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# **Policy Brief**

## **SOLID WASTE MANAGEMENT IN INDIA'S MEGA CITIES - CROSSROADS FOR SMARTER CITIES**

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November, 2019

New Delhi, India



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### **About the Organisation:**

LexQuest Foundation (LQF) is an independent, non-profit, research and action organisation, established in 2014, in New Delhi. We are striving to create, advocate and implement effective solutions for a diverse range of development issues.

To endorse participative governance, we engage with a broad spectrum of stakeholders, from various sections of the society, to ensure that policy-making remains a democratic process. We utilize pragmatic and futuristic research to disseminate actionable knowledge to decision-makers, experts and the general public.

Our key activities include capacity and skill-building workshops, policy advisory programs, public outreach, and stakeholder consultations. We collaborate with the government, other organizations and individuals for impactful policy formulation and execution.

By employing sustainable and equitable solutions through our multidisciplinary, intersectional initiatives and programs, we are constantly working towards creating empowered communities.



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Waste Management Systems in the present day context have become extremely important for sustainable growth of cities. The issue remains one of the most problematic and neglected aspects of Indian cities. High population growth and industrialization, among others, strain this basic infrastructural and municipal service. **It is of highest importance to have an extremely efficient waste management system to maintain public health and avoid any kind of environmental crisis.**

By the virtue of the Constitution, Solid Waste Management (SWM) is a State subject and it is the responsibility of the State Government to ensure that appropriate solid waste management practices are introduced and implemented soundly. However, **SWM is a municipal function and it is the Urban Local Bodies (ULBs) that are directly responsible for it. The ULBs are required to plan, design, operate, and maintain the SWM in their respective cities/towns.** Last year, the Union Ministry of Environment, Forests and Climate Change (MoEFCC) notified the **Solid Waste Management Rules (SWM), 2016 which will replace the existing Municipal Solid Wastes (Management and Handling) Rules, 2000.** The new rules are now applicable beyond municipal areas and have included urban agglomerations, census towns, notified industrial townships, areas under the control of Indian Railways, airports, special economic zones, places of pilgrimage, religious and historical importance, and State and Central Government organisations.

When it comes to efficient waste management, it is important to look at the practices of India's biggest and most densely populated urban centres, i.e., its metropolitan cities, as they would be a relevant starting point to understand the limitations and abilities of our municipal bodies in tackling the challenge of urban waste management.



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## **Technicalities of Waste Management in Delhi**

Currently, there are three municipal authorities which are responsible for solid waste management in the city—the Municipal Corporation of Delhi (MCD) which covers 90% of Delhi catering to the general population and is further divided into three parts namely, the North Delhi Municipal Corporation (NDMC), South Delhi Municipal Corporation (SDMC) and East Delhi Municipal Corporation (EDMC), the New Delhi Municipal Council (NDMC) which has all the Central government buildings, offices, residences of officers, parliament, Rashtrapati Bhawan etc., and the Delhi Cantonment Board (DCB) which is managed and directly controlled by the Ministry of Defence.

**All studies on waste composition show that 50–60% of Indian municipal solid waste consists of compostable matter. According to new SWM rules of 2016, the mixed waste requires a calorific value of 1600 kcal/kg to be treated by Waste-to-Energy (WTE) plants without use of any auxiliary fuel.** But a survey in May 2017 conducted by Shriram Institute of Industrial Research based on a sample from SDMC area showed that biodegradable part of all the waste generated, was between 55-60% which had a calorific value in the range of 1274.25 -1324 kcal/kg. **It therefore highlights how the waste composition for the city is not appropriate for incineration-based technologies.**

**Only a small fraction of the municipal waste is suitable to be treated in WTE plants but presently, MCDs are encouraging everything to be incinerated. Moreover, the quality of compost obtained from incineration is highly compromised upon. Over 20-30 tonnes of compost is lying unattended in the Bawana plant because it has no takers. The reason behind this poor efficiency of the plants is that they receive mixed waste. This is in contradiction with directions of the National Green Tribunal (NGT) as well as the new SWM Rules, that have mentioned that no recyclables and mixed waste should be used in these plants.**

**All the three existing dumpsites of Delhi exceeded their capacities way back in 2008. These sites do not have any methanisation or gasifiers to control the quantity of methane being produced naturally by the biodegradable garbage. There are no fire protection systems at these sites, thus making them potentially flammable locations. There is no landfill gas (LFG) collection system either.** One LFG pilot project at Ghazipur had been established in



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2013 by GAIL for extraction of landfill gas to reduce greenhouse gases but is functional only a few days a month due to unavailability of the gas.

