Achieving Garbage Free Cities as per SBM 2.0- Potential City Level Approach

Research Study
2023-24

Preface

The rapid urbanization and population growth in Indian cities have brought about significant challenges in managing municipal solid waste. Addressing these challenges is crucial not only for ensuring urban sustainability but also for safeguarding public health. The Swachh Bharat Mission 2.0 (SBM 2.0) represents a renewed commitment by the Government of India to enhance cleanliness and sanitation across the country. This mission emphasizes sustainable waste management practices and aims to achieve garbage-free status for Indian cities.

This research study, "Towards Garbage-Free Indian Cities: A City-Level Approach under Swachh Bharat Mission 2.0," is significant as it tackles a critical aspect of urban sustainability and public health. By proposing city-level strategies to achieve garbage-free status, this study aims to contribute towards the ambitious goals of SBM 2.0. It seeks to promote sustainable waste management practices, encouraging cities to adopt innovative and effective approaches tailored to their unique contexts.

Achieving garbage-free cities in India is a complex yet achievable goal. It requires a coordinated effort from municipal authorities, communities, and various stakeholders at the city level. Through this research, we aim to provide valuable insights and practical recommendations that will support the effective implementation of SBM 2.0. Our objective is to contribute to the creation of sustainable, clean, and healthy urban environments across India.

We hope that this study will serve as a useful resource for policymakers, urban planners, and practitioners working towards enhancing waste management systems in Indian cities. By fostering a deeper understanding of the challenges and opportunities associated with waste management, we aspire to inspire and drive the collective effort needed to build garbage-free cities under the vision of SBM U 2.0.

Acknowledgement

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Abbreviations

1. ASSOCHAM - Associated Chambers of Commerce and Industry of India
2. CPCB - Central Pollution Control Board
3. DHW - Domestic Hazardous Waste
4. GFC – Garbage Free City
5. GoI – Government of India
6. IEC - Information, Education, and Communication
7. IMC - Indore Municipal Corporation
8. MoEF – Ministry of Environment & Forest
9. MoUD – Ministry of Urban Development
10. MSW - Municipal Solid Waste
11. NGO – Non-Government Organization
12. PPP - Public-Private Partnerships
13. RDF - Refuse-Derived Fuel
14. RWA - Resident Welfare Associations
15. SBM – Swachh Bharat Mission
16. SDG – Sustainable Development Goal
17. SHG – Self Help Groups
18. SOP - Standard Operating Procedures
19. SPCB - State Pollution Control Boards
20. SLA - Service Level Agreements
21. SLB - Service Level Benchmarks
22. SMART - Single Metric for Achieving Results Together
23. SMC – Surat Municipal Corporation
24. SWM- Solid waste management
25. TAG - Technology Advisory Group
26. ULB – Urban Local Body

Chapter 1 – Introduction

1.1 Background and Scope:

India, a land of diverse cultures and rich heritage, is undergoing rapid urbanization, with cities emerging as centers of economic growth and development. However, alongside this urban growth comes the formidable challenge of managing municipal solid waste (MSW), which poses serious environmental and public health concerns.

Managing the cleanliness of cities is an immense task that cannot be accomplished by any single entity alone. The scale of the problem is too vast for municipal bodies or the private sector to handle it independently, and it exceeds the capacity of community-based groups and citizens working in isolation. Effective urban cleanliness requires a collaborative effort where all these groups work together towards a shared goal.

In India, the responsibility for managing MSW lies with Urban Local Bodies (ULBs). This duty was reinforced by the 74th Amendment to the Indian Constitution in 1992, which included solid waste management in the 12th Schedule listing the functions of urban local bodies.

The lack of effective execution by ULBs was brought to the attention of the Hon'ble Supreme Court of India through public interest litigation in 1996. The Supreme Court responded by establishing a committee of experts to recommend improvements in city waste management systems. The Government of India, largely based on this committee's report, enacted the Municipal Solid Waste Management & Handling Rules, 2000 (MSW Rules), under the Environment Protection Act, 1986.

Solid Waste Management (SWM) is a systematic process that encompasses the storage, collection, transportation, processing, and disposal of solid waste in engineered sanitary landfills. It involves various collection methods, transportation equipment, storage solutions, recovery mechanisms for recyclable materials, and waste reduction techniques such as composting, refuse-derived fuel (RDF), waste-to-energy conversion, and disposal in designated landfills.

The choice of an appropriate SWM process depends on the source and quality of the waste generated. Solid waste originates from numerous sources, including households (kitchen and yard waste), commercial areas (shops, hotels, and restaurants), industries (raw materials and packaging), institutions (schools, hospitals, and offices), construction and demolition sites, animal carcasses and manure, parks (fallen branches and leaves), and streets (sand, silt, clay, concrete, bricks, asphalt, residues from air deposition, and dust).

Approximately 1,32,000 metric tons of municipal solid waste are generated daily from urban areas across India. In major cities, the per capita waste generation ranges from 300 to 550 grams per day (Paveen kumar, 2024). Generally, waste collection efficiency in metro cities ranges between 70 to 90%, while in many small and medium-sized cities, it is below 50%. ULBs spend between Rs. 700 to Rs. 1500 per ton on the collection, transportation, treatment, and disposal of solid waste (NIUA 2020).

With the growth in urban population, per capita income, commerce, and industry, there has been a significant increase in the quantity and complexity of solid waste generated in Indian cities. This trend is

expected to continue in the foreseeable future. Proper disposal of urban waste is essential not only for public health but also for resource recovery and urban environmental management.

In response to these challenges, the Swachh Bharat Mission (SBM) was launched in 2014. It marked a significant milestone in India's efforts towards achieving cleanliness and sanitation. Building upon the success of SBM U Phase I, the government then introduced SBM U 2.0, with a renewed focus on sustainable waste management and the ambitious goal of achieving Garbage-Free Cities (GFC). It represents a renewed commitment by the Government of India to achieve cleanliness, hygiene, and sanitation across the nation. Building upon the successes and lessons learned from SBM U Phase I.

The COVID-19 pandemic had a profound impact on waste generation patterns across Indian cities. Initially, the pandemic led to a surge in waste production due to increased use of disposable personal protective equipment (PPE), such as masks and gloves, and heightened consumption of packaged goods. This surge strained existing waste management systems, as cities grappled with managing the additional burden of healthcare-related waste. However, the pandemic also prompted significant improvements in waste management practices. Cities adopted stricter protocols for handling and disposing of medical and hazardous waste and accelerated the adoption of digital waste tracking systems. Public awareness campaigns and increased community participation in waste segregation were also emphasized to adapt to new challenges. As a result, several cities witnessed a gradual reduction in waste generation and improved management practices as they adjusted to the new realities brought about by the pandemic.

The challenge of waste management in Indian cities is multifaceted, encompassing issues such as inadequate infrastructure, inefficient collection systems, lack of awareness, and poor segregation practices. Addressing these challenges requires a holistic and integrated approach, with active participation from various stakeholders at the city level. SBM-U 2.0 recognizes the importance of city-level interventions and emphasizes the need for innovative strategies to achieve its objectives.

In this context, this research study aims to explore the potential city-level approaches for achieving garbage-free status in Indian cities under SBM-U 2.0. By examining the status of waste management, identifying key challenges, and proposing tailored strategies, this study seeks to contribute towards the realization of the SBM 2.0 goals and the broader agenda of sustainable urban development in India.

Figure 1: Clean City

Drawing upon examples from diverse Indian cities such as Mumbai, Delhi, Bengaluru, Kolkata, Chennai, Pune, and Hyderabad, this research will analyze the unique waste management challenges and opportunities faced by each city. These examples will serve to illustrate the varying contexts and complexities of waste management in different urban settings across India.

The introduction chapter sets the stage for the research by providing an overview of the significance of the topic, the context of SBM 2.0, and the rationale for focusing on city-level approaches. It outlines the objectives of the research, the methodology adopted, and the expected outcomes.

By delving into these aspects, this research paper aims to provide a comprehensive understanding of the challenges and opportunities in achieving garbage-free Indian cities and to offer actionable insights for policymakers, urban planners, and related stakeholders.

In the subsequent chapters, the study will delve deeper into the current state of waste management in Indian cities, analyze case studies to identify best practices and lessons learned, propose city-level approaches and strategies, and provide recommendations for enhancing waste management under SBM 2.0. Through this research endeavor, we aspire to contribute towards building cleaner, healthier, and more sustainable cities in India.

Chapter 2 - Rationale of Garbage-Free Cities in India

2.1 Early Interventions:

The Swachh Bharat Mission – Urban (SBM-U), launched in 2014, marked a significant step towards achieving cleanliness and sanitation in India. While SBM U Phase -I made considerable progress in improving sanitation infrastructure and promoting hygiene practices, challenges in waste management persist, especially in urban areas. This chapter delves into the background and rationale of the Garbage-Free Cities (GFC) initiative in India, highlighting the need for innovative approaches to address waste management challenges and create sustainable urban environments.

Over the past two and a half decades, the Government of India has undertaken numerous initiatives to enhance Solid Waste Management (SWM) practices across the country. Some key initiatives and recommendations are highlighted below:

I. Asim Burman Committee (1998):

In response to Writ Petition No. 888 of 1996, the Hon'ble Supreme Court of India constituted a committee on January 16, 1998, under the chairmanship of Mr. Asim Burman, Municipal Commissioner of Kolkata Municipal Corporation, to examine all aspects of solid waste management in Class-I cities of India. Known as the Burman Committee, it identified deficiencies in the existing SWM system and produced the "Interim Report on SWM Practices in Class I Cities." (Class I cities are those with populations ranging from 100,000 to 1,000,000.)

Key Recommendations of the Burman Committee:

- o Ban on waste disposal on streets
- o Storage of waste at the source
- o Doorstep waste collection
- o Daily street sweeping
- o Defined work norms for street sweeping
- o Installation of litter bins in public places
- o Elimination of open waste storage sites and unhygienic street bins
- o Synchronization of waste transportation with storage facilities to eliminate manual waste loading
- o Conversion of organic and biodegradable waste into bio-organic fertilizer (compost)
- o Caution against using unproven technologies
- o Criteria for site selection, development, and landfill operations
- o Institutional strengthening and capacity building g
- o Participation of NGOs and the private sector in SWM services
- o Enforcement measures
- o Management Information Systems (MIS)
- o Financial aspects, including support from state and central governments

- o Health and legal considerations
- o Public awareness strategies
- o Technology mission for solid waste management

II.   Technology Advisory Group (TAG) on Solid Waste Management:

Following the Burman Committee's recommendations, the Supreme Court directed the then Ministry of Urban Development, now Ministry of Housing & Urban Affairs (MoHUA), Government of India (GoI) to establish a Technology Advisory Group (TAG) on Solid Waste Management in August 1999. This group was tasked with collecting information on proven technologies for waste processing and disposal, identifying appropriate and cost-effective technologies suitable for Indian conditions, and providing technical assistance to urban local bodies (ULBs) in adopting these technologies.

