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**Research Article**

# Sustainable Solutions for Waste Management in Aizawl: An Evolutionary Perspective

Dr. Janet Vanlalhlimpuii*

*Associate Professor, Department of Public Administration, Government Aizawl West College, Email: jvlhpuii1@gmail.com

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**ABSTRACT**

A waste is viewed as a discarded material, which has no consumer value to the person abandoning it. The World Health Organization (WHO) refers to the term 'solid waste' applied to unwanted and discarded materials from houses, street sweepings, and commercial and agriculture operations arising from mass activities. Keeping cities clean and environmentally friendly has been one of the greatest challenges in urban governance in urban areas. This paper investigated the process of evolution of Solid Waste Management in Aizawl, the capital of the state of Mizoram and the twenty-third state of the Indian Union. It is descriptive and is based primarily on secondary sources. It has made an enquiry into the management of solid waste from the year of inception of the Local Administration Department in 1973 up to the initiation of the Public-Private Partnership under the Urban Development and Poverty Alleviation (UD&PA) Department and Aizawl Municipal Council and later on under the Aizawl Municipal Corporation.

**Keywords:** Waste, Solid Waste, Management, Urban Local Bodies, Urban Development and Poverty Alleviation Department, Aizawl Municipal Council, Aizawl Municipal Corporation.

## Introduction

The growth of urban population, increasing urbanization, rising standards of living and rapid development in technology have increased the quantum of waste generated and changed the waste pattern in India. In rural areas, people throw their waste in open fields which over a period of time gets decomposed and is locally handled. In urban areas, waste is generally dumped in low-lying areas and burned openly or collected, transported and disposed of in landfill sites. The marked shift in the quantities and quality of waste generated contributes to a rising deficit between the demand for municipal solid waste (MSW) services and the current capacities among Urban Local Bodies (ULBs) to service the same. At the same time, half of the urban population in developing countries does not have access to services for solid waste disposal.

A waste is viewed as a discarded material, which has no consumer value to the person abandoning it. Solid waste refers to materials that are no longer useful to the person who is responsible for them, often discarded when they have lost their value (Zhu et al., 2007, p. 3). Terms like rubbish, garbage, trash, or refuse are commonly used interchangeably to describe this type of waste The World Health Organization (WHO) refers to the term 'solid waste' as applied to unwanted and discarded materials from houses, street sweepings, commercial and agriculture operations arising out of mass activities (Government of Tamil Nadu, 2005, p.2) 'Solid Waste' (SW) is the term used to describe non-liquid materials arising from domestic, trade, commercial, agricultural and industrial activities and public services. It is commonly known as garbage, refuse, rubbish or thrash. Its main sources are residential premises, business establishments and street sweepings. It is a mixture of vegetables and organic matter; inert matters like glass, metal, stones, ashes, cinders, textiles, wood, grass etc., (Government of Tamil Nadu, 2005, p.2). Solid Waste Management (SWM) is the systematic waste collection, segregation, storage, transportation, resource recovery, processing, treatment and final disposal of solid waste (Government of India, n.d., p.1).

## Research Objectives

- To trace the evolution of Solid Waste Management (SWM) in India.
- To trace the development of Solid Waste Management (SWM) in Aizawl.
- To analyze Solid Waste Management Frameworks and Practices in Aizawl.
- To identify the challenges and recommend strategies for sustainable Solid Waste Management in Aizawl.

## Methodology

This research adopts a descriptive approach, utilizing secondary sources such as government reports (e.g., Municipal Solid Waste Management Rules, 2000, and Mizoram Municipalities Act, 2007), historical records from the Local Administration Department (LAD) and other governing bodies, as well as scholarly articles and case studies on urban solid waste management (SWM) in India. It also incorporates insights from institutional and NGO reports on environmental sustainability and urban waste management. The study examines the evolution of SWM in Aizawl through a chronological analysis of governance and policy milestones, with particular focus on the introduction and impact of Public-Private Partnerships (PPPs). By assessing the implementation, public response, and operational challenges of these initiatives, the research synthesizes data to identify best practices and persistent challenges, providing actionable recommendations for enhancing SWM in Aizawl.

## Historical Evolution of Solid Waste Management in India

Historically, Indian society has been deeply influenced by cultural practices that prioritize reuse, repair, and reduction of waste. These practices stemmed from traditional values of frugality and environmental harmony, where most materials were biodegradable and were either reused or naturally reintegrated into the ecosystem. Examples include the widespread use of cloth bags instead of plastic, repurposing old clothes into household items like quilts, and composting organic waste for agricultural use. These habits reflect an inherent commitment to resource conservation and a sustainable lifestyle.