As per information provided by MCDs, there are two waste systems running in Delhi. One is the authorized collection system enforced via formal sector by the municipal staff or by an authorized party or private concessionaire. The other is an informal sector which involves ragpickers, informal contractors who provide door to door collection services to every household in their area. All the waste collected ends up in dhalaos (three-walled garbage collection points), collection centres, receptacles at different places in all statutory bodies in Delhi. But this waste is not segregated and is taken directly for processing/disposal.

**There are many loopholes in the current system of management. DDA approves planning of colonies with much lesser space for segregation and dhalaos than required as per Master Plan 2021.** Infact, devising a disposal system by proposing dhalaos as vital points, is a nuisance in itself. Adding to the problem are private contractors who do not engage in segregation practices which is a part of their agreement. Moreover, these contracts are expensive and do not establish a sustainable system for waste collection. Therefore, dependency on formal sector increases exponentially. **A report in 2016 by Centre for Science and Environment says, there exist around 3-4 lakh informal ragpickers in the city.**

Recently, a new system of collection and transportation has been introduced to take the place of the dhalao system which is known to create huge menace and makes it difficult to operate with. This new system which is currently only adopted by SDMC is known as **Fixed Compactor Transfer Station (FCTS) which includes primary collection of waste from the street level through auto tippers, transporting the waste in covered primary vehicles to the (FCTS)/mobile transfer stations, transporting the compressed garbage from the secondary storage through mobile compactors to the WTE plants and collection & transportation of street sweeping waste, drain silt and dumping of same to the Secured Landfill Facility (SLF) site.** However, installation of such systems is also pushing for non-segregation and feeding mixed waste to WTE plants. A GPS based tracking system is also in place by EDMC and SDMC to locate the position of its refuse removal trucks and other vehicles to increase their efficiency and productivity.



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## **State Policy for SWM**

Solid Waste Management Bye-Laws in Delhi focus on individual accountability and notified new additions on January 15, 2018. It includes the following:

- Every **waste generator has to segregate waste into three streams: biodegradable (wet waste), non-biodegradable (dry waste) and domestic hazardous waste for storing in colour-coded bins: green, blue and black respectively for wet, dry and domestic hazardous waste**. All dhalaos will also have covered colour-coded containers for storing the aforementioned three types of waste.
- MCD will provide a door-to-door collection and transportation facility for segregated solid waste. **These services will also be extended to slum areas and informal settlements by integrating informal door-to-door collection systems with the municipality.**
- **Preference will be given to decentralised waste processing** like biomethanation, composting, and any other method for biostabilization of biodegradable waste so that transportation cost and environmental impacts are minimised.
- **All brand owners, who are responsible for selling their products in non-biodegradable packaging material, will have to put in place a system to collect back the packaging waste generated.**
- **The MCDs will take deposits from event organisers and give refund on the completion of the event after ensuring that the public place where the event was held was restored to a clean state and any waste that was generated has been collected and transported to the designated place.**



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## **Mumbai's Waste Management Problem**