Three core groups were formed under TAG:

- o Appropriate technology, research, and development
- o Financial resources and private sector participation
- o Capacity building, human resource development, and Information, Education, and Communication (IEC)

III.   Municipal Solid Waste Management Rules, 2000:

In September 2000, the Ministry of Environment & Forests (MoEF) notified the 'Municipal Solid Waste (Management and Handling) Rules, 2000'. These rules mandated ULBs to enhance their waste management systems by the end of 2003. Developed under Sections 3, 6, and 25 of the Environment Protection Act, 1986, the rules aimed to standardize and enforce SWM practices in urban areas.

IV.   Service Level Benchmarks (SLBs)

The urban sector in India has been experiencing rapidly increasing challenges, prompting government agencies at various levels to address gaps in service delivery. One crucial step towards improving urban services was the implementation of effective systems for information management, performance monitoring, and benchmarking. Unfortunately, many ULBs lack reliable baseline data on service level indicators, which hinders the assessment of service delivery performance improvements. This absence of realistic data complicates performance improvement planning and decision-making at both the city and state levels.

To address this issue, it is essential to establish a mechanism for the periodic measurement of service level performance at ULBs. To streamline this process, the MoHUA GoI developed a standardized Service Level Benchmarks (SLBs) framework for monitoring and reporting on service level indicators, along with guidelines for operationalizing this framework.

Benchmarking is recognized as a vital tool for introducing accountability in service delivery. Sustained benchmarking can help Municipal Corporations and Utilities identify performance gaps and implement improvements by sharing information and best practices, ultimately leading to enhanced services for citizens. The MoHUA, GoI has developed a framework encompassing water supply, wastewater management,

stormwater drainage, solid waste management services, and urban transport. This initiative resulted in the creation of a Handbook of Service Level Benchmarks (SLBs), which provides

(i) a common minimum framework for monitoring and reporting on service level indicators, and
(ii) guidelines for operationalizing this framework in phases.

The initiative covers essential components of a benchmarking system, including data sources, performance indicators, targets, and institutional arrangements. It addresses performance monitoring for internal decision-making and reporting to higher levels of government and Municipal Corporations.

Why Benchmarking?

Benchmarking is essential for driving continuous improvement and accountability in urban service delivery. It allows municipalities to measure their performance against defined standards, identify gaps, and implement targeted improvements to enhance service quality and efficiency. For continual improvement in performance to achieve benchmarks:

- o Comparison with peers
- o Quantifying outcomes of investments in services by focusing on service delivery rather than infrastructure
- o Identifying gaps, planning, and prioritizing improvement measures
- o Linking investment decisions to service outcomes
- o Enabling the identification and sharing of good practices
- o Improving accountability to citizens
- o Enhancing transparency through regular disclosure of information
- o Establishing a framework that can underpin contracts/agreements with service providers

Performance Indicators:

Each sector has key performance indicators (KPIs) that are widely understood by stakeholders. In the urban sector, various performance indicators related to urban management and service delivery have been defined, measured, and reported. However, past initiatives in performance management have encountered several key limitations:

- o Different initiatives have defined different sets of performance indicators.
- o Definitions or assessment methods for the same performance indicator can vary, hindering inter-city or intra-city comparisons.
- o Many measurement exercises have been externally driven, leading to issues of ownership of performance reports.
- o Most performance measurement initiatives have not been institutionalized, limiting the benefits of monitoring performance trends over time.
- o The process of performance measurement has often not progressed into performance management.

These limitations suggest that systems for measuring performance and taking further action have not been fully institutionalized within urban agencies. Therefore, it is crucial that a basic minimum standard set of

performance parameters is commonly understood and utilized by all stakeholders. Additional performance parameters can be defined and used as needed.

Measuring the Service Level Benchmarks (SLBs) of municipal bodies implies assessing outcomes and indirectly reflects on institutional capacity, financial performance, and other parameters. Service level parameters can be measured from the perspective of utility managers/planners or from the perspective of citizens or consumers. Furthermore, to facilitate comparisons between cities/service delivery jurisdictions and track changes in performance over time, it is important that performance levels are benchmarked and monitored against these benchmarks.

These efforts illustrate the government's commitment to addressing urban waste management challenges and initiatives like the Swachh Bharat Mission Urban 2.0, which continues to build on these foundational steps to achieve cleaner, garbage-free cities.

Figure 2: Zero Waste

Urban areas in India are confronted with a multitude of waste management challenges, which encompass insufficient infrastructure as well as ineffective methods of collection and disposal. Changing consumption patterns, accelerated urbanization, and population expansion have all contributed to the exacerbation of these difficulties. Important issues consist of:

- **Insufficient waste segregation:** at the point of origin impedes recycling endeavors and results in the commingling of biodegradable and non-biodegradable materials.
- **Inefficient Collection Systems:** A significant number of municipalities contend with shoddy waste collection systems, which lead to inconsistent or insufficient collection services.
- **The lack of adequate processing infrastructure** further compounds the dependence on landfills as a means of waste treatment and processing, resulting in detrimental environmental conditions and health risks.
- **Irregular Waste Disposal:** Open discarding, burning, and other forms of improper waste disposal result in the contamination of air, soil, and water resources, thereby presenting environmental and public health hazards.

2.2 Rationale for the Garbage-Free Cities Initiative:

The Garbage-Free Cities (GFC) initiative is a comprehensive approach launched under the Swachh Bharat Mission Urban 2.0 with the objective of creating cleaner and more sustainable urban environments across India. This initiative addresses the multifaceted challenges of waste management in Indian cities, such as inadequate infrastructure, high population density, and the presence of informal waste sectors. GFC aims to mitigate environmental damage through sustainable practices, promote public health by reducing exposure to hazardous waste, and enhance urban livability by maintaining clean cities that attract investment and

tourism. By aligning with the Sustainable Development Goals (SDGs), particularly Goal 11 (Sustainable Cities and Communities) and Goal 12 (Responsible Consumption and Production), the GFC initiative fosters community participation and encourages innovative solutions to waste management challenges. The primary objective of the Garbage-Free Cities initiative is to generate sustainable, healthier, and clearer urban environments in response to the issues. Multiple considerations form this initiative's rationale:

➢ **Environmental Sustainability:** Effective waste management is crucial for natural resource conservation and the preservation of environmental quality. The Green-cycle carbon initiatives mitigate the ecological damage caused by waste through the implementation of sustainable practices, promotion of recycling, and reduction of waste generation.

➢ **Public health:** Substandard waste management practices give rise to hazardous public health, encompassing the proliferation of pathogens, contamination of food, potable water sources, air and water pollution. By enhancing waste management infrastructure, endorsing hygiene practices, and minimizing exposure to hazardous waste, GFC initiatives prioritize public health.

➢ **Urban livability:** When cities are kept clean and effectively managed, it facilitates new investment opportunities, tourism, and expands the economic scope for the locals. By encouraging community participation and pride in city sanitation, reducing pollution, and enhancing cleanliness can create more sustainable urban environments.

➢ **Ensuring adherence to the Sustainable Development Goals (SDGs):** The GFC initiatives are in accordance with the Sustainable Development Goals (SDGs), specifically Goal 12 (Responsible Consumption and Production) and Goal 11 (Sustainable Cities and Communities). The promotion of sustainable waste management practices is how GFC initiatives aid in the realization of these worldwide development objectives.

The Garbage-Free Cities initiative in India represents a holistic approach to addressing waste management challenges and creating environmentally sustainable urban areas. To achieve the vision of clean, sustainable, and garbage-free cities - policymakers, urban planners, and stakeholders must understand the initiative's background and rationale, enabling them to develop and implement effective strategies.
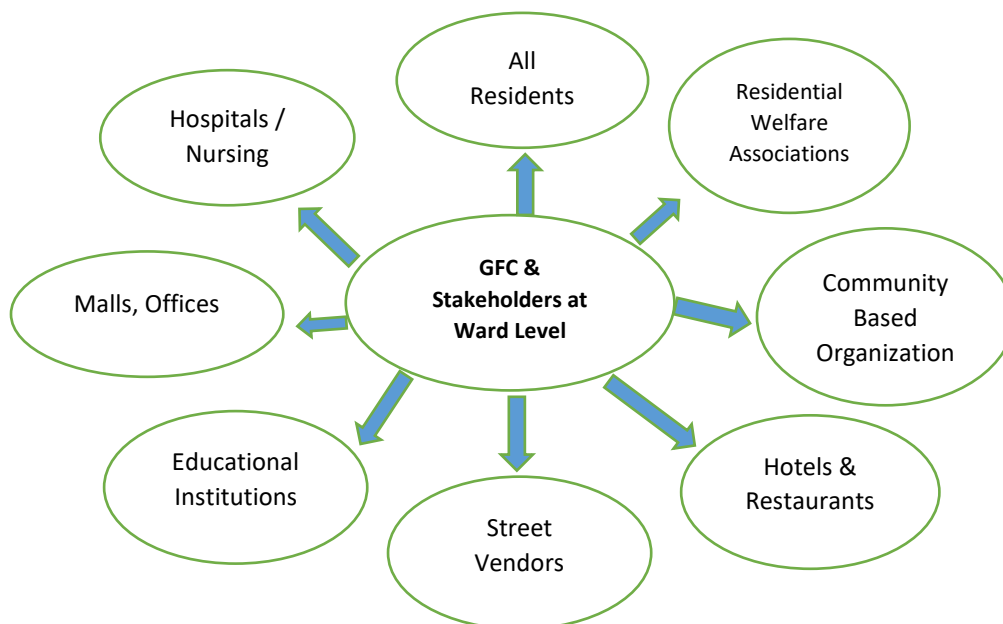
Figure 3: GFC Stakeholders

2.3 Challenges in Solid Waste Management:

Waste management in Indian cities poses a myriad of challenges that stem from rapid urbanization, population growth, and inadequate infrastructure. The complexities of waste management are compounded by factors such as inadequate waste collection systems, inefficient disposal practices, and a lack of awareness among citizens. The high population density in urban areas further exacerbates these challenges, leading to increased waste generation and accumulation. Reflecting on the Burman Committee's recommendations, there is a crucial need for capacity building, skill development, and knowledge management. Awareness programs should educate the public on the importance of waste segregation, recycling, and composting. By involving community leaders and using media platforms, these programs can effectively reach a larger audience and instill a sense of responsibility towards maintaining a clean environment.

Additionally, the presence of an informal waste sector and inconsistent policy implementation further complicates formal waste management efforts. Addressing these challenges requires innovative solutions, community engagement, and collaborative efforts from various stakeholders to build sustainable waste management systems that ensure the cleanliness, health, and well-being of urban residents.

   a. Inadequate Infrastructure: Many Indian cities lack proper waste management infrastructure, including waste collection systems, treatment facilities, and disposal sites.

   b. Population Density: High population density in urban areas exacerbates waste management challenges, leading to increased generation and accumulation of waste.

   c. Lack of Awareness: There is a need for greater awareness among citizens regarding waste segregation, recycling, and responsible disposal practices.

   d. Informal Waste Sector: The presence of an informal waste sector complicates formal waste management efforts and often leads to inefficient practices.

   e. Policy Implementation: Inconsistent enforcement of waste management policies and regulations at the local level hampers effective implementation.

