Understanding Material Recovery Facility Policies in the Philippines: A Scoping Review

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Abstract:

This scoping review addresses a significant research gap in the comprehensive analysis of Material Recovery Facility (MRF) policies and their practical implications in the Philippines. The study aimed to identify and describe existing national and local MRF policies, explore key themes, challenges, and best practices in their implementation across various localities, and pinpoint gaps with proposed recommendations. Following the PRISMA-ScR guidelines and PCC framework, the methodology involved a systematic search of peer-reviewed and grey literature from 2001 to June 2025 across multiple databases and government websites. The review comprised 18 documents, including 6 research articles, 10 public documents, and 2 NGO reports. The principal findings indicate that Republic Act 9003 serves as the foundational national mandate for MRFs, resulting in an increase in the number of facilities from 6,957 in 2010 to 13,612 in 2018. Local ordinances further strengthen these mandates. Key themes include decentralized implementation, a "Zero Waste Philosophy," and community participation. Significant challenges identified include weak policy implementation, insufficient MRF coverage and functionality (only 30.92% of barangays had MRFs by 2018, far below the 2016 target of 77.10%), limited public awareness, and constraints related to space and budget. Best practices identified in the review include the use of centralized facilities, leveraging existing infrastructure, and integrating the informal waste sector. Major conclusions highlight ongoing gaps in stakeholder cooperation, infrastructure, financial support, data, and a need for gender-responsive policies. Recommendations include stricter enforcement, increased citizen participation, enhanced education, and innovative solutions for addressing space and funding challenges.

Keywords: Material Recovery Facility, Solid Waste Management, Republic Act

Introduction

The growing global crisis of waste management has highlighted the importance of the circular economy model, emphasizing the need for resilient and environmentally sustainable waste management systems (Cariño, 2005). In this context, Material Recovery Facilities (MRFs) play a vital role. They enable the segregation, processing, and recycling of waste materials, which reduces the amount of waste that ends up in landfills and aids in resource conservation (Castillo & Otoma, 2013). The Philippines, with its rapid economic and population growth, is facing an increase in waste generation, which contributes to environmental degradation (Coracero et al., 2021). The country's challenges include rising

solid waste, a shortage of sanitary landfills, and weak law enforcement, highlighting an urgent need for effective waste management strategies (Coracero et al., 2021).

In response to the challenge of waste management, the Philippine government enacted Republic Act 9003, also known as the Ecological Solid Waste Management Act of 2000. This legislation provides a legal framework for solid waste management in the country (Coracero et al., 2021; Serrona et al., 2014). It prioritizes waste reduction, reuse, and recycling, and mandates the establishment of Material Recovery Facilities (MRFs) at the local government level. However, despite this comprehensive legal framework, the implementation of MRF policies in the Philippines has encountered numerous challenges, leading to inconsistent performance across different localities.

The Philippines' efforts in sustainable waste management are significantly shaped by the Ecological Solid Waste Management Act of 2000, known as RA 9003. This essential legislation aims to protect public health and the environment. It highlights the importance of waste diversion, proper disposal, and segregation practices, with the vision of achieving a "trash-free Philippines" through public participation and awareness (Coracero et al., 2021). The Act requires local government units to lead initiatives in solid waste management. This includes establishing Materials Recovery Facilities (MRFs), developing waste management plans, and promoting programs for waste reduction and recycling (Domingo & Manejar, 2021). The legislation promotes a decentralized approach, placing primary responsibility for managing solid waste on local government units within their respective areas. Despite the existence of RA 9003, the effective implementation of MRF policies in the Philippines faces numerous challenges. These challenges include limited financial resources, inadequate infrastructure, lack of technical expertise, and weak enforcement mechanisms (Castillo & Otoma, 2013). Additionally, varying local contexts, political dynamics, and levels of community participation lead to inconsistent performance of MRFs across the country. The efficient operation of MRFs is vital for achieving broader waste management goals. However, their effectiveness depends on a complex interplay of regulatory frameworks, practical implementation strategies, and community engagement. Therefore, investigating the regulatory frameworks and practical implications of MRF policies in the Philippines is essential for understanding the country's progress toward sustainable waste management.