However, the advent of industrialization, coupled with rapid urbanization and population growth, posed significant challenges. The Third Five-Year Plan (1961-1966) marked the beginning of a structured approach to municipal solid waste management in India. It highlighted the importance of composting municipal solid waste (MSW) to address the growing challenge of urban waste, recognizing composting as a sustainable practice for managing biodegradable waste. Financial assistance was allocated for this purpose under the Fourth Five-Year Plan (1969-1974), facilitating the establishment of composting plants in urban areas to reduce landfill reliance and enhance waste processing capacities. From the 1970s onwards, waste generation began to rise exponentially due to changing consumption patterns and the introduction of non-biodegradable materials like plastics. Urban centres became hubs of economic activity, leading to the accumulation of municipal solid waste (MSW) in public spaces. Efforts to manage waste were initiated during this period, but they were largely isolated and lacked systematic approaches.

In the 1980s, environmental concerns started gaining attention in policy-making. India began adopting strategies for waste management, although these were often limited to localized initiatives rather than nationwide policies. For instance, certain urban municipalities introduced composting projects and basic waste collection systems, but the absence of adequate infrastructure and public awareness hindered their effectiveness. Additionally, informal sectors, such as waste pickers, played a critical role in recycling and reducing waste, although their contributions were not formally recognized or supported by the system. The Bhopal Gas Tragedy in 1984, which underscored the dangers of hazardous waste mismanagement, catalyzed significant legislative action in India. This led to the enactment of the Environment Protection Act (1986), a comprehensive law to safeguard the environment and manage hazardous waste ((Environment Protection Act, 1986, p. 268-270). Subsequent regulations, such as the Hazardous Waste (Management and Handling) Rules (1989) which was formulated under the Environment (Protection) Act, these rules set forth guidelines for the proper management and handling of hazardous wastes to prevent environmental contamination and ensure public safety (Hazardous Wastes Rules, 1989/2003). Further strengthening waste management practices through the BioMedical Waste (Management and Handling) Rules, 1998 which provides rules to manage the safe disposal of biomedical waste generated from healthcare facilities, aiming to reduce the risk of infection and environmental hazards.

The introduction of the Municipal Solid Waste (Management and Handling) Rules, 2000 marked a pivotal moment in India's approach to waste management. These rules aimed to establish scientific methods for waste disposal, focusing on improved landfill practices and waste segregation. However, their implementation faced challenges due to a lack of clarity in defining the roles and responsibilities of various stakeholders, including municipal authorities, waste generators, and private entities. As a result, enforcement remained inconsistent, and the potential benefits of the rules were not fully realized (Central Pollution Control Board [CPCB], 2002, p. 4,5,6). Concurrently, regulations for managing plastic and electronic waste began to emerge, reflecting growing environmental concerns about their impact. These regulations prioritized eco-friendly practices, such as promoting recycling and ensuring the safe disposal of nonbiodegradable materials, which posed a significant

threat to ecosystems and public health. Despite their progressive intent, these initiatives highlighted the need for greater stakeholder coordination and accountability to achieve meaningful results (Chatterjee, 2011).
The Solid Waste Management Rules, 2016 introduced comprehensive revisions to India's waste management framework, addressing limitations of previous regulations. These updated rules extended their applicability beyond municipal areas, including economic zones, railway premises, pilgrimage sites, and other non-urban locations. A key focus was on source segregation, requiring waste generators to classify waste into biodegradable, recyclable, and hazardous categories at the point of generation, thereby streamlining waste processing and minimizing environmental impact. For the first time, the rules also addressed the management of construction and demolition (C&D) waste, recognizing its significant contribution to urban solid waste. By promoting safe disposal practices and resource recovery from C&D waste, the revised rules aimed to mitigate environmental challenges posed by rapid urbanization. These reforms underscored the importance of integrating sustainable practices into waste management systems while emphasizing the active participation of stakeholders, including local authorities, private entities, and the general public (Ministry of Environment, Forest and Climate Change [MoEFCC], 2016).
In urban areas, solid waste is produced by households, businesses, industries, healthcare facilities, and various institutions. Streets, which often serve as dumping grounds for all types of waste, tend to collect refuse from numerous sources. In regions with inadequate sanitation and where animals roam freely, street waste frequently includes human waste and animal manure. Additionally, streets are often sites for the disposal of construction and demolition debris, which encourages further illegal dumping of solid waste (Zhu et al., 2007, p. 3). India generates approximately 62 million tons of municipal solid waste annually, with projections estimating 436 million tons by 2050. However, only 70 per cent of the waste is collected, and a mere 12.45 per cent is treated scientifically. Uncollected waste contributes to environmental and health hazards, particularly in urban areas (Joshi & Ahmed, 2016, p. 6). The lack of source segregation and unscientific disposal methods are major issues.