2.4 Research Methodology:

The research methodology employed in this study involves a comprehensive secondary data analysis of case studies from representative cities across India. The selected case studies include Chennai, Indore, Pune, and Surat, chosen for their diverse waste management practices, challenges faced, and lessons learned. Secondary data analysis offers a systematic approach to examining existing data and literature related to waste management in these cities, allowing for a thorough understanding of their waste management strategies and experiences.

a.   Data Collection Method:

Secondary data for the case studies was collected from various sources, including academic articles, government reports, policy documents, and other authoritative sources. The data encompasses information

on waste management practices, infrastructure, policies, regulations, stakeholder engagement initiatives, and outcomes related to cleanliness and sustainability.

b. Data Analysis Techniques:

The collected data was analyzed using qualitative content analysis techniques. This involves systematically categorizing and interpreting the data to identify key themes, patterns, and insights related to waste management in the selected cities. The analysis will focus on understanding the effectiveness of waste management practices, the challenges faced by each city, and the lessons learned from their experiences.

Comparative Analysis: A comparative analysis was conducted to identify similarities and differences in waste management approaches, challenges, and outcomes across the selected case studies. This involved examining common themes and trends while also highlighting unique aspects of each city's waste management experience.

Secondary data analysis of case studies from Chennai, Indore, Pune and Surat as representative cities in India offers a robust methodology for examining waste management practices, challenges, and lessons learned. By systematically analyzing existing data and literature, this research's aim was to contribute to the understanding of effective waste management strategies across the country and inform policy decisions aimed at achieving garbage-free status in Indian cities.

Chapter 3 - Garbage-Free Cities (GFC) Initiatives in India
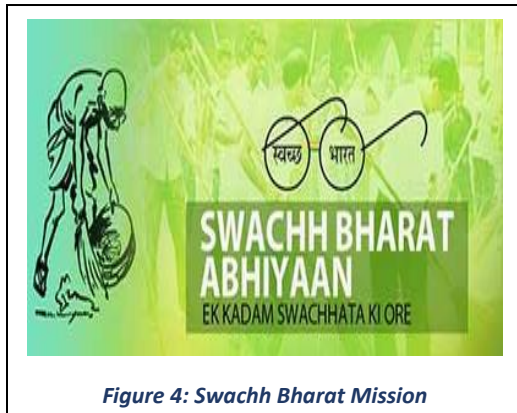
3.1 Swachh Bharat Mission - Urban (SBM)

Figure 4: Swachh Bharat Mission

The Honorable Prime Minister launched Swacch Bharat Mission Urban 2.0 with the overall vision of creating Garbage Free Cities by Placing India on a new trajectory of growth towards an ecosystem of holistic waste management and sanitation.

The Swachh Bharat Mission – Urban (SBM-U) marked a significant step towards achieving cleanliness and sanitation in India. While SBM Phase-I made considerable progress in improving sanitation infrastructure and promoting hygiene practices, challenges in waste management persist, especially in urban areas. This chapter delves into the background and rationale of the Garbage-Free Cities (GFC) initiative in India, highlighting the need for innovative approaches to address waste management challenges and create sustainable urban environments.

Urban areas in India are confronted with a multitude of waste management challenges, which encompass insufficient infrastructure as well as ineffective methods of collection and disposal.

Current Status and Impact of SBM-U 2.0 across the Indian cities:

➢ **ENHANCED WASTE MANAGEMENT INFRASTRUCTURE IN INDORE, MADHYA PRADESH:**

Indore has maintained its position as India's cleanest city for four consecutive years (2017-2020) in the Swachh Survekshan (SS) rankings. Under SBM U 2.0, the city has continued to enhance its waste management infrastructure, including the introduction of advanced waste segregation facilities and composting units. As of 2023, Indore processes 100% of its organic waste into compost, significantly reducing the amount of waste sent to landfills.

Indore has also opted for bio-mining, removing 15 lakh metric tons of waste and reclaiming 100 acres of land. Bhopal used a combination of bio-mining and bio-capping on 37 acres of land, demonstrating effective waste management and land reclamation strategies.

➢ **COMMUNITY-DRIVEN INITIATIVES IN PUNE, MAHARASHTRA:**

Pune has successfully implemented a zero-garbage initiative, emphasizing waste reduction, recycling, and composting. Recent data from 2023 shows that Pune has achieved over 70% waste segregation at source (PMC 2023), with extensive community participation and awareness campaigns. The city has also established decentralized composting facilities in various residential areas, contributing to the reduction of organic waste.

➢ **PUBLIC-PRIVATE PARTNERSHIPS AT BENGALURU, KARNATAKA:**

Bengaluru has leveraged public-private partnerships (PPPs) to enhance its waste management capabilities. By collaborating with private waste management companies, the city has implemented waste-to-energy plants and advanced recycling facilities. As of 2023, Bengaluru's waste-to-energy plants have a combined capacity of processing 5,000 tons of waste per day, generating renewable energy and reducing the reliance on landfills.

➢ **TECHNOLOGICAL INNOVATIONS IN SURAT, GUJARAT:**

Surat has implemented a Supervisory Control and Data Acquisition (SCADA) system to enhance its waste management processes. This system utilizes GPS-enabled vehicles for efficient waste collection and a digital monitoring system for real-time tracking of waste segregation and processing. The SCADA system has significantly improved Surat's waste collection efficiency, achieving a 90% success rate in 2023. By providing real-time data and insights, the SCADA system ensures timely service, better resource allocation, and increased transparency in waste management operations.

➢ **TECHNOLOGICAL INNOVATIONS IN VIJAYAWADA, ANDHRA PRADESH**

Vijayawada has implemented smart semi-underground waste collection bins with ultrasonic weight sensors and a bio methanation plant to process biodegradable waste. The city also uses real-time monitoring systems to ensure efficient waste management.

➢ **FINANCIAL SUSTAINABILITY IN AHMEDABAD, GUJARAT**

Ahmedabad has introduced innovative financing models to ensure the sustainability of its waste management programs. The city has implemented a waste management fee for households and commercial establishments, generating additional revenue to fund waste processing infrastructure. As of 2023, Ahmedabad has successfully reduced its waste management costs by 20% while improving service delivery and infrastructure.

➢ **SWACHH SURVEKSHAN 2023**

The Swachh Survekshan 2023 rankings highlighted the top-performing cities in waste management and cleanliness. Indore, Surat, and Navi Mumbai emerged as the cleanest cities in their respective categories. These cities were recognized for their innovative waste management practices, community engagement, and effective implementation of SBM U 2.0 guidelines.

Under SBM U 2.0, cities are focusing on source segregation of solid waste, utilizing the principles of the 3Rs (reduce, reuse, recycle), and scientific processing of all types of municipal solid waste. Legacy dumpsite remediation is a key component, involving techniques like bio-mining and bio-capping.

The present status and impact of SBM U 2.0 demonstrate significant progress in urban waste management across Indian cities. Enhanced infrastructure, community-driven initiatives, public-private partnerships, technological innovations, and financial sustainability are key factors contributing to the success of SBM U 2.0. By building on these successes and addressing ongoing challenges, Indian cities can move closer to achieving the vision of garbage-free, sustainable urban environments.

3.2 Solid Waste Management Rules, 2016

With the launch of the flagship programme by the Government of India, Swachh Bharat Mission Urban in 2014 that aims to provide basic infrastructural and service delivery with respect to sanitation facilities to every family, including toilets and adopting the scientific methods to collect, process and disposal of municipal solid waste. The mission focuses on quality and sustainability of the service provision as well as emphasising on the commitment on every stakeholder to bring about a visible change in society.

Figure 5 : Solid Waste Management

The Municipal Solid Waste comprises household waste, Commercial and Institutional waste, Marketing and Catering waste, Street sweepings and silt from Drains, Horticulture and dairy waste, Slaughterhouse waste, and Treated Biomedical Waste. In 2016, there was an introduction of new SWM Rules which were separately notified as below –

- o Solid Waste Management Rules, 2016
- o Plastic Waste Management Rules 2016
- o Construction and Demolition Waste Management Rules 2016
- o E – Waste Management Rules 2016
- o Biomedical Waste Management Rules 2016
- o Hazardous and Other waste management Rules 2016

As per the Central Pollution Control Board's (CPCB's) Annual Report (2020-21), India generates over 1.60 lakh tons of solid waste per day. Out of this, 95% is collected, amounting to 152,749.5 tons per day. Of the collected waste, 52.3% is treated, while 19.2% is sent to landfills. However, 31.7% of the total waste remains unaccounted for and is disposed of unscientifically.

Among states, Maharashtra generates the maximum solid waste (22,632.71 TPD), followed by Uttar Pradesh (14,710 TPD) and West Bengal (13,709 TPD). Chhattisgarh is notable for collecting and treating 100% of its waste, with no waste sent to landfills.