Although there is some scholarly work on solid waste management in the Philippines, a significant research gap remains regarding comprehensive analyses of Materials Recovery Facility (MRF) policies and their practical implications. While some studies, such as those by Camarillo and Bellotindos (2021), have evaluated the implementation of solid waste management practices at the local level, a more in-depth examination of the specific challenges and opportunities related to MRF implementation across various regions and municipalities is necessary. Current literature often emphasizes the technical aspects of MRFs, including facility design and operational efficiency. Still, it tends to overlook a thorough exploration of the policy and regulatory dimensions that affect their effectiveness. Additionally, there is a limited understanding of the socio-economic factors influencing the success of MRF initiatives, such as community participation, the involvement of the informal waste sector, and economic incentives. While some studies have identified the challenges faced by local government units

in executing solid waste management programs, a more nuanced understanding of the specific barriers to the effective operation of MRFs is needed. These barriers may include limited funding, inadequate infrastructure, and a lack of technical expertise (Gamao & Caelian, 2023).

Objectives

This scoping review rigorously explores the complexities of MRF policies in the Philippines. It is organized around three primary objectives:

1. To identify and describe the existing national and local government policies about Material Recovery Facilities (MRFs) in the Philippines.

2. To explore and synthesize the key themes, challenges, and best practices evident in the implementation of MRF policies across different localities in the Philippines.

3.To identify the gaps in existing MRF policies and their implementation, and propose recommendations for strengthening them in the Philippines.

Significance of the study

The study has important implications for policymakers, local government units, waste management practitioners, and communities in the Philippines. By offering a comprehensive overview of existing Materials Recovery Facility (MRF) policies, this review can help policymakers refine and strengthen the regulatory framework to address identified gaps and challenges. The findings of this review can also assist local government units in developing and implementing MRF programs that are more effective and tailored to their specific contexts and needs.

Methodology

The scoping review of Material Recovery Facility (MRF) policies in the Philippines was conducted following a predetermined research protocol to ensure systematic rigor and transparency, as outlined by Tricco et al. (2018). This protocol guided every phase of the review—from formulating the research questions to interpreting the findings—while any significant deviations from the original plan were carefully documented. To strengthen the reliability and validity of the conclusions, the review adhered to the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) guidelines (Lee & Gambiza, 2022), ensuring a structured and comprehensive reporting standard.

Using the PCC (population, concept, context) framework, this review focused on studies published in English from 2001, when the Republic Act 9003, known as the Ecological Solid Waste Management Act, was enacted, to June 2025. The review drew from both peer-reviewed and grey literature, including government reports, policy documents, and publications from NGOs. The targeted population included all stakeholders in the Philippines who were involved in or affected by the policies and implementation of Material Recovery Facilities (MRFs). This included local government units (LGUs), barangays, communities, the informal waste sector, government agencies, and non-governmental organizations. Studies that did not address human populations or were conducted outside the Philippines were explicitly excluded. The concept focused on MRF policies, which encompass their regulatory

frameworks, implementation strategies, challenges encountered, best practices observed, funding mechanisms, community engagement, and integration with the informal sector. Studies that solely addressed general waste collection, landfill operations, or purely technical engineering aspects without direct policy implications were excluded. The context was strictly limited to the Philippines, excluding global studies that lacked direct relevance to the country.

The search strategy involved a comprehensive and systematic exploration across multiple electronic databases, including Scopus, Web of Science, Google Scholar, and the Philippine E-Journals. This search was complemented by consultations with various government and organizational websites, such as those belonging to the Department of Environment and Natural Resources (DENR), the National Solid Waste Management Commission (NSWMC), the Department of the Interior and Local Government (DILG), and relevant non-governmental organizations (Moradpour et al., 2025). To ensure thoroughness, keywords and search terms were carefully selected to encompass Material Recovery Facilities (MRFs), policy aspects, and the Philippine context. Combinations of terms used included: ("Material Recovery Facility" OR "MRF" OR "solid waste management" OR "waste segregation" OR "recycling facility") AND ("policy" OR "regulation" OR "law" OR "framework" OR "ordinance" OR "implementation" OR "challenge" OR "best practice" OR "gap" OR "recommendation") AND ("Philippines" OR "Philippine" OR "LGU" OR "barangay"). The review prioritized relevant and significant studies within a specified timeframe, limiting the inclusion to publications in English. Additionally, reference list checks and citation tracking were utilized to enhance the coverage of the search.

The data extraction process was guided by the research objectives of the review and the key thematic areas identified in the literature. Initial searches helped to establish a structured approach to extraction, focusing on three main areas:

1. Specific national and local government policies related to Material Recovery Facilities (MRFs), including their key provisions, mandates, and responsible agencies.

2. Key themes, challenges, and best practices observed in the implementation of MRF policies across various localities, along with reported outcomes and influencing factors.