### *Constitutional Framework for Environmental Protection and Waste Management*

The Indian Constitution establishes a comprehensive legal foundation for environmental protection and public health. It emphasizes the need to safeguard natural resources while ensuring the well-being and quality of life for all citizens.

*Article 243(W): Empowering Municipalities*

Article 243(W) entrusts municipalities with significant responsibilities related to environmental management. These include ensuring proper waste disposal, protecting natural resources, and providing essential services like healthcare, education, and a better quality of life (Constitution of India, 2020, p.239). The 12th Schedule of the Constitution outlines these duties, including public health, sanitation, and solid waste management (Constitution of India, 2020, p 102), all of which are vital for creating sustainable urban environments.

*Role of State Governments in Health and Sanitation*

The state governments hold a crucial role in formulating laws and executing initiatives to address health, sanitation, and hygiene challenges. SWM is a part of Health and Sanitation which falls under the purview of the state government as provided in the State List of the Constitution of India. Article 243(W) further supports the delegation of these responsibilities to local governments, promoting a decentralized approach to governance (Constitution of India, 2020, p.239). The 12th Schedule reinforces this by detailing the functions of municipalities in managing public health concerns and sanitation (Constitution of India, 2020, p. 102, 103)

*Item 6, List II, Schedule VII: Supporting Local Governance*

The activity is local in nature, and the responsibility for providing the services is entrusted to the local bodies, whether rural or urban. SW has been made one of the essential and obligatory functions of local bodies with the enactment of the 73rd and 74th Constitutional Amendment Act, 1992 which gave constitutional status to the local bodies. The respective state governments provide for SWM as per their Local Government Acts. Under Item 6 of List II in the Seventh Schedule, the Constitution empowers local governments to handle issues related to public health (Constitution of India, 2020, p. 216). This provision enables states and municipalities to draft laws and undertake initiatives for effective waste disposal, sanitation improvements, and the prevention of health hazards caused by environmental degradation.

*Directive Principles: The Right to a Clean and Healthy Environment*

The Directive Principles of State Policy serve as a moral compass for governance, highlighting the state's responsibility to protect the environment (Constitution of India, 2020, p. 34-36). These principles emphasize the right of citizens to live in a clean and healthy environment and guide policymakers in crafting rules and regulations to ensure sustainable waste management and environmental conservation.
Prior to the enactment of the Municipal Solid Wastes (Management and Handling) Rules 2000 on 25th September 2000, there was no explicit statute dealing with SWM in India. The issues relating to SWM were scattered in the provisions of the Indian Penal Code, Criminal Procedure and the Constitution of India (Malik, 2010, p. 41). With the passing of the MSWM Rules 2000 by the Ministry of Environment and Forests (MoEF),

steps were laid down to be observed by all urban authorities, regardless of size, to ensure efficient and healthy management of solid waste.

Key components of Indian MSW include:

- Biodegradable waste (40–60 per cent)
- Recyclables (10–30 per cent)
- Inerts (30–50 per cent) (Joshi & Ahmed, 2016, p. 4).

These components necessitate targeted waste management strategies, focusing on segregation at source, recycling, and environmentally responsible disposal. Effective management requires a systematic approach to reduce the volume of waste sent to landfills, recover resources, and minimize the environmental impact.

## Challenges in Waste Management in India

Urbanization has significantly contributed to the complexities of waste management in India. With 31.2% of the population residing in urban areas, waste generation patterns vary widely due to diverse consumption habits. This variation, coupled with the absence of comprehensive studies on regional waste characterization, has hindered the development of tailored waste management strategies (Joshi & Ahmed, 2016, p. 3). The lack of region-specific data makes it challenging to devise effective plans for collection, segregation, and disposal, leaving many urban areas grappling with inefficient systems.

The infrastructural and financial deficiencies in waste management exacerbate these challenges. Many cities lack the necessary facilities for scientific waste disposal, such as treatment plants and recycling units. Overburdened landfill sites, often operating beyond capacity, contribute to environmental and health hazards. Additionally, insufficient funding limits the ability of urban local bodies (ULBs) to invest in infrastructure upgrades and sustainable waste management solutions, further compounding the problem (Joshi & Ahmed, 2016, p. 6).

Policy implementation gaps present another critical barrier to efficient waste management. Although the Municipal Solid Waste (Management and Handling) Rules, of 2000, provide a regulatory framework, the enforcement of these rules has been inconsistent. ULBs often face challenges in adhering to the guidelines due to limited resources, lack of expertise, and inadequate monitoring mechanisms. This disconnect between policy formulation and execution results in suboptimal outcomes and continued reliance on unsustainable waste disposal methods (Joshi & Ahmed, 2016, p. 12).