The CPCB's data indicates a gradual increase in per capita solid waste generation, from 118.68 gm per day in 2015-16 to 119.07 grams per day in 2020-21. There is also an increasing trend in the percentage of waste processed, rising from 19% in 2015-16 to 49.96% in 2020-21. Concurrently, the percentage of waste sent to landfills has decreased from 54% in 2015-16 to 18.4% in 2020-21 (CPCB 2021).
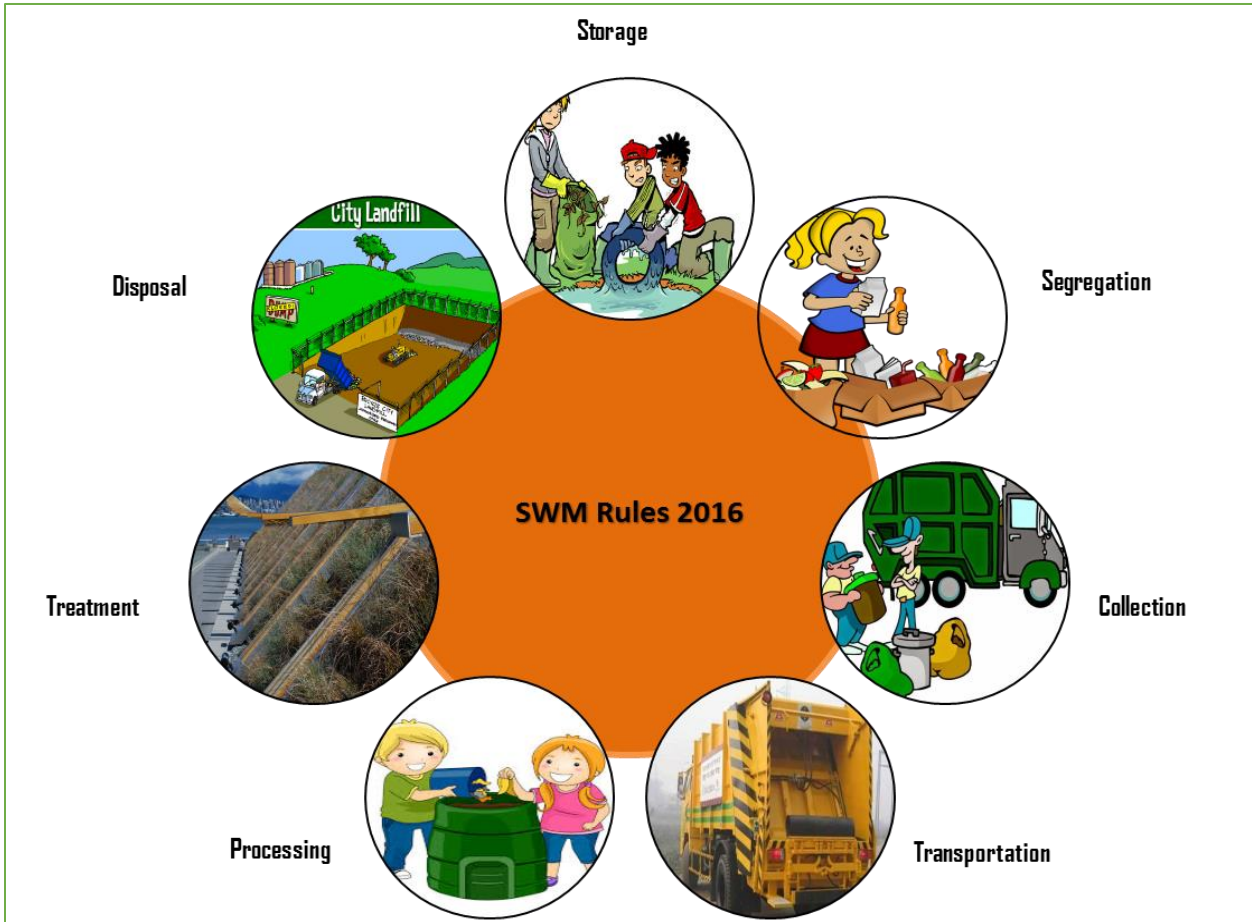
Figure 6: Salient Features of SWM 2016

3.2.1 Composition of Municipal Solid Waste:

The operational guidelines of Swachh Bharat Mission – Urban 2.0 highlight the composition of municipal solid waste in India:

- o Organic or compostable fraction: 40-60%
- o Recyclable or resource recoverable fraction: 20-30%
- o Non-recyclable or combustible (RDF): 10-20%
- o Construction and demolition (C&D) waste and unusable combustible: 5-15%

Sanitary landfills are designed for the safe disposal of residual solid waste and inert wastes, protecting against pollution of groundwater, surface water, and air. There are currently 305 constructed landfills in India, with 126 under construction and 341 in operation. Additionally, 3184 dumpsites exist, with 234 reclaimed and 8 converted into landfills.

A report by ASSOCHAM and PwC titled "Waste Management in India – Shifting Gears" estimates that by 2050, 50% of India's population will live in urban areas, and waste generation will grow by 5% annually. This growth necessitates significant land area for waste disposal. If current waste management practices continue, an estimated 88 square kilometers of land will be required for landfilling by 2050, equivalent to the size of the New Delhi Municipal Council area.

Garbage free City ensures a holistic evaluation across entire SWM which includes various components such as –

- Door to Door Collection of waste
- Source Segregation of waste (Dry, Wet, Sanitary & Domestic Hazardous Waste (DHW)) and E-waste
- Sweeping of public, commercial & residential areas, Waste Storage Bins, Litter Bins
- Scientific Waste Processing (Dry, Wet & DHW), Scientific Landfilling and Construction & Demolition (C&D) Waste Management
- Dumpsite remediation
- Bulk Waste Generators Compliance
- User Fees, Enforcement of Plastic Ban, Sale of waste by-products
- Geo-mapping of wards & processing facilities, Digital Monitoring of SWM Operations
- Citizen grievance redressal
- Waste reduction through on-site processing of wet waste
- Cleaning of storm water drains & water bodies, and screening of Nallahs
- City Beautification, IEC & Capacity building

Figure 7 : Door to Door Waste Collection

3.3 Star Rating Protocol:

Under the Swachh Bharat Mission Urban (SBM- U) in India, the Star Rating Protocol for Municipal Solid Waste Management (MSWM) is a system designed to assess and rate cities based on their cleanliness and effectiveness in waste management practices. The star rating is an evaluation mechanism that aims to incentivize cities to improve their waste management infrastructure, services, and overall cleanliness.

The Star Rating Protocol assesses cities on various parameters related to waste management, including:

1. Door-to-Door Collection: Evaluates the effectiveness of door-to-door waste collection services in the city, including frequency, coverage, and efficiency.

2. Waste Segregation: Assesses the extent to which households and institutions segregate their waste into categories such as biodegradable, non-biodegradable, and hazardous waste.

3. Processing and Disposal: Examines the city's capacity for waste processing and disposal, including the presence of treatment plants, landfill sites, and adherence to environmentally sound practices.

4. Open Defecation and Littering: Considers the prevalence of open defecation and littering in public spaces, streets, and other areas, reflecting the overall cleanliness of the city.

5. Behaviour Change Communication: Measures the effectiveness of awareness campaigns and behaviour change communication initiatives aimed at promoting cleanliness, waste segregation, and proper waste disposal practices among residents.

Figure 8: Star Rating Protocol

The Star Rating Protocol utilizes a rating system based on stars, with cities being awarded one to seven stars based on their performance across the parameters. Additionally, the protocol incorporates the **SMART (Single Metric for Achieving Results Together)** rating, which provides an overall assessment of a city's performance in waste management using a single numerical score. The SMART rating is calculated based on the city's performance on key indicators and is designed to facilitate easy comparison and benchmarking among cities.

Overall, the Star Rating Protocol, including the **SMART rating component**, serves as a valuable tool for assessing and incentivizing cities to improve their waste management practices and move towards the goal of achieving garbage-free status under the Swachh Bharat Mission.

S – Single Metric (One rating comprising all components of SWM)

M – Measurable (what % of door-to-door collection is taking place in the city? What % of waste is processed?)

A - Achievable (All parameters are based on citizen's expectations of the ULB therefore achievable)

R - Rigorous verification (Similar to ODF Certification, declarations and service levels of a city is assessed by Third Party Agency)

T - Targeted towards outcomes (Does not score on inputs, processes but solely on outcomes. E.g. dumpsite remediated, waste processed, etc.)

The **GFC 2022** has modified and updated few protocols from the older one which are as follows –

1. Mandatory participation by all ULBs
2. 24 components with two groups into 'Important' (1 & 3 Star – 16 components and 'Aspirational' indicators (5 & 7 Star – 24 components)
3. One step calculation
4. In-built weightage aligned with SBM – 2.0 objectives: source segregation, processing, dumpsite remediation etc.


Figure 9: Segregation of Waste at source

5. Geo-mapping (As separate components):
   • Waste Processing Facilities, incl. C&D waste, landfills, dumpsites, drains, nallahs, STPs
   • Ward boundaries
   • Water bodies, storm water drains, nallahs etc.
6. Digital declarations for ease of application
7. Progress to be digitally monitored by ULB and linked with SBM portal for 5 & 7 Star, in alignment with NUDM
8. Introduced following new components: a) IEC and Capacity Building b) Geo-mapping of city assets c) Sale of Waste by-products d) Digital monitoring of SWM Operations
9. Assessors to be centrally monitored by the Ministry.
   • Detailed profiles of assessors available on MoHUA, GoI's assessor portal with their qualifications and work experience.
   • Assessors are not from the same city or district where the assessment is taking place.

The mechanism for assessment of Star Rating is carried out in the following stages:

1. Self-Assessment – will be carried out as per the methodology of the protocol
2. Declaration of Star Rating - request to be communicated to MoHUA, GoI through the State Govt. request for third party verification.
3. Third Party Authority Certification (TPA) – MoHUA, GoI will take up independent verification and validation through a third-party agency and it will only recognize the MoHUA, GoI TPA certified/ re-certified cities. It will be valid for one year and city will have to be re-assessed and re-certified every 12 months.
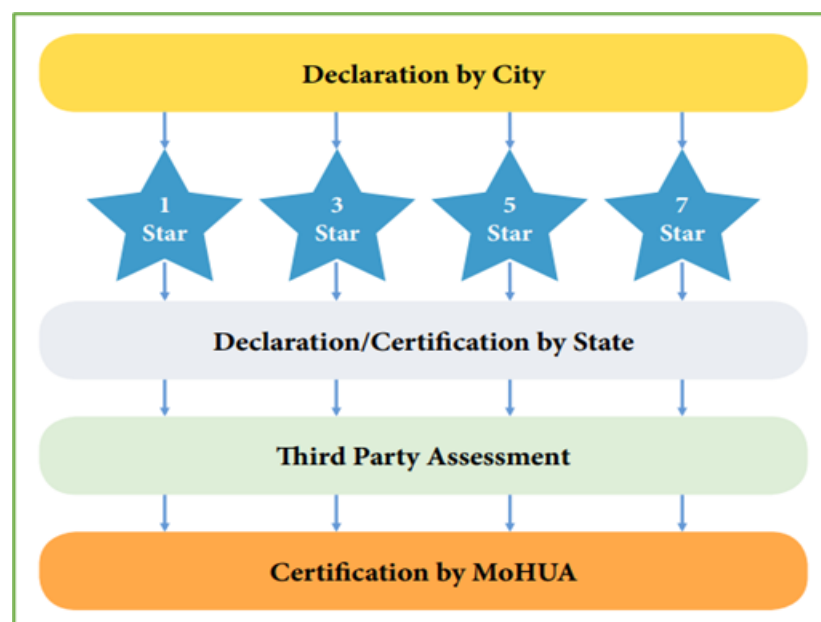
Figure 10: Star Rating Protocol

3.4 Swachh RWAs – Resident Welfare Associations

Resident Welfare Associations (RWAs) play a crucial role in the Swachh Bharat Mission's (SBM) goal of achieving garbage-free cities in India. As the urban population grows, RWAs have become essential in ensuring the cleanliness and sanitation of residential complexes, gated communities, and housing societies. The Ministry of Urban Development has recognized the significance of RWAs and has released Standard Operating Procedures (SOPs) to guide them in maintaining high standards of cleanliness and waste management.

The Swachh Bharat Mission Urban, launched on October 2, 2014, aims to make India clean and open defecation-free by October 2, 2019. Urbanization has increased pressure on housing, not only in terms of quantity but also quality. The SOPs for RWAs were developed to ensure that residential complexes meet minimum cleanliness standards, fostering a healthy living environment for residents.