3. Identified gaps in existing MRF policies and their implementation, along with proposed recommendations for enhancing them.

The extracted data were carefully double-checked for accuracy and consistency, then organized into thematic clusters detailed in the results section, ensuring a thorough and coherent synthesis of the diverse sources included in the review.

Research Results

Cluster One: Existing National And Local Government Policies About Mrfs In The Philippines.

The legal framework governing Material Recovery Facilities (MRFs) in the Philippines is primarily established by national legislation and various local government ordinances. Republic Act (RA) 9003, known as the Ecological Solid Waste Management Act,

requires that each barangay or group of barangays have a dedicated space for a materials recovery facility (MRF) designed to receive, sort, and process compostable and recyclable materials (Corecero et al., 2021). This national mandate has led to an increase in MRFs, growing from 6,957 facilities servicing 7,938 barangays in 2010 to 13,612 facilities servicing the same number of barangays in 2018 (Corecero et al., 2021; DENR, 2018). This growth in MRFs has reduced littering problems nationwide (Corecero et al., 2021; DENR, 2018).

Local government units (LGUs) have enacted specific ordinances to implement and strengthen these national mandates:

Pasig City Ordinance No. 1, series of 2018, also known as the Ecological Solid Waste Management Code**,** outlines the following provisions: Chapter V, Section 10, mandates the establishment of a Material Recovery Facility (MRF) in every barangay or in clusters of barangays. This facility should be located on land owned or leased by the City or Barangay, or any suitable open space determined by the Pasig City or Barangay through its solid waste management board. Chapter VII, Section 14, requires all malls, commercial complexes, condominiums, buildings, motels, hotels, hospitals, townhouses, subdivisions, and villages to establish their own Material Recovery Facility. The Pasig City Solid Waste Management Office must accredit these facilities.

Alaminos City Ordinance No. 2016-16, known as the Zero Waste Ordinance of Alaminos City, mandates the establishment of a Material Recovery Facility (MRF) in every barangay or cluster of barangays. According to Article VII, Section 17, the MRF shall be located on barangay-owned or leased land, or any other suitable open space as determined by the barangay council (sangguniang barangay). Additional guidelines for setting up these facilities can be found in Section 18 of the ordinance. This ordinance embodies a commitment to minimizing waste that is sent to disposal facilities, emphasizing its goal of achieving a "zero waste" environment.

Quezon City Ordinance No. SP-1483, S-2005, known as the Ecological Solid Waste Management Ordinance**,** mandates that residents and business establishments separate spent fluorescent light bulbs from regular solid waste. Designated materials recovery facilities (MRFs) serve as designated drop-off points for disposing of broken bulbs from households. This regulation is outlined in both the ordinance and the Environmental Management Program of Quezon City, published in 2018.

Municipal Ordinance No. 006, Series of 2023, from Pura, Tarlac, outlines the Integrated Zoning Ordinance for the Municipality of Pura (2022-2032). This ordinance provides incentives for developments that implement a "Private Materials Recovery Facility (MRF)" on-site, as part of their waste management strategies, to qualify for zoning incentives. The MRF should include designated receptacles for various types of waste, including compostable materials, recyclables (such as plastics, metals, glass, and paper), residual waste, hazardous waste, and special waste. Additionally, the MRF should provide information regarding its capacity.

Municipal Ordinance No. 06, Series of 2020, known as The Ecological Solid Waste Management Code of 2020 for Balaoan, La Union, establishes in Section 17 that "there shall be a Material Recovery Facility (MRF) in every barangay." The Code specifies that the design of the MRF building and its layout, as well as the equipment used, must facilitate "efficient and safe materials processing, movement, and storage." Additionally, it should allow for "efficient and safe external access" while accommodating the internal flow of materials (Municipal Ordinance No. 06, 2020). The Code also assigns primary responsibility for segregating and collecting biodegradable, compostable, and reusable wastes to the barangay level, highlighting the importance of decentralization in waste management (Municipal Ordinance No. 06, 2020).

Municipal Ordinance No. 2019-19 of Palanan, Isabela**,** mandates source segregation of waste. In Section 5, it states, "Every barangay shall establish a Material Recovery Facility (MRF) designed to efficiently receive, sort, process, and store compostable and recyclable materials in an environmentally sound manner" (Municipal Ordinance No. 2019-19, 2019).