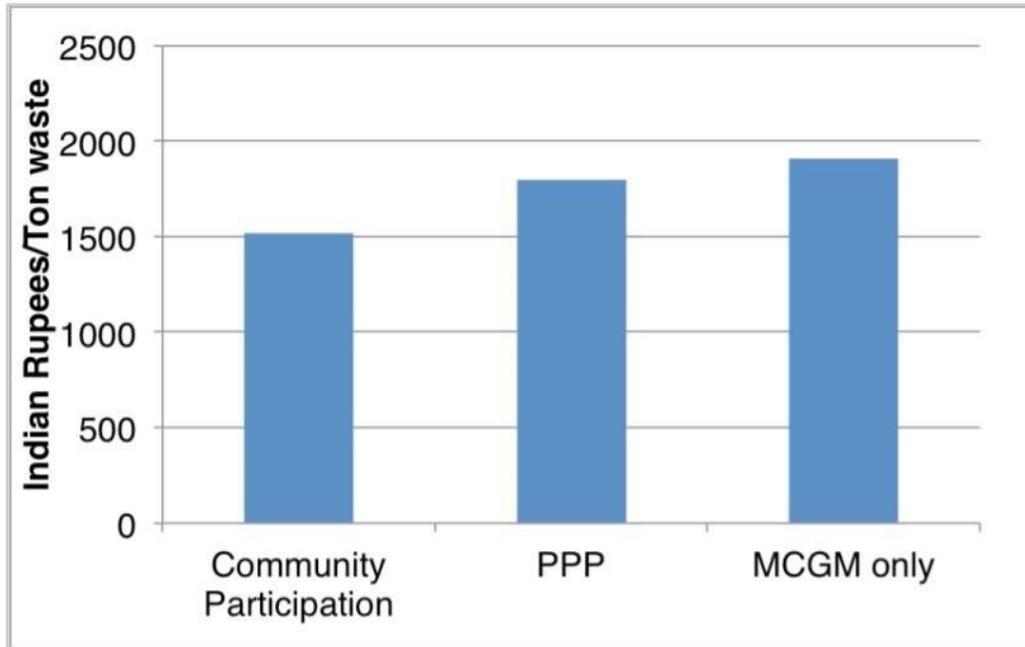
Mumbai, a low-lying peninsular city is recognised for its highly improper and inefficient Solid Waste Management System. Unplanned urbanization and expansion have resulted in poor management of waste. This combined with insufficient financial resources has made the situation worse. The Municipal Corporation of Greater Mumbai (MCGM) is primarily responsible for collection, treatment and disposal of solid waste in the city. Mumbai, being a coastal city, faces several problems because of the inadequate SWM system.

Waste collection system in Mumbai is similar to that in Delhi wherein door to door collection services are facilitated by both the informal and the formal sector. But since **60% of the population of Mumbai resides in slums, public awareness of managing solid waste is very poor.** As a result, many households tend to throw their waste in roadside gutters for later clearance by street sweeping crews, even in areas where storage and collection systems are available. **While this is primarily due to lack of discipline and inadequate placements of the storage arrangements, it is partly a result of scavenging by rag pickers and stray animals.** This is a major loophole in the SWM system as **people are inclined to put minimum effort for managing their waste, thus increasing the burden on the informal sector whose primary concern is to earn livelihood and not environmental well-being.**

On the other side, Mumbai's solid waste is mostly organic in nature and has a high calorific value of 1786 kcal/kg. **It means major portion of the solid waste in the city is suitable for incineration and for generating energy but except for an incineration plant at Deonar for biohazardous and other hospital refuse that puffs out blackened smoke, no such facilities exist in the city as of now.** Treatment and disposal are mostly done via dumping and landfills which gives rise to health problems in the surrounding area and are potential sites of fire. Composting facilities are also functional at a very small scale. Vehicles used for transportation of Municipal Solid Waste have outlived their normal economic life spans, resulting in high fuel consumption, low efficiency and higher expenditure on repairs. Moreover, transportation of debris from new construction and demolition sites is the responsibility of private truckers, **who dump the waste incessantly in the creeks of the city which causes serious environmental damage.**



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*Cost comparison of MSWM in mumbai*

Limited resources of land are noted as one of the biggest limitations, therefore **optimizing already available disposal sites becomes a major focus in planning the SWM system in case of Mumbai**. To do so the emphasis is mainly on three fronts, first of all by instituting “zero-garbage” campaigns, aiming to at least reduce the amount of waste that reaches the disposal sites. Secondly by customized technologies for treatment and disposal and lastly by creating more functional landfill sites while ensuring that all operational disposal sites should be scientifically optimised.

### **State Policy for SWM**

- According to the SWM handbook, 2016 **a two bin system of waste segregation is followed**, wherein biodegradable and non-biodegradable waste is to be stored in green and blue bins respectively.
- The technology available for composting is of two types. The bio-conversion process is used to the organic fraction of wastes (wet waste), to form compost or to generate biogas such as methane (biomethanation) and residual sludge (manure). The thermal conversion technologies are incineration with or without



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heat recovery, pyrolysis and gasification, plasma pyrolysis and pelletization or production of Refuse Derived Fuel (RDF) which are used for treating dry waste or mixed waste.