RWAs manage residential complexes, gated communities, and housing societies, and they are tasked with ensuring that these areas adhere to high standards of cleanliness and waste management. The Ministry of Urban Development has developed Standard Operating Procedures (SOPs) for RWAs to guide them in their efforts to maintain clean and hygienic living environments.

3.4.1 Responsibilities of RWAs:

1. Compliance with SOPs

RWAs are responsible for ensuring that their residential complexes comply with the SOPs laid out by the Ministry of Urban Development. This involves:

- o Understanding and Implementing SOPs: RWAs must familiarize themselves with the SOPs and ensure their thorough implementation. This includes the establishment of a robust waste management system and regular monitoring to ensure adherence to prescribed standards.
- o Facility Management: Through their facility management service providers, RWAs must oversee daily operations related to sanitation and cleanliness within their premises.

2. Sanitation and Cleanliness Oversight

- o Regular Cleaning Schedules: RWAs must establish and enforce regular cleaning schedules for common areas, including lobbies, corridors, staircases, and recreational spaces. This ensures that all public areas are kept clean and hygienic.
- o Waste Management Practices: RWAs must implement effective waste management practices, including waste segregation at source, composting of organic waste, and proper disposal of non-recyclable materials. This includes providing color-coded bins for different types of waste and ensuring that residents comply with segregation guidelines.

3. Contracting External Agencies

- o Service Level Agreements (SLAs): When necessary, RWAs may contract external agencies to provide specialized cleaning and waste management services. They must draft and enforce SLAs to ensure these agencies meet the required standards.
- o Monitoring and Accountability: RWAs must regularly monitor the performance of these external agencies to ensure compliance with SLAs and take corrective actions if necessary.

4. Infrastructure Development

- o Sanitation Facilities: RWAs must ensure that adequate sanitation facilities, such as toilets and washrooms, are available and maintained in good working condition. These facilities must be accessible and hygienic to prevent any health hazards.
- o Waste Collection and Storage: RWAs must provide sufficient infrastructure for waste collection and storage, including strategically placed dustbins, waste segregation units, and composting facilities. Proper signage should be used to guide residents on waste disposal practices.

5. Community Engagement and Awareness

- o Awareness Campaigns: RWAs should conduct regular awareness campaigns to educate residents about the importance of cleanliness, hygiene, and proper waste management. This can include workshops, seminars, and distribution of educational materials.
- o Resident Participation: Encouraging active participation from residents in cleanliness drives, waste segregation initiatives, and other community-led activities is crucial. RWAs can organize events and competitions to foster a sense of ownership and responsibility among residents.

6. Health and Safety

- o Regular Inspections: RWAs must conduct regular surprise inspections to ensure that cleanliness standards are maintained and that there are no lapses in waste management practices.
- o Health Monitoring: RWAs should monitor the health of sanitation workers and provide them with necessary protective gear and health check-ups to ensure their safety and well-being.

7. Financial Management

- o Budget Allocation: RWAs need to allocate appropriate budgets for sanitation and waste management activities. This includes funding for infrastructure development, payment for external service providers, and costs related to awareness campaigns and community engagement activities.

o   Financial Support: RWAs should seek financial support from state and central governments for large-scale projects and infrastructural enhancements related to waste management.

8. Reporting and Documentation

o   Performance Reporting: RWAs must maintain detailed records of all activities related to waste management and cleanliness. Regular reports should be submitted to relevant municipal authorities to ensure transparency and accountability.

o   Data Management: Accurate data on waste generation, segregation, collection, and disposal must be maintained. This data is crucial for monitoring progress and planning future interventions.

Hence, RWAs are essential for the success of GFC initiatives as they serve as the primary interface between residents and municipal authorities. By effectively managing waste and maintaining cleanliness within residential complexes, RWAs contribute significantly to the overall cleanliness and sustainability of urban areas. Their role in fostering community participation and ensuring compliance with waste management practices is pivotal in achieving the goals of SBM U 2.0.

By adhering to these responsibilities and working collaboratively with residents, municipal authorities, and external agencies, RWAs have played a transformative role in making Indian cities garbage-free. This collective effort is vital for enhancing public health, preserving the environment, and creating cleaner, more livable urban spaces.

3.5 Role of 15th Finance Commission Grants in Achieving GFC

The 15th Finance Commission (FC) grants play a critical role in advancing India's waste management strategies, particularly in the pursuit of achieving Garbage-Free Cities.

The 15th FC has recognized the urgent need to improve waste management systems to achieve the SBM-U 2.0 objectives. Consequently, a significant portion of the grants have been earmarked for the development of robust waste management infrastructure. This includes the construction and upgradation of waste processing plants, building new waste processing facilities, and upgrading existing ones to handle increased waste volumes more efficiently. Additionally, investments have been made in modernizing waste collection and transportation systems, including the procurement of waste collection vehicles, installation of smart bins, and deployment of GPS-enabled tracking systems. Funds have also been directed towards the construction of sanitary landfills to ensure the safe disposal of residual waste, minimizing environmental impact.

Improving the delivery of waste management services is crucial for the sustainability of GFC initiatives. The 15th FC grants focus on enhancing the efficiency and effectiveness of these services through community participation and awareness programs, which support awareness campaigns and community participation programs to promote segregation at source and responsible waste disposal practices. Investment in

technology-driven solutions, such as automated waste collection systems and real-time monitoring platforms, has been a priority to streamline operations and enhance service delivery. Additionally, encouraging public-private partnerships (PPPs) has been a strategic approach to leverage private sector expertise and efficiency in waste management operations.

Capacity building is essential for ensuring that ULBs can sustainably manage waste. The 15th FC grants facilitate capacity building through training and development programs, with funds allocated for training municipal staff and waste management professionals in best practices and new technologies. Support for strengthening institutional frameworks, including the establishment of dedicated waste management cells within ULBs, has been a focus area. Additionally, grants are provided for technical assistance in the form of expert consultations, feasibility studies, and the development of comprehensive waste management plans.

The targeted use of 15th FC grants has led to measurable improvements in urban waste management systems. There has been a notable increase in the amount of waste processed and recycled, reducing the burden on landfills. Cities receiving 15th FC grants have shown significant improvements in cleanliness ratings, as assessed by the Swachh Survekshan surveys. Furthermore, the overall livability and environmental quality in urban areas have improved, contributing to better public health and well-being.

Thus, the 15th Finance Commission grants are instrumental in driving India's GFC initiatives by providing the necessary financial support for infrastructure development, service delivery enhancement, and capacity building in waste management. These efforts collectively contribute to creating cleaner, healthier, and more sustainable urban environments.

Chapter 4 - Waste Management Strategies

Effective waste management is essential for ensuring the cleanliness, sustainability, and public health of urban environments. Waste management strategies encompass a variety of approaches aimed at minimizing waste generation, promoting recycling and reuse, and ensuring proper disposal of residual waste. These strategies often include waste segregation at the source, community engagement and awareness programs, the establishment of integrated waste management systems, adoption of technology-driven solutions, and fostering public-private partnerships. By implementing these strategies, cities can mitigate the environmental impact of waste, optimize resource utilization, and create healthier and more livable urban spaces.

4.1 Effective Waste Management Strategies:

a. Segregation of waste at Source: Encouraging households and businesses to segregate waste at the source is essential for effective waste management. This involves separating biodegradable and non-biodegradable waste to facilitate recycling and composting.

b. Community Engagement: Engaging communities through awareness campaigns, citizen participation initiatives, and public education programs can promote behavioral change and encourage sustainable waste management practices.

c. Technology Adoption: Leveraging technology solutions such as smart waste bins, waste-to-energy plants, and mobile applications for waste tracking and management can enhance efficiency and transparency in waste management processes.

Figure 11: Waste Segregation

Figure 12: Integrated Solid Waste Management

d. Integrated Waste Management Systems: Implementing integrated waste management systems that encompass waste segregation, collection, transportation, treatment, and disposal ensures a comprehensive approach to waste management.

e. Public-Private Partnerships (PPP): Collaborating with the private sector to invest in and manage waste management infrastructure can improve service delivery and reduce the burden on municipal authorities.

4.2 Innovative Practices

In the journey towards achieving garbage-free cities (GFC) in India, several cities have implemented innovative strategies and initiatives that serve as examples for effective waste management. These best practices encompass a range of approaches, including decentralized composting, cleanliness drives, waste segregation programs, waste-to-energy projects, and zero garbage initiatives.

By highlighting these successful endeavors, this section aims to showcase the diverse strategies adopted by Indian cities to tackle the challenges of waste management and move closer to the vision of clean, sustainable, and garbage-free urban environments.

The following examples provide insights into the diverse approaches adopted by Indian cities towards achieving garbage-free status, along with the latest data showcasing their effectiveness.

- ❖ **Chennai's Decentralized Composting:** Chennai has implemented decentralized composting facilities to manage organic waste at the source, reducing the burden on landfills and promoting organic farming. As of 2023, Chennai's decentralized composting initiative has resulted in a reduction of over 30% in organic waste sent to landfills, contributing to a more sustainable waste management system.
- ❖ **Surat's Cleanliness Drive:** Surat's proactive approach towards cleanliness, including regular waste collection, street sweeping, and community involvement, has helped transform it into one of the cleanest cities in India. According to the Swachh Survekshan rankings of 2022, Surat was ranked as the 2nd cleanest city in India, showcasing the effectiveness of its cleanliness initiatives.
- ❖ **Indore's Waste Segregation Program:** Indore's successful waste segregation program involves extensive citizen engagement, awareness campaigns, and strict enforcement of waste segregation rules, resulting in significant improvements in waste management. With over 85% of households actively participating in waste segregation, Indore has been ranked as the cleanest city in India in the Swachh Survekshan rankings consecutively for 4 years since 2020.
- ❖ **Bengaluru's Waste-to-Energy Plants:** Bengaluru has invested in waste-to-energy plants to convert non-recyclable waste into electricity, reducing landfill dependency and mitigating environmental pollution. The waste-to-energy plants in Bengaluru have the capacity to generate over 100 MW of electricity from waste, contributing to both waste management and energy production goals.

❖ **Pune's Zero Garbage Initiative**: Pune's zero garbage initiative focuses on reducing waste generation through awareness campaigns, promoting recycling and composting, and implementing penalties for littering, contributing to a cleaner and greener city. Under this initiative, Pune has achieved a significant reduction in waste sent to landfills, with over 60% of waste being diverted towards recycling and composting facilities.

Achieving garbage-free cities in India requires concerted efforts from all stakeholders, including government bodies, communities, and the private sector. By addressing the challenges in waste management, implementing effective strategies, and adopting best practices from successful case studies, Indian cities can move closer to realizing the vision of clean, sustainable, and garbage-free urban environments.