Cluster Two: Key Themes, Challenges, And Best Practices In Mrf Policy Implementation Implementing MRF policies in various Philippine localities reveals recurring themes, significant challenges, and emerging best practices. Decentralized Implementation and Barangay-Level Focus: The mandate for Material Recovery Facilities (MRFs) at the barangay or cluster level, as well as for large private establishments, indicates a strategy aimed at localized waste processing and resource recovery (Pasig City Ordinance No. 1, 2018). MRFs are designed to promote waste management at the local (barangay) level (Trinidad & Vedra, 2025). The Code of Balaoan, La Union, explicitly assigns the primary responsibility for waste segregation and collection to the barangay level (Municipal Ordinance No. 06, 2020).

Zero Waste Philosophy and Resource Recovery**:** The Alaminos City ordinance is fundamentally a "Zero Waste Ordinance," reflecting a commitment to minimizing waste through prevention, reduction, recycling, reuse, and composting (Alaminos City Ordinance No. 2016-16, 2016). The establishment of MRFs, biogas projects, and the pursuit of Waste-to-Energy (WTE) in Quezon City demonstrate a commitment to diverting waste from landfills and converting it into valuable resources (Environmental Management Program of Quezon City, 2018). Waste reduction percentages are also tracked (Environmental Management Program of Quezon City, 2018).

Community Participation and Support**:** The study conducted in Lugait, Misamis Oriental, emphasizes the vital importance of community knowledge, perceptions, and attitudes, along with a strong appreciation for Materials Recovery Facility (MRF) workers, as essential components of community support (Trinidad & Vedra, 2025). Additionally, Batangas City's ordinance serves as a proactive effort by the local government to address waste management issues at the city level, relying on barangay MRFs for the collection of segregated plastics and Styrofoam (Marcial et al., 2016).

Gender Dynamics in the Workforce**:** A significant aspect of the operational side of MRFs is the predominance of women in the workforce, comprising 61.54% of employees (Trinidad & Vedra, 2025).

Challenges: Weak Policy Implementation and Compliance: Despite the enactment of Republic Act 9003 (RA 9003) two decades ago, the law continues to be poorly implemented, especially in areas such as waste segregation, the establishment of Material Recovery Facilities (MRFs), and the management of sanitary landfills (World Bank, 2022). A major issue in the implementation process is the lack of cooperation among residents, barangay officials, businesses, and educational institutions (Marcial et al., 2016). By 2018, only 37% of all city, municipal, and provincial Local Government Units (LGUs) were fully compliant with the requirements of RA 9003 (NEDA, 2018). Additionally, respondents in Bacnotan reported being unaware of the processes related to the collection and transportation of solid waste, and they demonstrated a lack of knowledge regarding the use of Material Recovery Facilities (Badua, 2022).

Insufficient MRF Coverage and Functionality**:** Out of the 1,710 barangays in Metro Manila, only approximately 20 percent (334) have their own Materials Recovery Facilities (MRFs) (World Bank, 2022). The term "recycling gap" refers to the substantial amount of recyclable materials still present in collection vehicles and disposal sites (World Bank, 2022). Some barangays in Minalin face challenges in establishing MRFs due to land availability issues (Dela Cruz et al., 2023). Additionally, the functionality of existing MRFs in Minalin is a concern, as these facilities often lack proper decomposing areas, and waste segregation commonly occurs at the source, which undermines the intended purpose of MRFs at the barangay level (Dela Cruz et al., 2023). Currently, only 31.28% of barangays have access to solid waste management (SWM) facilities, and merely 30.92% have established MRFs. These figures fall significantly short of the 2016 targets of 67.39% and 77.10%, respectively (NEDA, 2018). Moreover, the capacity of MRFs is often "not clearly defined," and there are "many gaps and inconsistencies in the data" regarding the operations of MRFs (Trinidad & Vedra, 2025).

Limited Public Awareness and Education: In Batangas City, very few homeowners practice waste segregation or bring their waste products to the designated barangay Material Recovery Facilities (MRFs) (Marcial et al., 2016). Although there is generally a good understanding of waste management, there is a significant "need for increased education and awareness about MRFs and recycling initiatives in the community," particularly concerning specific locations, contamination issues, and the proper preparation of recyclables (Trinidad & Vedra, 2025). Many residents remain "poorly informed" about collection schedules and the appropriate use of MRFs (Badua, 2022).

Space Limitations: The Malabon Local Government Unit (LGU) established a Materials Recovery Facility (MRF) in 2015, but it was one of only three barangay-operated MRFs in the area (Assistance and Cooperation for Community Resilience and Development Inc. & CARE Philippines, 2020). A significant practical challenge in densely populated urban environments is the lack of suitable space for constructing MRFs (Assistance and Cooperation for Community Resilience and Development Inc. & CARE Philippines, 2020).