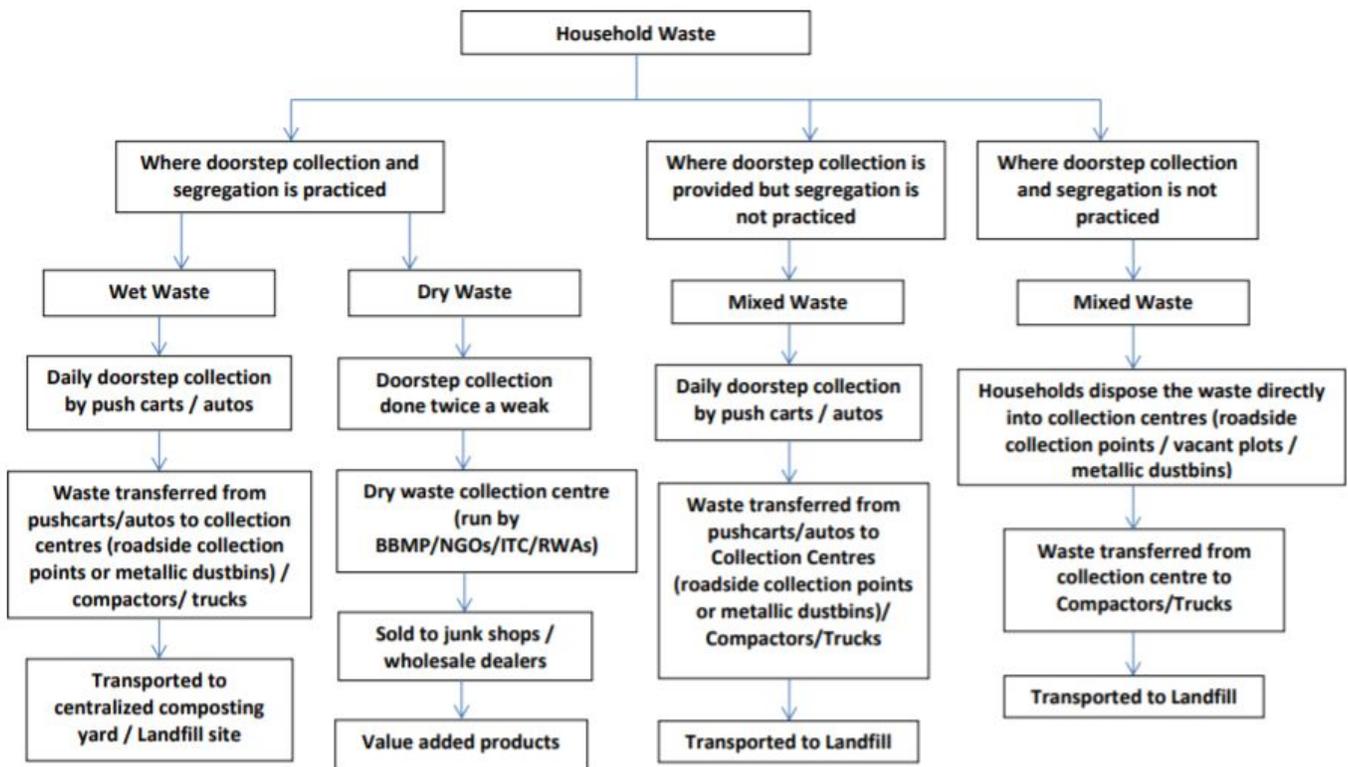
- Landfill has been the traditional disposal mechanism for construction & demolition waste, but in accordance with the waste management hierarchy and **having regard to the resource value of the discarded materials and the current exhaustive pressures on landfill space**, the policy suggests that **recycling must take over as the main management route for this waste stream**.
- The State Pollution Control Board shall enforce these rules through local bodies in their respective jurisdiction and review implementation of these rules at least twice a year in close coordination with the concerned Directorate of Municipal Administration or Secretary-in-charge of State Urban Development Department.



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## Bengaluru’s Prototype of efficient Waste Management

Like many other cities, Bengaluru is also facing issues in disposal of larger quantities of waste produced every day. The severity of the issue became more evident in 2012 when garbage piles started to build alongside streets and footpaths. During this period the city became more of a ‘Garbage City’ than a ‘Garden City’.



Process map for waste management for household waste

**Toxic froth lakes of Bengaluru are an evidence of the prevailing problem of waste disposal in the city.** Bellandur lake is one such example where nearby housing societies and industries dump waste and discharge untreated sewage incessantly into the lake. This has caused multiple incidents of fire in the lake, which resulted in



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formation of toxic froth that spilled on nearby roads and the surrounding areas risking the health of entire neighbourhoods.