Resistance to new landfill sites and the limited success of public-private partnership (PPP) models also hinder progress. Public opposition to establishing new landfills, driven by concerns over environmental degradation and health risks, delays essential infrastructure projects. Moreover, while PPPs are often touted as viable solutions, their effectiveness in waste management has been limited due to financial constraints, technical inadequacies, and governance issues (Joshi & Ahmed, 2016, pp. 11, 14). Addressing these challenges requires a holistic approach that combines robust policy enforcement, enhanced public awareness, and innovative funding mechanisms.

The central government, the Ministry of Urban Development, the Central Public Health Engineering Organization, the Central Pollution Control Board, and the Ministry of Environment and Forest are institutions responsible for SWM. At the State Level, the Department of Urban Development, the State Level Nodal Agency and the State Pollution Control Board are the institutions responsible for SWM. At the Local level, the municipal authorities and the District Magistrate or the Deputy Commissioner have the overall responsibility for the enforcement of the provisions of the Mizoram SWM Rules, 2000 within the territorial limits of their jurisdiction. The NGOs or Civil Society, Communities and public, conservancy workers, and the rag pickers all have equal responsibility in sustainable SWM.

## Solid Waste Management in Aizawl

Aizawl is the capital of Mizoram and the headquarters of Aizawl District. It is the largest district in Mizoram. The total population of Mizoram as per the Census of India 2011 is 1,097,206 (States Census 2011, n.d.). The total population of people living in rural areas is 529,037 and that of the urban area is 561,977 (51.51 per cent). Aizawl has a population of 3,15,875 (56.2 per cent) (Government of Mizoram, 2012). The Aizawl Municipal Corporation (AMC) carries out the city's civic administration. The present Mizoram, on the eve of India's independence, was a District under Assam. The Lushai Hills District Council under Assam came into being on 25th April 1952 with powers and functions conferred by the Sixth Schedule to the Constitution of India (Land Revenue and Settlement Department, n.d.). It continued to function till 21st January 1972, when it was granted the status of a Union Territory under the Indian Union. Subsequently, it became the twenty-third State of India on 20th February 1987 (Environment, Forests & Climate Change Department, n.d.).

### *Solid Waste Management in Aizawl under the Directorate of Local Administration Department*

With the creation of the Mizo District Council in 1952, a Sanitation Committee was formed and efforts were made towards cleanliness. When the District Council was granted the status of a Union Territory in 1972, the

Directorate of the Local Administration Department (LAD) was created on 1st January 1973, and the "Sanitation Wing" started functioning within it. On 15th January 1973, solid waste was collected and disposed of for the first time by the LAD in Mizoram with the lone vehicle of the then Deputy Commissioner. In 1975, there were two trucks used by the Government to collect and dispose of solid waste within Aizawl. At the same time, the Government kept Mini Dustbins and Fixed Dustbins at convenient places which were of great help to the people. However, with the growth in urban population and increasing urbanization, these dustbins were found to be inconvenient and were later disbanded on 6th March 1986 and 12th May 1986 respectively (Government of Mizoram, n.d.).

Mizoram was granted the status of a full-fledged State under the Indian Union in 1986 and there was marked progress in the sanitation department in terms of allocation of resources. The Sanitation Wing was made an attached office of the District Local Administrative Officer (DLAO). Government-owned trucks were used to collect solid waste from different corners of Aizawl which were disposed of at designated Dumping Grounds. Street Sweeping was also initiated during this period which continues to date (Government of Mizoram, n.d.). On 30th May 2005, the post of Sanitation Officer under the Sanitation Wing was upgraded to Senior Sanitation Officer (Government of Mizoram, 2005). The Sanitation Wing comprises seventeen Officers and two hundred supporting staff on regular and contract posts.

### *Solid Waste Management under the Urban Development and Poverty Alleviation Department*

With the creation of the Urban Development and Poverty Alleviation (UD&PA) Department on 24th August 2006, (Government of Mizoram, 2007) the Sanitation Wing which previously functioned under the LAD was transferred to the newly created department. All efforts were made by the Government for improved and environmentally friendly SWM and the funds used for SWM were sourced from different schemes of the Twelfth Finance Commission (2005 to 2010).

To improvise on the existing SWM the Government introduced Mobile Garbage Trailers on a trial basis at five places on 6th May 2006, which was increased to twenty Trailers by 18th October 2006. Initially, the Department vehicles were used to dispose of the waste from the Trailers but later on, it was found that the process was too cumbersome for the concerned Department, which was facing a manpower and financial crunch. At the initiation of the officers in the Department, the Government decided to enter into a Contract with a local contractor on 18th October 2006. As per the Deed of Agreement signed between the Government and the contractor, SW was to be collected and disposed of only at night. This agreement continued for some time. However, over time, it was found that it would be more feasible if the concerned Village Councils (VCs), where the Trailers were kept, handled the disposal of the SW. Hence, an agreement was signed between the VCs of Chanmari, Zarkawt, Dawrpui and Tuikual South localities and the Government to this effect. Despite the best effort put in by the concerned VCs, the Trailers were overloaded and it proved difficult to carry on the onerous task. At the same time, the SW collected in the Trailers were found to be of nuisance and hazardous to the health of the urban population. Therefore, the Government decided to part with the Mobile Garbage Trailers on 29th September 2009, after almost three years (Government of Mizoram, n.d.).