Maintenance and Sustainability Issues: Barangay Potrero, despite initial efforts, was unfortunately unable to maintain the Materials Recovery Facility (MRF) established in 2015

(Assistance and Cooperation for Community Resilience and Development Inc. & CARE Philippines, 2020). This situation highlights the challenge of ensuring sustainability beyond the initial construction phase.

Insufficient Budget: The municipality of Minalin faces a challenge in implementing policies due to an inadequate budget for solid waste management activities, including the construction of recycling centers, landfills, and the purchase of equipment (Dela Cruz et al., 2023).

Leveraging Existing Infrastructure: Inspecting the usage of Material Recovery Facilities (MRFs) indicates that they are part of the existing Solid Waste Management (SWM) infrastructure (Badua, 2022).

Centralized and Mechanized Facilities: Metro Manila has 13 centralized Materials Recovery Facilities (MRFs) that range in size from 200 to 1,000 square meters. These facilities process waste from various local government units (LGUs) and nearby barangays, with a primary focus on composting (World Bank, 2022). In Pasig City, privately operated mechanized MRFs are employed to handle large volumes of mixed waste, significantly reducing the need for manual sorting (World Bank, 2022).

Increased MRF Numbers: The number of MRFs increased from 6,957 in 2010 to 13,612 in 2018, contributing to a decline in littering problems nationwide (DENR, 2018).

Alternative Material Recovery Systems (MRS): In Malabon City, 21 barangays and 42 homeowners associations have existing arrangements with private junkshops that function as materials recovery systems (MRS), a solution that addresses the lack of space in urban areas for MRF construction (Assistance and Cooperation for Community Resilience and Development Inc. & CARE Philippines, 2020).

The Integration of the Informal Waste Sector: In Quezon City, Materials Recovery Facilities (MRF) were established and staffed by organized waste pickers and junk traders. Their role is to further segregate and buy recyclable materials and other saleable goods (Environmental Management Program of Quezon City, 2018).

Strategic Waste Segregation and Management: The Quezon City Hall Waste Management Segregation Project focuses on waste segregation at the source, promoting recycling. This initiative is supported by a Materials Recovery Facility (MRF) constructed near the city hall compound (Environmental Management Program of Quezon City, 2018). In Quezon City, hazardous wastes are not included in the regular collection process. Instead, designated MRFs serve as disposal locations for segregated spent fluorescent light bulbs collected from households (Environmental Management Program of Quezon City, 2018).

Compliance with SWM Planning: Minalin has an approved 10-year solid waste management plan, a key requirement of Republic Act 9003, which includes the establishment of Material Recovery Facilities (MRFs) (Dela Cruz et al., 2023).

Innovative Use of MRFs for Community Benefit: The barangay of Balangkas in Valenzuela City utilizes a Materials Recovery Facility (MRF) for urban gardening. This initiative creates green spaces, improves air and land quality, supports biodiversity, and promotes food security (Equator Prize, 2024). By converting biodegradable waste into organic fertilizer, the program reduces the burden on landfills and supports local agriculture and gardening (Equator Prize, 2024). Community Acceptance and Appreciation: Strong community support and appreciation for MRF workers in Lugait indicate positive local engagement. Basic Segregation and Processing: Materials Recovery Facilities (MRFs) actively sort and process recyclables, including broken bulbs, plastic bottles, steel, old tires, and batteries, while also segregating biodegradable and non-biodegradable waste

Cluster Three: Identified Gaps And Recommendations For Strengthening Mrf Policies And Their Implementation

Cooperation Deficit and Awareness: The most significant issue is the lack of cooperation among residents, barangay officials, businesses, and educational institutions, which directly affects the effectiveness of Materials Recovery Facilities (MRFs) (Marcial et al., 2016). Many residents are not sufficiently aware of the Republic Act 9003 and local solid waste management ordinances (Dela Cruz et al., 2023). Furthermore, many residents are unaware of collection schedules and the proper use of MRFs (Badua, 2022).

Inadequate Infrastructure and Personnel: There is a significant "lack of designated disposal areas for collecting plastic and styrofoam waste," along with a "limited number of waste disposal personnel" for materials recovery facilities (MRFs) (Marcial et al., 2016). Despite the mandate of Republic Act No. 9003, many barangays face challenges in establishing and maintaining functional MRFs (Trinidad & Vedra, 2025).

