment

12.	What actions do you recommend to maximize the environmental benefits of recycling in Yangon?	
		(a) Encouraging the use of technologies in recycling processes that reduce environmental pollution.
		(b) Establishing separate management plans for hazardous plastic types (e.g., PVC).
		(c) Establishing Waste-to-Energy plants for non-recyclable plastic waste.
		(d) Promoting campaigns to reduce single-use plastic consumption.
13.	How optimistic are you about the future of the plastic recycling industry in Yangon over the next five years?	
		(a) Very optimistic.
		(b) Moderately optimistic.
		(c) Neutral.
		(d) Slightly pessimistic.
		(e) Very pessimistic.
14.	What do you believe is the single most important action needed to strengthen and sustain the industry's growth?	
		(a) Strong government policy support and precise enforcement of regulations.
		(b) Increased investment in technology and infrastructure.
		(c) Enhancing public awareness and participation.
		(d) Building a strong market for recycled products.

***** Thank You *****