While SW was collected in the Mobile Garbage Trailer at certain points on the main road, the Department of UD&PA continued to collect and transport the SW from areas that were not accessible to the Trailers. This was done free of cost by the Government and the people did not have to pay user charges or fees. The frequency of waste collected was on average twice a week. However, there was no designated day on which the Government vehicles would collect the SW and this would depend on the availability of the Government vehicle (Government of Mizoram, n.d.).

A very interesting fact about SW in Aizawl and for that matter, the whole of Mizoram, is that there is no Door-to-Door Collection as practised in other Indian states. In Aizawl, SW is collected not from the doorsteps but at convenient and designated Sanitation Points where people assemble at the stipulated time to throw their waste. In view of the growing health hazards and unhygienic SWM, the Government decided to set up a Dumping Ground at Tuirial, about twenty kilometers from Aizawl. Subsequently, the Tuirial Dumping Ground was christened as the Solid Waste Management Centre and started functioning on 27th May 2006. The Centre was initiated with funds from the ULB Grants 2005-06 (Government of Mizoram, 2006). At the Solid Waste Management Centre, SWs are treated and processed mechanically.

### *SWM Value Chain and Management*

Following are the stages of SWM before the introduction of PPP in Aizawl:

(i) **Source Storage and Segregation**: Storage of waste at source is one of the recommendations of the Ministry of Environment and Forests. However, storage and segregation at source is absent in Aizawl and people are generally ignorant of the significance and necessity of such a practice. Though people may collect their waste in bags, these are not segregated. Besides, at the time of collection, these bags are emptied into the vehicles so that they may be used for further collection by the people.

(ii) **SWM Collection**: The system of door-to-door collection of waste in Aizawl is different from those in other parts of the country. In the case of Aizawl, the VCs (now LCs) designate a Sanitation Point in convenient places and people assemble at the Sanitation Point at the stipulated time to throw their waste in Government-owned vehicles. The frequency of waste collected was on average twice a week.

(iii) **Secondary Storage**: A huge Barrel to store market wastes was set up on 4th April 1972, at Bara Bazaar (Government of Mizoram, n.d.). But this was discontinued after a very short time as it was found to be a nuisance for the people at large. Mini and Fixed dustbins were installed at convenient places by the Government. However, since the cons outweighed the pros, it was stopped on 6th March 1986 and 12th May 1986 respectively (Government of Mizoram, n.d.). Secondary Storage was initiated in Aizawl when the Transfer Station was constructed near Beraw Lui, Bung Bungalow, and Tuirial road in 2006 under schemes from the Twelfth Finance Commission (2005-2010). The Transfer Station was to serve as a transit for SW before transferring them to Tuirial Dumping Ground and it was used for the first time on 18th October 2006. The transit was engaged for a while, but over time, it was found that directly transporting the SW from the designated standpoint to the Dumping Ground was more economical and efficient. Hence, the use of the Transfer Station was stopped (Government of Mizoram, n.d.). The Mobile Garbage Trailer was introduced on 6th May 2006. This again proved to be more of a problem from the environmental perspective and the Government discontinued its use on 29th September 2009.

(iv) **Street Sweeping**: For Street Sweeping Aizawl is divided into five Sectors and the work starts at 5:30 a.m. The sweepers collect waste and transport it to the designated Sanitation Points within their area and after completing their work gather in their respective Site Offices where a review of their morning routine is made at 10 in the morning.

(v) **Waste Transportation**: The Government had around nineteen vehicles used to collect waste from different Sanitation Points within Aizawl and transport the same at various Dumping Grounds designated by the Government from time to time. On average the vehicles usually made three trips per day to the Dumping Ground.

(vi) **SWM Processing**: There was no treatment and processing facility available in Aizawl for the conversion of waste or extraction of recyclables before final disposal at the Dumping Ground. All SW collected within the city was transported off in the open Dumping Ground.