4.3 Citizen Awareness and Community Participation

The SWM Rules, 2016 direct ULBs to create public awareness through information, education, and communication (IEC) campaigns and educate the waste generators to minimize waste and prohibit littering. Municipal authorities should organize awareness generation programs promoting segregation of waste and recycling or reuse of segregated waste. The communities should be educated, informed, and trained on waste segregation. ULBs should sensitize citizens to associated environment and health hazards of improper waste management. Further, the citizens should be made aware of the need to pay user fees or charges to ensure sustainability of the MSWM services.

Involvement of RWAs, CBOs, NGOs, Self-Help Groups (SHGs), and market associations is imperative to ensure the success of segregation at source. Regular meetings among the ULB staff and representatives of RWAs, market associations, NGOs, SHGs, and other stakeholders should be held until the community fully adopts this practice. The ULB through the NGOs, Rotary clubs, CBOs, and other such organizations should conduct school-level awareness and education programs focusing on segregation at Source; waste minimization through reduce, reuse, and recycle; and the importance of proper management of waste.

Engaging in group discussions led by effective communicators is essential for promoting cleanliness initiatives. For instance, in schools during parent-teacher meetings, teachers can emphasize the importance of proper waste disposal and demonstrate vermiculture processes. This educates parents and children, encouraging waste segregation at home. Shopkeepers can be addressed during their association meetings to promote proper disposal of recyclable materials and reduce plastic bag usage. Similarly, industrial waste generators should be educated through workshops, with expert assistance for legal and technical issues.

Figure 13: IEC Workshop at School

Involving hawkers in cleanliness campaigns through their union leaders is crucial, as hawkers play a significant role in urban areas. Educating them on hygienic practices and proper waste disposal is vital. Awareness about anti-spitting and non-littering can be raised through office meetings during lunch hours, utilizing audio-visual aids like slides, pictures, posters, skits, and films for greater impact.

Celebrating cleansing or zero-garbage days mobilizes the community and publicizes the cause, demonstrating that maintaining cleanliness is achievable. Continuous reminders through strategic hoardings and street plays reinforce the message. Competitions, such as slogan contests, can also engage the public.

Involving youth groups during festivals like Ganeshostav and Navratra Pooja through competitions and skits can further promote cleanliness. In slums, organizing 'Walkathons' with local leaders and clubs, and arranging talks can spread the message effectively. Utilizing television and video films on cleanliness in slums and organizing environmental competitions can aid in municipal cleansing drives.

Radio, television, films, magazines, and newspapers are crucial for disseminating cleanliness reminders and updates to the masses. Regular reinforcement is necessary to affect behavioral and attitudinal changes, making repetition of activities essential.

For significant attitudinal and behavioral changes towards cleanliness, IEC activities are pivotal. Methods include:

- o Individual Discussions: Motivated individuals adopting new behaviors should communicate effectively to influence others.
- o Mass Education: Messages on cleanliness, like avoiding plastic bags, should target both consumers and shopkeepers for widespread impact.

Implementing IEC strategies is critical for promoting waste segregation and decentralized waste management. Sustainable solid waste management relies on multifaceted IEC approaches to ensure community participation in clean city programs.

4.4 Citizen Swachhata App: An ICT Initiative for Enhanced Sanitation Management

The Swachhata App is a significant Information and Communication Technology (ICT) initiative launched by the Ministry of Housing and Urban Affairs (MoHUA), Government of India (GoI), under the Swachh Bharat Mission Urban (SBM-U). This innovative app serves as a powerful tool to bridge the gap between citizens and municipal authorities by enabling the direct reporting of sanitation-related issues. Designed to enhance citizen engagement and ensure the timely resolution of complaints, the Swachhata App embodies the principles of transparency, accountability, and participatory governance.

Key Features of the Swachhata App:

i.   **User-Friendly Interface:** The app boasts a user-friendly interface, making it accessible to a broad demographic, including those with limited technological proficiency. Users can easily navigate through the app to lodge complaints and track their status.

ii. **Real-Time Reporting:** Citizens can report various sanitation issues such as garbage dumps, overflowing dustbins, potholes, and waterlogging. The app allows users to take photographs of the problem areas and upload them with precise

Figure 14: Swachhata App

geotagging, ensuring accurate location details for municipal action.

iii. **Instant Acknowledgment and Tracking:** Upon submission of a complaint, the app provides instant acknowledgment, giving citizens confidence that their concerns are being addressed. The app also includes a tracking feature that allows users to monitor the progress of their complaints in real-time until resolution.

iv. **Interactive Communication:** The app facilitates interactive communication between citizens and municipal authorities. Users receive notifications and updates about the status of their complaints, fostering a sense of involvement and accountability.

v.   **Feedback Mechanism:** After the resolution of a complaint, citizens can provide feedback on the quality and timeliness of the response. This feature helps municipal bodies improve their services based on direct citizen input.

The Swachhata App has significantly enhanced citizen engagement in urban sanitation management. By empowering citizens to report issues directly to municipal authorities, the app has democratized the process of urban governance. The app's impact can be categorized into several key areas:

➢ **Increased Citizen Participation:** The app has mobilized citizens to actively participate in maintaining cleanliness in their communities. The ease of reporting issues has led to a surge in citizen involvement, creating a collective responsibility towards urban sanitation. Pune has leveraged the app to engage citizens in its zero-garbage initiative. The timely reporting and resolution of waste issues have been critical in maintaining high cleanliness standards in the city.

➢ **Timely Resolution of Complaints:** The app ensures that sanitation-related complaints are addressed promptly. Municipal authorities receive real-time alerts and location-specific details, enabling them to prioritize and act on issues efficiently. This has resulted in quicker resolution times and improved service delivery. Indore, consistently ranked as one of the cleanest cities in India, has extensively used the Swachhata App to maintain its sanitation standards. The app has enabled the city to address thousands of complaints efficiently, contributing to its top rankings in cleanliness.

➢ **Transparency and Accountability:** The tracking and feedback features of the app promote transparency and accountability in municipal operations. Citizens can see the actions taken on their complaints and provide feedback, which holds municipal bodies accountable for their performance. Surat's proactive use of the Swachhata App has facilitated regular cleanliness drives and community involvement. The city's efficient complaint resolution system, powered by the app, has played a crucial role in its cleanliness achievements.

➢ **Data-Driven Decision Making:** The app generates valuable data on sanitation issues reported by citizens. Municipal authorities can analyze this data to identify problem areas, allocate resources effectively, and plan long-term interventions. The insights gained from the app help in making informed decisions to improve urban sanitation.

➢ **Enhanced Public Trust:** The responsive nature of the Swachhata App has strengthened public trust in municipal bodies. Citizens feel heard and valued when their complaints are promptly addressed, leading to increased trust in local governance.

The Swachhata App represents a significant advancement in leveraging ICT for urban governance and sanitation management. By enabling direct citizen participation, ensuring timely resolution of complaints, and fostering transparency and accountability, the app has become a cornerstone of the Swachh Bharat Mission Urban. Its success underscores the importance of technology in transforming public service delivery and enhancing the quality of urban life. As more cities adopt and effectively use the Swachhata App, India moves closer to achieving its vision of clean, garbage-free cities.

4.5 Swachhata Standards: Benchmarking Cleanliness in Urban Areas

The Swachhata Standards are a set of comprehensive benchmarks established under the Swachh Bharat Mission Urban (SBM-U) to measure and enhance the cleanliness of urban areas across India. These standards are designed to create a structured and consistent approach to maintaining urban hygiene by evaluating various critical parameters such as waste collection, segregation, transportation, processing, and disposal. The primary objective of the Swachhata Standards is to ensure that cities not only achieve but also sustain high levels of cleanliness, thereby promoting public health, environmental sustainability, and improved quality of life for urban residents.

Key Parameters of Swachhata Standards:

i. **Waste Collection:** Effective waste collection is the foundation of urban cleanliness. The Swachhata Standards mandate systematic door-to-door collection of waste to prevent littering and accumulation of garbage in public spaces. Cities are evaluated based on the frequency, coverage, and efficiency of waste collection services. Ensuring 100% collection of household waste, including both residential and commercial areas, is a crucial benchmark.

ii. **Waste Segregation:** Waste segregation at the source is vital for efficient waste management and recycling. The standards emphasize the importance of segregating waste into biodegradable (wet waste), non-biodegradable (dry waste), and hazardous categories. Cities are required to provide adequate facilities and awareness programs to promote and ensure compliance with segregation practices. Effective segregation not only reduces the burden on landfills but also facilitates resource recovery and recycling efforts.

iii. **Waste Transportation:** Proper transportation of waste is essential to maintain cleanliness and prevent secondary pollution. The Swachhata Standards assess the adequacy and condition of waste transport vehicles, ensuring they are covered and leak-proof to avoid spillage and odour. The route planning and frequency of waste transport operations are also evaluated to ensure timely and efficient removal of collected waste.

iv. **Waste Processing:** Processing waste is a critical aspect of sustainable waste management. The standards promote the establishment of facilities for composting, recycling, and waste-to-energy conversion. Cities are benchmarked based on the proportion of waste processed through these methods versus the amount sent to landfills. Innovative and scientific processing techniques are encouraged to maximize resource recovery and minimize environmental impact.

v. **Waste Disposal:** Safe and scientific disposal of residual waste is the final step in the waste management chain. The Swachhata Standards mandate the use of engineered sanitary landfills that comply with environmental and health regulations. Cities are required to have designated landfill sites equipped with protective measures to prevent soil and groundwater contamination. Regular monitoring and maintenance of these sites are crucial benchmarks to ensure long-term environmental sustainability.

The implementation of Swachhata Standards has had a transformative impact on urban cleanliness in India. By providing a clear and measurable framework, these standards have motivated cities to adopt best practices in waste management. The systematic approach helps in identifying gaps, planning improvements, and tracking progress over time. Moreover, the competitive spirit fostered by rankings and recognition under these standards has driven cities to continuously innovate and excel in their cleanliness efforts.

The Swachhata Standards serves as a vital tool for benchmarking and improving urban cleanliness. They address all critical aspects of waste management, from collection to disposal, ensuring a holistic approach to maintaining urban hygiene. By adhering to these standards, cities can achieve sustainable cleanliness, thereby enhancing the overall quality of urban life and contributing to the broader goals of environmental conservation and public health.

4.6 Urban-Rural Convergence: Case Studies from Kerala and Maharashtra

Urban-Rural Convergence in waste management is a strategic approach that enables cities and nearby rural areas to collaborate, leveraging each other's strengths to achieve more efficient and sustainable waste management practices. This model has proven successful in various parts of India, notably in Alappuzha, Kerala, and Pune, Maharashtra, where urban and rural areas have joined forces to address their waste management challenges.

I.   Alappuzha, Kerala -

Alappuzha, a picturesque city in Kerala, is renowned for its decentralized waste management system, which integrates both urban and rural areas. Faced with the dual challenges of increasing waste generation and limited urban space, the Alappuzha Municipal Corporation partnered with neighboring rural panchayats to establish decentralized composting units. These units, managed jointly, allowed both urban and rural areas to process organic waste at the source, significantly reducing the need for landfill use.