Insufficient Financial Support: Barangays often struggle to secure the financial assistance needed for solid waste management (SWM) programs, including the operation of materials recovery facilities (MRFs) (Marcial et al., 2016). In the municipality of Minalin, an insufficient budget for SWM activities hinders the implementation of policies (Dela Cruz et al., 2023).

Lack of Suitable Land in Urban Areas: A major challenge in dense urban areas is the lack of suitable space for constructing Materials Recovery Facilities (MRFs) (Assistance and Cooperation for Community Resilience and Development Inc. & CARE Philippines, 2020).

Low MRF Coverage and Capacity: In 2018, only 57 out of the 142 barangays in Quezon City had Materials Recovery Facilities (MRFs), indicating a significant shortfall in meeting the requirements of Republic Act 9003, which mandates that every barangay or cluster should have an MRF (Environmental Management Program of Quezon City, 2018). Nationally, only 30.92% of barangays had MRFs by 2018, far below the 2016 target of 77.10% (NEDA, 2018). This situation has resulted in "insufficient MRF/MRS coverage and capacity," leading to a "recycling gap" (World Bank, 2022).

Data Deficiencies: Essential solid waste management data, including waste generation, diversion, collection coverage, and MRF/MRS inputs/outputs, as well as detailed

plastic composition, are often unavailable, outdated, or collected inconsistently across all levels (World Bank, 2022).

Gender Imbalance and Lack of Gender-Responsive Policies: The predominance of women in the workforce, potential gender bias in job assignments, unclear wage data, and differing opinions on occupational health and safety highlight a gap in workplace gender equality and the need for gender-responsive policies (Trinidad & Vedra, 2025).

Recommendations

Strengthen Implementation and Citizen Participation: Although an existing law and framework exist, their success depends on proper and strict implementation, which requires the active participation and wholehearted application of strategies taught by experts to citizens (Corecero et al., 2021).

Prioritize and Support Community-Based SWM and MRFs: Both national and local policies should prioritize and support community-based solid waste management (SWM) and materials recovery facilities (MRFs). This approach actively encourages and formalizes community participation while recognizing that community members, particularly the urban poor and informal waste workers, are essential to the solution (Andaya et al., 2025; Trinidad & Vedra, 2025).

Address Budgetary Constraints: Allocate sufficient funds for solid waste management activities, including the development of infrastructure such as materials recovery facilities (MRFs) and recycling centers, as well as the procurement of necessary equipment (Dela Cruz et al., 2023).

Enhance Education and Awareness: Implement regular seminars and training sessions on solid waste management for residents (Badua, 2022). Some barangays need to be educated on the proper usage of the mandated barangay Material Recovery Facility (MRF). Currently, improper practices lead them to directly dispose of collected waste at the municipal MRF (Dela Cruz et al., 2023).

Establish Centralized Recovery Facilities: Establish large-scale, centralized facilities for clusters of barangays and local government units (LGUs) to systematically sort, clean, and bale dry source-segregated waste and recyclables from Materials Recovery Facilities (MRFs) and Materials Recovery Systems (MRS). This will ensure clean, high-quality output for recyclers (World Bank, 2022).

Update SWM Plans: Local government units should update their 10-Year Solid Waste Management plans with the latest population data and factor in rising per capita waste generation (World Bank, 2022).

Creative Solutions for Space Constraints: Support innovative solutions for Material Recovery Facilities (MRFs) in urban areas, such as formalizing partnerships with private junkshops through a Materials Recovery System (MRS) model, or developing multi-level or modular MRF designs that are suitable for limited urban space (Trinidad & Vedra, 2025).

Discussions

This scoping review aimed to understand the policies surrounding Material Recovery Facilities (MRFs) in the Philippines. It identified existing regulatory frameworks, explored themes related to implementation, addressed challenges and best practices, and highlighted gaps along with recommendations. The findings reveal a complex yet evolving landscape of solid waste management. While various local initiatives complement national mandates, significant disparities in implementation still exist.

The review identified Republic Act 9003 as the foundational national policy that mandates the establishment of Materials Recovery Facilities (MRFs) at the barangay or barangay cluster level (Corecero et al., 2021). Since the enactment of this law, there has been a notable increase in the number of established MRFs, rising from 6,957 in 2010 to 13,612 in 2018 (Corecero et al., 2021; DENR, 2018). Additionally, local ordinances from various cities and municipalities demonstrate adaptations and reinforcements of this mandate to suit local contexts. These local policies often specify requirements for the establishment and operation of MRFs and may even extend the mandate to include commercial and private establishments (e.g., Pasig City Ordinance No. 1, 2018; Municipal Ordinance No. 006, 2023).