(vii) **SWM Disposal**: Solid Waste was for the first time collected and disposed of on 15th January 1973. The first Dumping Ground was at an old Quarry in Bawngkawn. However, the site was closed on 30th September 1982, as it was unable to withstand the huge amount of waste. Since then, the government has designated seven Dumping Grounds. As far as biomedical waste is concerned, they are handled by the concern Department of Health and Medical Education in the case of Government hospitals while private hospitals manage themselves. These wastes are being dumped at the same Dumping Ground at Tuirial. Though provisions exist for separate Dumping Grounds and incineration, yet, these are not complied with by the hospitals. Post 2000 Market Waste is handled by the Department of Trade and Commerce, Government of Mizoram. The Department tenders Quotation twice in a financial year for the Disposal of Market Garbage for five Market areas viz., New Market, Bawngkawn, Vaivakawn, Mission Veng and Ramhlun. The Department has its own Dumping Ground at Lengte which is 26 kilometres from Aizawl. However, work is yet to be completed, so in the meantime, the market waste is being dumped at Tuirial Dumping Ground.

Table I shows the different Dumping Grounds used by the Government from time to time.

**Table I: Dumping Grounds Used by the Government (1973 till date)**

| Sl. No. | Disposal Site | Years in Used |
|---|---|---|
| 1. | Bawngkawn Kham | 15. 01. 1973 – 30. 09.1982 |
| 2. | Bung Bungalow kawng bul | 01.10. 1982 – 24. 06. 1993 |
| 3. | Chawke Kham | 25. 06. 1993 – 25. 06. 1994 |
| 4. | Muthi Tlang | 10. 06. 1993 - 1995 |
| 5. | PTC Peng, Sairang Road | 25. 06. 1994 – 09. 04. 1995 |
| 6. | Sairang Buichali Kai | 10. 04. 1995 – 01. 05. 1997 |
| 7. | Tuirial Dumping Ground | 02. 05. 1997 – 11.12.2019 |
| 8. | Sakawrhmuituai Tlang | 02. 05. 2001 – 10. 12. 2010 |
| 9. | Solid Waste Management Centre, Tuirial | 11.12.2019 till date |

*Source:* http://udpamizoram.nic.in/ Retrieved on December 17, 2020

### *Solid Waste Management under Urban Development and Poverty Alleviation (UD&PA) Department*

The UD&PA Department had been collecting and transporting SW for quite some time. However, it was found that the Department faced several problems in the form of increasing SW without an increase in manpower, very few government vehicles to collect and transport SW, and financial scarcity. At the same time, due to the change and restructuring in the Government's policy; the Supreme Court of India recommendation; notification of Municipal Solid Wastes (Management and Handling) Rules 2000 (MSWM Rules 2000), by the Ministry of Environment and Forests in September 2000; funds from Jawaharlal Nehru Urban Renewal Mission (JnNURM) and Urban Infrastructure Development Scheme for Small and Medium Towns

(UIDSSMT); Twelfth Finance Commission recommendations; creation of Aizawl Municipal Council (AMC) and the advantages that PPP subscribes to in terms of providing efficient management service with regularity, speed and quality, increased coverage, community participation and ownership qualities created in the minds of the people through user charge, the Government decided that the best policy in SWM was to introduce the concept of PPP.

On 4th October 2010, PPP in SWM was introduced in Aizawl, for the first time in the history of Mizoram though not in the true form of PPP. In the case of Aizawl, PPP is between the Government and the Elected Village Council (VC) and not a private operator, unlike other PPP ventures where the contracting members are the government and private sectors or developers. A Deed of Agreement was signed between the UD&PA Department, the Government of Mizoram and the erstwhile Village Councils (VCs) within Aizawl in November 2010. The Deed of Agreement specified the general and financial terms and conditions and it was to be in force for a period of six months and renewed, if desired. As per the Agreement, SWM was to be carried out using PPP mode wherein the Government would sanction 90 per cent of the finances in the form of Grants-in-Aid and the VCs would have to pay 10 per cent. The UD&PA Department would also be responsible for monitoring and supervising SWM. The VCs would be responsible for the collection of 10 per cent of the User fee from the local population either in the form of cash or through voluntary deeds, earmarking a Stand Point, collection, transportation and disposal of SWM most efficiently and sustainably. Both parties would be responsible for undertaking Public Information, Education and Communication (IEC). At the initial stage, the partnership was started in sixty VC areas within Aizawl.

### *Municipal Solid Waste Management under Aizawl Municipal Council*

The Mizoram Municipalities Act 2007 received the assent of the Governor on 16th April 2007; subsequently, the first office of the Aizawl Municipal Council was established on 1st July 2008. The first general election to the Council was held on 3rd November 2010 as per the Aizawl Municipal Act 2007 (amended in 2009) (Government of Mizoram, 2009). With elections of the Local Councils (LC) across nineteen Wards under the Council, SWM came to be the responsibility of the Council as per the powers and functions of the Aizawl Municipal Act 2007 (amended in 2009) (Government of Mizoram, 2009). The Deed of Agreement on SWM signed between the UD&PA Department and the VC had expired and a fresh Agreement was signed between the Council and LC. With the creation of the Council, the Sanitation Wing of the UD&PA Department was transferred to the AMC on 20th September 2011 (Government of Mizoram, 2011). and has been functioning under it till date. At the same time, the nomenclature of the VC was changed to Local Council. PPP in MSWM was continued by the Council and those LCs, which were still using Government vehicles to collect and transport solid waste, have resorted to PPP.