The convergence between Alappuzha and its surrounding rural areas led to the effective management of organic waste, transforming it into compost for agricultural use. This collaboration not only alleviated the pressure on urban waste management systems but also fostered a culture of sustainability across the region, with both urban and rural communities actively participating in waste segregation and composting practices.

II.   Pune, Maharashtra-

In Pune, Maharashtra, a similar convergence strategy was adopted to manage the city's growing waste management demands. The Pune Municipal Corporation (PMC), in response to the city's rapid urbanization and industrial growth, extended its waste processing capabilities to include neighboring rural areas. The PMC collaborated with rural panchayats to set up decentralized waste processing facilities, such as composting and biogas plants, in the outskirts of the city.

Figure 15: Biogas Plant

This partnership provided the rural areas with much-needed infrastructure and technical expertise, while Pune benefited from the additional processing capacity. The decentralized approach helped

reduce the transportation costs and environmental impact associated with waste disposal. Furthermore, it created economic opportunities in rural areas through the production of organic fertilizers and biogas, contributing to the region's overall sustainability.

The Urban-Rural Convergence models in Alappuzha and Pune highlight the significant benefits of collaborative waste management. By sharing resources, infrastructure, and expertise, both cities successfully improved their waste management practices, reduced environmental impact, and fostered sustainable development across urban and rural regions. These case studies demonstrate the potential of Urban-Rural Convergence to address waste management challenges in a holistic manner, ensuring that both urban and rural communities contribute to and benefit from enhanced waste management practices.

The success of these initiatives serves as a blueprint for other regions facing similar challenges, illustrating how strategic partnerships between urban and rural areas can lead to more effective, sustainable, and inclusive waste management solutions across India.

Chapter 5 - Case Studies

In this chapter, we conduct a comprehensive analysis of case studies from representative cities across India to examine their waste management practices, challenges faced, and lessons learned. The selected case studies include Chennai, Indore, Pune, and Surat, chosen for their diverse approaches to waste management and their significant contributions to the discourse on urban cleanliness and sustainability. Through secondary data analysis of existing literature and reports, we aim to gain insights into the effectiveness of waste management strategies in these cities and extract valuable lessons that can inform efforts to achieve garbage-free status in Indian cities.

I.   Chennai, Tamil Nadu: Decentralized Composting Initiative

Chennai, the capital city of Tamil Nadu, has been grappling with the challenges of waste management due to its rapidly growing population and urbanization. In response to the mounting pressure on landfills and the need for sustainable waste management solutions, Chennai implemented a decentralized composting initiative aimed at managing organic waste at its source. This case study provides an overview of Chennai's decentralized composting program, its impact on waste management, and the lessons learned from its implementation.

With its burgeoning population and urban sprawl, Chennai has been facing increasing challenges in managing its waste effectively. Organic waste, in particular, constitutes a significant portion of the city's waste stream and poses environmental and health risks if not managed properly. In light of these challenges, the Chennai Municipal Corporation launched a decentralized composting initiative to address the issue of organic waste management at the source.

Chennai's decentralized composting initiative involves the establishment of composting facilities at various locations across the city, including residential complexes, schools, and commercial establishments. These facilities utilize composting techniques to convert organic waste into nutrient-rich compost, which can be used as organic fertilizer in gardens, parks, and agricultural fields.

The Chennai Municipal Corporation collaborated with local communities, RWAs, and NGOs to promote awareness and encourage participation in the composting program. Training sessions and workshops were conducted to educate residents and stakeholders about the benefits of composting, the process involved, and the proper management of composting units.

Impact:

Since the inception of the decentralized composting initiative, Chennai has witnessed a significant reduction in the amount of organic waste sent to landfills. As of 2023, the initiative has resulted in a reduction of over 30% in organic waste, easing the burden on landfill sites and reducing the city's environmental footprint.

Moreover, the decentralized composting program has contributed to the promotion of organic farming practices in Chennai and the surrounding areas. The nutrient-rich compost produced through the initiative is utilized by local farmers and agricultural communities, leading to improved soil health, increased crop yields, and a shift towards sustainable agriculture.

Challenges and Lessons Learned:

While Chennai's decentralized composting initiative has been successful in reducing organic waste and promoting sustainable waste management practices, it has also encountered several challenges along the way. These include:

1. Community Engagement: Ensuring active participation and sustained engagement from residents and stakeholders requires continuous effort and outreach.
2. Infrastructure and Resources: Adequate infrastructure and resources are essential for the successful operation and maintenance of composting facilities, including equipment, space, and trained personnel.

Figure 16 : Sustainable waste cycle

3. Regulatory Compliance: Compliance with composting operations, including regulatory standards and guidelines for environmental regulations and health and safety protocols, is crucial to ensure the effectiveness and safety of the program.
4. Scaling Up: Scaling up the decentralized composting initiative to cover a larger geographic area and accommodate the growing population of Chennai requires strategic planning, investment, and coordination among multiple stakeholders.

Despite these challenges, Chennai's decentralized composting initiative serves as a model for sustainable waste management practices, demonstrating the potential for decentralized solutions to address organic waste management and contribute to a cleaner and greener environment.

Chennai's decentralized composting initiative exemplifies the city's commitment to sustainable waste management and environmental stewardship. By harnessing the power of community participation, awareness-building, and decentralized infrastructure, Chennai has successfully reduced its reliance on landfills and promoted organic farming practices. Moving forward, continued investment, innovation, and collaboration will be essential to further expand and enhance the impact of decentralized composting initiatives in Chennai and beyond.

II.   Indore, Madhya Pradesh: Waste Management Practices

Indore, situated in the state of Madhya Pradesh, has garnered widespread acclaim for its pioneering waste management practices and citizen engagement initiatives. The city has not only implemented a successful waste segregation program but has also actively engaged its citizens in waste management efforts while rigorously enforcing waste segregation rules. This case study provides an overview of Indore's waste management practices, the challenges faced, and the lessons learned from its experience, including its recognition through national awards.

Indore, like many urban areas in India, faces significant challenges in waste management due to its burgeoning population and rapid urbanization. To address these challenges, the Indore Municipal Corporation (IMC) has spearheaded various initiatives aimed at improving waste management practices and minimizing the city's environmental footprint.

Waste Management Practices:

Indore's waste management practices revolve around three core components:

1. **Waste Segregation Program:** The IMC has rolled out a highly effective waste segregation program, urging residents to segregate their waste into different categories such as biodegradable, non-biodegradable, and hazardous. This segregation is pivotal for efficient waste management and recycling endeavors.

2. **Citizen Engagement Initiatives:** Indore has actively involved its citizens in waste management endeavors through extensive awareness campaigns, community events, and citizen participation programs. These initiatives seek to educate residents about the importance of waste segregation and foster a sense of responsibility towards waste management.

3. **Enforcement of Waste Segregation Rules:** The IMC has enforced stringent regulations pertaining to waste segregation, imposing penalties on individuals or establishments found flouting these rules. This enforcement mechanism serves as a deterrent against non-compliance and underscores the significance of adhering to proper waste management practices.

Figure 17: Waste Collection Van

Challenges and Lessons Learned:

Despite its remarkable achievements, Indore encountered following challenges in sustaining its waste management practices:

1. Sustaining High Levels of Citizen Engagement: Maintaining consistent levels of citizen engagement necessitates continuous investment in awareness campaigns and community outreach endeavors.

2. Informal Waste Sector Activities: Indore grapples with addressing informal waste sector activities, such as unregulated waste picking and recycling, which can impede formal waste management efforts.

3. Scaling up Waste Processing Infrastructure: While Indore has made considerable strides in waste segregation, expanding waste processing infrastructure, such as composting and recycling facilities, remains a formidable challenge.

Indore's exemplary waste management practices have earned its national recognition, including prestigious awards such as the **"Cleanest City in India"** under the Swachh Survekshan awards. This accolade not only validates the city's commitment to cleanliness and waste management but also serves as a testament to its innovative approaches and sustained efforts in this domain.

Indore's experience in waste management offers invaluable lessons for other cities:

1. **Community Participation:** The success of Indore's waste segregation program underscores the pivotal role of community participation in achieving effective waste management outcomes.

2. **Enforcement Mechanisms:** Stringent enforcement of waste segregation rules is indispensable for ensuring compliance and upholding the integrity of waste management initiatives.

3. **Integration of Informal Waste Workers:** Indore could explore strategies for integrating informal waste workers into formal waste management systems, thereby enhancing efficiency and inclusivity.

Indore's waste management practices serve as a beacon of inspiration for cities across India, exemplifying the efficacy of community engagement, enforcement mechanisms, and innovative solutions in fostering sustainable waste management. By addressing challenges and embracing lessons learned, Indore can further elevate its waste management efforts and contribute to a cleaner, healthier environment for its residents.

III.   Pune, Maharashtra: Zero Garbage Initiative

Pune, located in the state of Maharashtra, has embarked on an ambitious zero garbage initiative aimed at revolutionizing waste management practices in the city. With a focus on waste reduction, recycling, and composting, Pune has implemented innovative strategies to tackle its waste management challenges. This case study provides an overview of Pune's waste management practices, the challenges faced, and the lessons learned from its zero-garbage initiative.