In terms of implementation, several key themes are worth considering. First, there is a strong emphasis on decentralized operations, with primary responsibility delegated to barangays, as outlined in Municipal Ordinance No. 06 (2020), Pasig City Ordinance No. 1 (2018), and further discussed by Trinidad and Vedra (2025). Second, the initiative adheres to a "Zero Waste Philosophy," which focuses on resource recovery and waste diversion, as seen in Alaminos City Ordinance No. 2016-16 (2016) and the Environmental Management Program of Quezon City (2018). Additionally, as noted by Marcial et al. (2016) and Trinidad and Vedra (2025), community participation and support play a crucial role in these efforts. Interestingly, a prominent feature of Material Recovery Facility (MRF) operations is the female-dominated workforce, which makes up 61.54% of personnel in some areas, according to Trinidad and Vedra (2025).

However, the implementation of solid waste management (SWM) faces numerous challenges. Key issues include weak policy enforcement and low compliance among various stakeholders (Marcial et al., 2016; World Bank, 2022), insufficient coverage and functionality of Material Recovery Facilities (MRFs) across barangays (Dela Cruz et al., 2023; NEDA, 2018; World Bank, 2022), and a widespread lack of public awareness and education regarding waste segregation and MRF usage (Badua, 2022; Marcial et al., 2016; Trinidad & Vedra, 2025). Additionally, practical barriers such as limited space for MRFs, particularly in urban areas, pose significant challenges (Assistance and Cooperation for Community Resilience and Development Inc. & CARE Philippines, 2020). Insufficient budgetary allocations further hinder effective SWM activities, including the operations of MRFs (Dela Cruz et al., 2023). Despite these challenges, there are best practices that demonstrate successful models. These include centralized and mechanized MRFs (World Bank, 2022), leveraging existing infrastructure (Badua, 2022), forming innovative partnerships with private junkshops (Assistance and Cooperation for Community Resilience and Development Inc. & CARE Philippines, 2020), integrating informal waste pickers into the system (Environmental

Management Program of Quezon City, 2018), and using MRFs for community-benefiting projects such as urban gardening (Equator Prize, 2024).

Despite various efforts, significant gaps still exist. A primary issue is the ongoing "cooperation deficit" among stakeholders, which results in low participation rates (Marcial et al., 2016). There is also a clear lack of adequate infrastructure and personnel, and insufficient financial support for barangays (Marcial et al., 2016). Despite existing mandates, the low national coverage of Materials Recovery Facilities (MRFs) and deficiencies in data regarding MRF performance are critical concerns (Environmental Management Program of Quezon City, 2018; NEDA, 2018; World Bank, 2022). Moreover, problems related to gender imbalance and the absence of gender-responsive policies within the MRF workforce highlight a systemic issue. To address these challenges, recommendations include the strict implementation of policies, increased citizen participation (Corecero et al., 2021), and a focus on community-based solid waste management (SWM) initiatives (Andaya et al., 2025; Trinidad & Vedra, 2025). Other essential suggestions involve increasing budget allocations (Dela Cruz et al., 2023), regular public education and awareness campaigns (Badua, 2022), establishing centralized recovery facilities (World Bank, 2022), and developing creative solutions for space constraints, such as formalizing partnerships with private junk shops or implementing modular MRF designs

The findings indicate a clear need to strengthen the enforcement mechanisms of RA 9003 and local ordinances. The ongoing low compliance levels suggest that policies should go beyond simple mandates and incorporate strong monitoring and accountability frameworks. National agencies such as the DENR and the NSWMC could develop more standardized guidelines for Material Recovery Facility (MRF) operations and performance metrics to minimize inconsistencies across local government units (LGUs). Additionally, policies should actively integrate and formalize the informal waste sector, acknowledging their essential role in resource recovery and ensuring their well-being through gender-responsive and occupational health and safety policies. Furthermore, sustainable financing mechanisms for MRFs, beyond their initial establishment, require policy attention to ensure their long-term effectiveness.

The review emphasizes the crucial role of sustained political will and consistent resource allocation in supporting local government units (LGUs) and barangays. Effective implementation involves establishing Material Recovery Facilities (MRFs), ongoing public education, and strong community engagement to promote effective waste segregation at the source. Practical challenges, such as limited space, require innovative solutions, including inter-LGU collaboration for clustered MRFs and formal partnerships with private material recovery systems. Additionally, it is essential to build the capacity of MRF operators and LGU personnel in technical skills and data management to enhance efficiency and support better planning.