An appeal was made by the Chief Executive Officer (CEO) of AMC to the NGOs viz., the Young Mizo Association (YMA), the Mizo Upa Pawl (MUP and the Mizo Hmeichhe Insuihkhawm Pawl (MHIP), of different localities within the jurisdiction of AMC to extend their cooperation regarding efficient, effective and sustainable SWM in July 2011 (CEO, 2011, p. 2) As suggested in the letter, the Solid Waste Management Committee (SWMC) is to be constituted in every locality. The SWMC is to be formed with the Councillors and would comprise of the Local Council (LC) members and two representatives each from the YMA, MHIP and MUP. The letter also contained how SWM was to be carried out, post the election of AMC.

As per the Notification of the AMC, SWMC is to be constituted in every locality. The Office Bearers of the Committee would consist of the LC Chairman or any member of the Local Council, whichever is more convenient as the Chairman; an LC Member as the Vice Chairman; Secretary, Assistant Secretary, Treasurer and Financial Secretary from the Member Representatives of the YMA, MUP and MHIP. The Member Representatives who do not fill up the Office Bearers post will automatically become the Committee Members. The Committee Members would consist of all the members of the Local Council; three prominent citizens and a member nominated to the Ward Committee automatically becomes a member of the SWMC (CEO, p. 2). Since the modus operandi of SW is to be in PPP mode, the local people have to pay not less than rupees ten only as a user charge. The SWMC has to make arrangements for the most convenient, economical, efficient and effective SWM as well as the collection of Solid Waste for those people living in areas that may not be accessible to vehicles. The Chairman of the SWMC would be clothed by the AMC with powers and functions prescribed by The Mizoram Municipalities Act, 2007 (as amended in 2009) regarding SWM and others (First Schedule Sec. 153, 154,155,157). Fine Receipt will also be given to him or her. The SWMC is to discharge any activity specified by the AMC regarding SWM. Only Domestic Waste is to be collected by the SWMC. Regarding Commercial Waste, Industrial and Construction Waste the AMC has given the responsibility to the SWMC who will make arrangements as and when necessary. The AMC can make desirable changes to the terms and conditions as and when necessary.

The arrangement came into force with effect from 1st August 2011, and the Work Bill is to be given with the approval of the Councillors. As per the guidelines of the AMC, MSW were collected and transported by the SWMC in every locality including those that may not be accessible by vehicles. The SWMC hires vehicles and labourers to collect and transport SW from the designated Stand Points to the Dumping Ground. The whole LC area for effective and efficient SWM may be divided into as many routes as convenient. The number of trips the hired vehicles make to collect and transport SW would depend on the total population, the size of the LC and the density of the population. Because Aizawl is a hilly area the route of the hired vehicles has to be properly

worked out. At the same time, those entire households living in step areas and other areas not accessible by vehicles will also have to be considered. However, all routes must be visited by the hired vehicles at least twice a week so that SW is effectively managed. Usually, the hired vehicles make two trips in a week in a particular route of a locality.

Meanwhile, the Government of Mizoram on 30th August 2011, passed "The Mizoram Urban Sanitation and Solid Waste Management Policy, 2011 with the objectives of (Government of Mizoram, 2011):

1. Providing directions for carrying out sanitation and solid waste management activities in a manner which is not environmentally, socially and financially sustainable but is also economically viable;
2. Establishing an integrated and self-contained operating framework for Urban Sanitation and Solid Waste Management, which would include the development of appropriate means and technologies to handle various waste management services;
3. Enhancing the ability of the Government functionaries /ULB/local authorities to provide effective waste management services to their citizens;

### *Municipal Solid Waste Management under Aizawl Municipal Corporation*

The Aizawl Municipal Council was upgraded to Aizawl Municipal Corporation (AMC) on 15th October 2015 by the Fourth Amendment of the Mizoram Municipalities Act, 2007 and elections to the nineteen wards of AMC were held on 26th November 2015. The SWMC, collection, transportation and disposal of SW practised during the Council days was continued and the AMC made no fresh Deed of Agreement in this regard except where signatories were required with change in the members of the LCs.