Pune, like many rapidly growing urban centers in India, has been grappling with the challenges of waste management due to its expanding population and urban sprawl. In response to these challenges, the Pune

Municipal Corporation (PMC) has launched the zero-garbage initiative to transform the city's waste management landscape and promote sustainability.
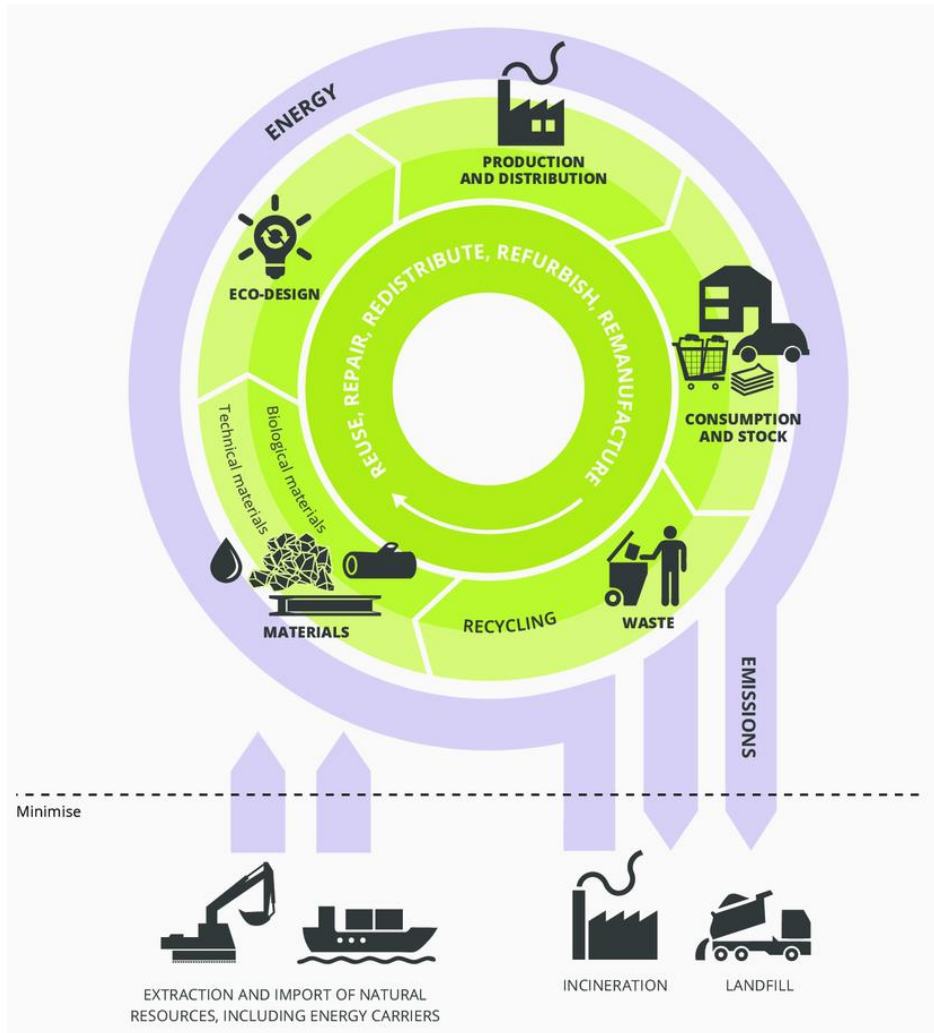

Figure 18: Zero Garbage Initiative Model

Pune's zero -garbage initiative is characterized by the following key components:

1. Waste Reduction: The PMC has implemented measures to reduce the generation of waste at the source, including promoting sustainable consumption practices and encouraging residents to minimize waste generation.

2. Recycling: Pune emphasizes recycling as a core element of its waste management strategy, with dedicated recycling centers and initiatives to promote the segregation and recycling of recyclable materials.

3. Composting: The city has invested in composting infrastructure to process organic waste into nutrient-rich compost, which is then used for gardening, landscaping, and agricultural purposes.

4. Public Awareness Campaigns: Pune conducts extensive public awareness campaigns to educate residents about the importance of waste management, segregation, and recycling. These campaigns aim to foster a culture of sustainability and environmental consciousness among Pune's residents.

5. Penalties for Littering: The PMC enforces strict penalties for littering and improper waste disposal, aiming to deter such behavior and promote responsible waste management practices.

Challenges and Lessons Learned:

Despite its commendable efforts, Pune encounters several challenges in implementing its zero-garbage initiative:

1. Insufficient Waste Processing Infrastructure: Pune lacks adequate infrastructure for waste processing, including composting and recycling facilities, which limits the city's capacity to manage its waste effectively.

2. Illegal Dumping: Illegal dumping of waste is a persistent problem in Pune, undermining the city's efforts to maintain cleanliness and sanitation.

Figure 19: Biogas Box

3. Limited Resources for Enforcement: The PMC faces resource constraints in enforcing waste management regulations and penalties, hindering its ability to curb littering and enforce waste segregation rules effectively.

Pune's experience with the zero-garbage initiative offers valuable lessons for other cities:

1. **Comprehensive Waste Management Strategies:** Pune's zero garbage initiative highlights the importance of adopting comprehensive waste management strategies that prioritize waste reduction, recycling, and composting.
2. **Community Participation:** Engaging the community and fostering a sense of ownership among residents are critical for the success of waste management initiatives.
3. **Partnerships with the Private Sector:** Pune could explore partnerships with the private sector to enhance waste processing capacity and improve the efficiency of waste management operations.

Pune's zero -garbage initiative exemplifies the city's commitment to sustainable waste management and environmental stewardship. By addressing challenges and embracing lessons learned, Pune can further enhance its waste management efforts and pave the way for a cleaner, greener future for its residents.

Pune's zero garbage initiative underscores the importance of comprehensive waste management strategies that prioritize waste reduction and community participation. The city could also explore partnerships with the private sector to enhance waste processing capacity.

IV.   Surat, Gujarat: Proactive Cleanliness Drives

Surat, situated in the vibrant state of Gujarat, has emerged as a model city for proactive waste management practices and community involvement initiatives. With a focus on cleanliness drives, regular waste collection services, and active citizen participation, Surat has made significant strides in maintaining a clean and sustainable urban environment. This case study provides an overview of Surat's waste management practices, the challenges faced, and the lessons learned from its initiatives.

Surat, renowned as the "Diamond City" of India, has experienced rapid urbanization and population growth in recent years. In response to the increasing challenges of waste management, the Surat Municipal Corporation (SMC) has implemented the following initiatives to promote cleanliness and sustainability in the city.

Surat's waste management practices are characterized by several key components:

1. **Proactive Cleanliness Drives:** The SMC organizes regular cleanliness drives and campaigns to raise awareness about waste management, cleanliness, and hygiene among residents. These drives mobilize community participation and foster a sense of civic responsibility.

Figure 20: Cleanliness Drive- Surat

2. **The SCADA system**: significantly improved Surat's waste collection efficiency, which has reached an impressive 90% as of 2023. This improvement is attributed to the system's ability to provide real-time insights and alerts, enabling swift corrective actions when deviations occur.

3. **Regular Waste Collection Services:** Surat has established efficient waste collection services, ensuring timely and regular pickup of waste from residential, commercial, and industrial areas. This helps in preventing littering and maintaining cleanliness across the city.

Challenges and Lessons Learned:

Despite its successes, Surat encounters several challenges in managing its waste effectively:

1. Waste Management in Rapidly Urbanizing Areas: Surat's rapid urbanization has led to increased waste generation, straining the city's waste management infrastructure and resources.
2. Informal Waste Sector Activities: The presence of informal waste sector activities, such as unregulated waste picking and recycling, poses challenges to formal waste management efforts and sustainability.
3. Sustainable Funding for Waste Management Programs: Ensuring sustainable funding for waste management programs remains a challenge for Surat, particularly in the face of competing priorities and budget constraints.

Surat's experience offers valuable lessons for other cities:

1. **Public Engagement:** Surat's proactive cleanliness drives and community involvement initiatives underscore the importance of public engagement in maintaining clean and sustainable urban environments.
2. **Innovative Financing Mechanisms:** Surat could explore innovative financing mechanisms, such as public-private partnerships or user fees for waste management services, to support ongoing waste management efforts and ensure long-term sustainability.
3. **Improved Decision-Making and Resource Allocation**: The real-time data provided by the SCADA system supports better decision-making and resource allocation. Municipal authorities can analyse the data to identify trends, predict future waste generation, and plan accordingly to ensure that the necessary resources are available when needed.
4. **Transparency and Accountability**: The SCADA system enhances transparency and accountability in waste management operations. With detailed records of vehicle movements, waste collection, and processing activities, it becomes easier to monitor performance, enforce regulations, and maintain high standards of service delivery. By incorporating a SCADA system, Surat has not only streamlined its waste management processes but also set a benchmark for other cities aiming to achieve similar efficiencies. The use of such advanced technological solutions underscores the city's commitment to sustainable and effective waste management practices.

Surat's waste management practices exemplify the city's commitment to cleanliness, sustainability, and community engagement. By addressing challenges and leveraging lessons learned, Surat can further enhance its waste management efforts and serve as a role model for other cities striving to create cleaner and healthier urban environments. Surat's cleanliness drives and community involvement initiatives highlight the importance of public engagement in maintaining clean and sustainable urban environments. The city could explore innovative financing mechanisms to support ongoing waste management efforts.

These case studies provide insights into the diverse approaches and experiences of representative cities across India in effectively managing their waste. Analyzing these case studies can help identify best practices, challenges, and lessons learned that can inform strategies for achieving garbage-free status in Indian cities.

Chapter 6 – Way Forward

As the research study reflect on the comprehensive efforts and strategies employed in achieving garbage-free cities under the Swachh Bharat Mission 2.0, it becomes evident that sustained progress requires a multi-faceted approach involving all stakeholders. The insights gained from successful case studies and the lessons learned from various cities provide a robust foundation for future initiatives. Hence, we would highlight the following key recommendations from our study:

1. Strengthening Infrastructure and Technology:

Invest in advanced waste processing facilities and technologies such as waste-to-energy plants and automated waste segregation units. Cities like Bengaluru have demonstrated the potential of waste-to-energy plants in reducing landfill dependency and generating renewable energy.

2. Community Engagement and Awareness:

Foster a culture of cleanliness and responsible waste management through continuous awareness campaigns and educational programs. Resident Welfare Associations (RWAs) play a crucial role in this, as seen in cities like Pune and Surat, where community involvement has significantly improved waste management outcomes.

Figure 21: Sustainable Living

3. Policy and Regulatory Framework:

Enhance the enforcement of waste management regulations and introduce stringent penalties for non-compliance. The experience of Indore underscores the importance of strict enforcement in maintaining high standards of waste segregation and disposal

4. Public-Private Partnerships (PPP):

Encourage collaboration between municipal authorities and private enterprises to enhance waste management services. PPPs can bring in the necessary investment and expertise to improve infrastructure and operational efficiency, as evidenced by various successful initiatives across Indian cities.

5. Sustainable Funding Mechanisms:

Develop innovative financing models to ensure the sustainability of waste management programs. This includes exploring user fees, waste-to-wealth initiatives, and government grants. Surat's proactive approach towards securing sustainable funding highlights the importance of financial planning in waste management.

6. Integration of Informal Waste Sector:

Formulate strategies to integrate informal waste workers into the formal waste management system. This not only enhances efficiency but also ensures social inclusion and better working conditions for these workers.

The path to achieving garbage-free cities in India is challenging but achievable through coordinated efforts and strategic planning. By leveraging the experiences and best practices from cities that have made significant strides in waste management, we can formulate effective policies and practices tailored to the unique contexts of different urban areas.
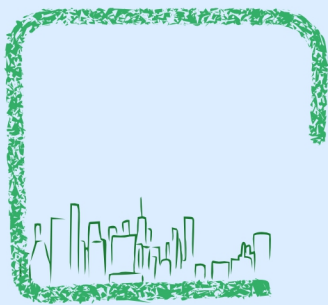
The Swachh Bharat Mission Urban 2.0 provides a robust framework for urban sanitation and waste management, but its success hinges on continuous innovation, community involvement, and strong governance. As we move forward, it is imperative to keep adapting and evolving our approaches to meet the dynamic challenges of urban waste management.

Together, with sustained effort and commitment, we can realize the vision of garbage-free, sustainable, and livable cities across India, ensuring a healthier and cleaner environment for future generations.

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