This scoping review provides a comprehensive overview of Material Recovery Facility (MRF) policies in the Philippines, systematically mapping the existing literature. Its strength lies in the broad search strategy, which encompasses both peer-reviewed journals and extensive grey literature, including government reports and local ordinances. This approach is essential for capturing the diverse and often localized nature of policy implementation in the

Philippines. The review successfully synthesizes overarching themes, common challenges, and various best practices, providing a comprehensive understanding of the MRF landscape. However, as a scoping review, this study has some limitations. It does not critically evaluate the quality of individual studies or provide a quantitative synthesis of the data. The findings are based on the available published and grey literature, which may not fully reflect the nuanced details of ground-level implementation or the complete extent of unsuccessful MRF initiatives, potentially due to publication bias. Additionally, the varying depth and focus of the identified documents meant that some themes could only be explored descriptively, rather than being analyzed in detail.

Several avenues for future research arise based on the identified gaps and limitations. Empirical studies are necessary to assess the functionality and performance of Material Recovery Facilities (MRFs) in various localities. This could involve in-depth case studies that compare successful MRF models with those that are struggling. Research into the cost-effectiveness and sustainability of various MRF operational models—such as centralized versus barangay-level and mechanized versus manual—would provide valuable insights for resource allocation. Moreover, studies examining the impact of specific policy interventions, such as incentives for private MRFs or enhanced enforcement mechanisms, on compliance with waste segregation and rates of waste diversion are necessary. Given the identified gender dynamics, it is essential to explore gender-responsive policies within the waste management sector, particularly at MRFs, to ensure equitable and safe working conditions. Finally, research into effective data collection and reporting strategies on MRF performance could support the development of a robust national monitoring system.

Conclusion

This scoping review comprehensively examines Material Recovery Facility (MRF) policies in the Philippines. It focuses on three key objectives aimed at understanding their regulatory frameworks and practical implications. The findings offer a holistic overview of the current state of MRF policies and their implementation at the local level. To achieve the first objective, the review identifies Republic Act 9003 as the foundational national mandate for establishing MRFs. This act has been instrumental in the significant increase in the number of operational MRFs across the country between 2010 and 2018. Additionally, various local government ordinances from cities such as Pasig, Alaminos, and Quezon City and municipalities like Pura, Balaoan, and Palanan demonstrate how local government units (LGUs) have localized and enhanced these national directives. Many of these ordinances include specific requirements for establishing MRFs and even mandate their implementation for commercial establishments.

In addressing the second objective, the review highlighted several key themes, challenges, and best practices related to implementing Materials Recovery Facility (MRF) policies. The core themes identified include a decentralized approach to MRFs at the barangay level, a strong commitment to a "Zero Waste Philosophy," and the vital importance of community participation.

However, significant challenges remain. These include weak policy enforcement and low compliance among stakeholders, inadequate coverage and functionality of MRFs, a lack of public awareness and education, and practical issues such as limited facility space and

insufficient budget allocations. Despite these obstacles, some notable best practices have emerged. These include the successful operation of centralized and mechanized MRFs, innovative partnerships with private junk shops, the inclusion of informal waste pickers, and the creative use of MRFs for community-benefiting projects like urban gardening.

Finally, in line with the third objective, the review identified several gaps in the existing Municipal Recycling Facility (MRF) policies and their implementation. These gaps include a widespread lack of cooperation among stakeholders, inadequate infrastructure and personnel, insufficient financial support at the local level, and significant deficiencies in MRF coverage and data collection. Additionally, the predominance of a female workforce highlighted the need for more gender-responsive policies. Based on these findings, the review proposed several recommendations to strengthen MRF policies and their execution. These recommendations include enforcing stricter regulations, enhancing citizen participation, prioritizing and supporting community-based solid waste management (SWM), addressing budgetary constraints, increasing public education efforts, establishing centralized recovery facilities, and exploring innovative solutions to handle space limitations.

In conclusion, while the Philippines has a basic legal framework for Material Recovery Facilities (MRFs) and has made visible efforts to establish them, the effective and sustainable implementation of these policies remains a significant challenge. To advance solid waste management and unlock the full potential of MRFs in the country, it is essential to address the identified gaps through targeted policy interventions, robust funding, continuous capacity building, and sustained community engagement.

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