In 2017, though not totally disbanding the PPP mode, AMC created nine (9) zones for the collection and disposal of solid waste and entered into a contract with nine (9) contractors for the discharge of the same. However, this was discontinued in April 2019 as there were a lot of grievances from the public due to dissatisfaction with the contractors in the management of solid waste. On 17th July 2019, the AMC created the Aizawl Municipal Corporation Solid Waste Management By-Laws, 2019 for regulating all matters and things connected with the storage, collection, transport, processing and disposal of municipal solid waste and related sanitation matters. Subsequently, SWM within the jurisdiction of AMC is guided by these bylaws. The Solid Waste Management Centre at Tuirial was inaugurated on 11th December 2019 following which SW were disposed at the Centre till date. As of date, PPP in SWM is being carried out in all the eighty-five LCs of the AMC's jurisdiction and all efforts for sustainable SWM are being explored and

## Concluding Observation

Municipal Solid Waste Management (MSWM) in India has faced numerous challenges, especially with rapid urbanization and population growth. In Aizawl, like other cities across the country, the increasing volume of solid waste generated has highlighted the inadequacies in waste management systems. This growing waste problem has been exacerbated by financial and human resource constraints, inefficiencies within local governance, and a lack of organizational capacity. The absence of adequate transportation infrastructure, such as the unavailability of proper waste collection vehicles and the low productivity of municipal personnel, has led to significant inefficiencies in waste collection and disposal. Moreover, policy gaps, such as the failure to effectively prevent public littering, remain persistent issues in the city. Another critical challenge for the Aizawl Municipal Corporation (AMC) is the lack of technical expertise to design and implement sanitary landfill facilities, compounded by difficulties in acquiring suitable land for such infrastructure. These challenges contribute to the suboptimal functioning of Aizawl's SWM system, affecting the city's environmental and public health.

The informal waste segregation system, primarily dependent on rag-pickers, plays a crucial role in waste management in Aizawl. Rag-pickers, who often work in hazardous conditions, recover recyclable materials such as plastics, metals, and paper from mixed waste. However, the lack of formal infrastructure or protective measures exposes them to health and safety risks, making their work inefficient and labour-intensive. Furthermore, without recognition or proper compensation, rag-pickers remain marginalized, and their contribution is undervalued. Aizawl's waste segregation system, like many other Indian cities, lacks a systematic approach, leading to mixed waste collection, which hinders the recycling process and lowers recovery rates for valuable recyclable materials. Integrating rag-pickers into a formal system with better protective measures, fair compensation, and improved waste segregation practices at the source could increase the efficiency of recycling efforts and reduce the overall burden on landfills.

The disposal methods in Aizawl reflect broader issues observed across India, with open dumping still being a common practice. This leads to significant environmental pollution, including groundwater contamination from leachate and harmful emissions from the burning of waste, contributing to air pollution and climate change. Despite efforts to adopt more scientific methods like sanitary landfilling, these solutions have not been widely implemented due to high costs and the limited availability of land. Waste-to-energy technologies, although explored, are still in their early stages, with slow adoption due to financial constraints and lack of infrastructure. To address these challenges, Aizawl must invest in modern disposal technologies, including sanitary landfills and waste-to-energy systems, and ensure their effective implementation and maintenance.

In response to these mounting challenges, the Government of Mizoram initiated a Public-Private Partnership (PPP) model for MSWM in Aizawl on October 4, 2010. While the PPP model in Aizawl may not fully align with the ideal concept of a PPP, it represents a significant shift towards involving the private sector in waste management. The partnership has garnered a positive response from the local population, and both the government and the people of Aizawl have made concerted efforts towards achieving sustainable MSWM. This initiative has provided a platform for mobilizing resources, improving waste management infrastructure, and fostering public engagement in waste reduction practices (Government of Mizoram, 2011).

Several legislative milestones have played a key role in shaping Aizawl's SWM framework. The enactment of The Mizoram Municipalities Act, 2007, and its subsequent amendments, laid the groundwork for urban local bodies to manage solid waste effectively. The introduction of The Mizoram Urban Sanitation and Solid Waste Management Policy, 2011, and the official notification of the PPP model in 2010, further strengthened the regulatory and policy framework for waste management in Aizawl. These milestones have been pivotal in driving democratic decentralization and creating new partnerships between the government, private sector, and citizens, setting the pace for a more effective and collaborative approach to waste management in the city (Government of Mizoram, 2011).

While Aizawl has made notable progress, ongoing efforts are required to overcome the challenges of waste segregation, transportation, disposal, and recycling. Strengthening the technical capabilities of the AMC, improving infrastructure, and addressing policy gaps are essential for ensuring the long-term sustainability of the city's waste management system. The PPP model has proven to be a valuable tool in addressing some of these challenges, and with continued investment in capacity building and public awareness, Aizawl can develop a more efficient and sustainable waste management system. The city's experience can serve as a valuable model for other urban centres in India, demonstrating how collaborative efforts and legislative support can help tackle the complex issue of municipal solid waste management.

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