Total waste generation by the city of Bengaluru is 5000 tons of solid waste everyday. Primary method of collection and disposal is the same as other mega cities i.e. door-to-door collection and transportation to processing sites. But the point of paramount importance is that nearly **80% of MSW activities starting from primary collection to disposal is outsourced by Bruhat Bengaluru Mahanagara Palike (BBMP) which is the primary body responsible for solid waste management in the city.** Secondary collection method is prevalent, wherein waste collected from households is brought to a common point i.e., secondary collection points (vacant sites, road sides, etc.) from where it is shifted to the compactors & tipper lorries for transportation to the treatment/disposal sites. **Following the Lok Adalat's direction in 2011, the BBMP also became the first municipality in the country to register waste-pickers and enumerate scrap dealers.**

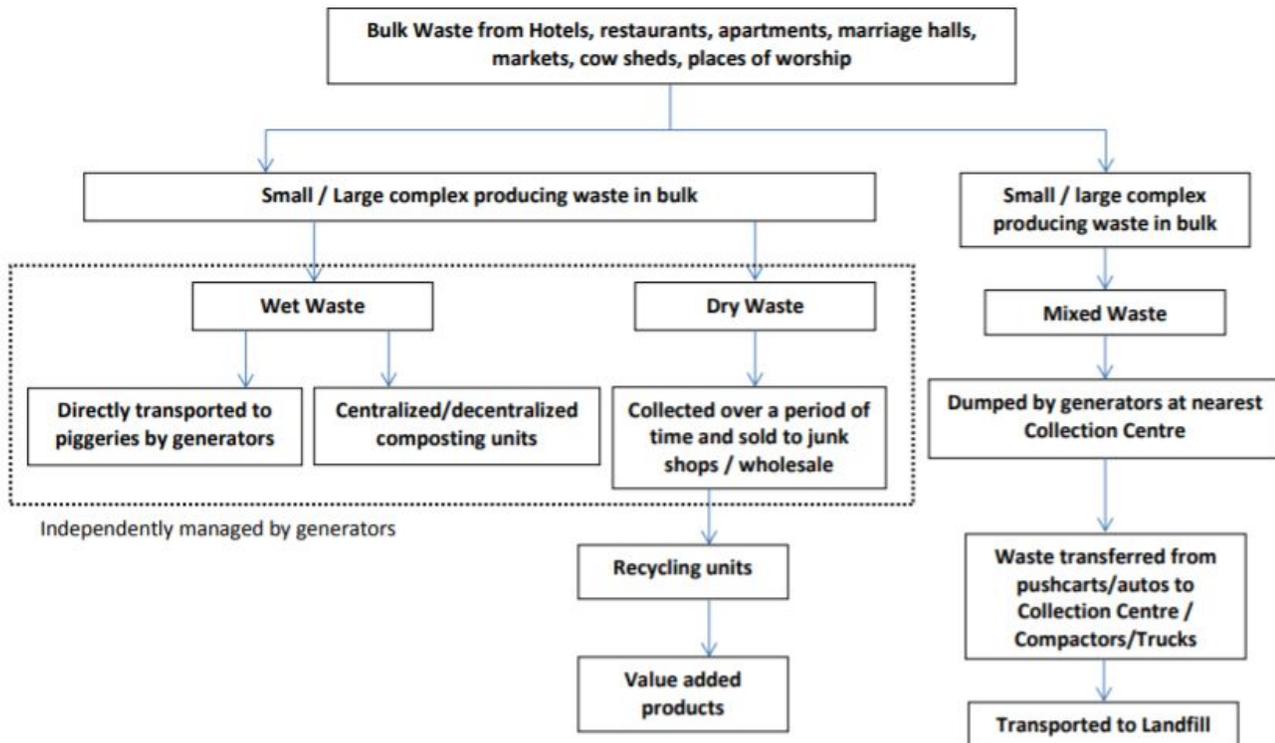
Bengaluru is a historical city, with several narrow lanes, high population density and pockets of rural areas which have been amalgamated with developed areas, posing serious problems for collection and transport of municipal waste. The phenomenal growth of vehicles on roads makes the task even more difficult. Therefore, **the city follows a decentralized system of solid waste management in which various Self Help Groups (SHGs) are responsible for collection in certain areas and Resident Welfare Associations (RWAs) are facilitating door to door collection in several other areas.** The waste is segregated at source, thanks to Kasa Muktha Programme launched on 24th July 2013 and the organic waste is composted at the community level by the aid of respective RWAs. These measures proved helpful to counter the trend of developing illegal dumping sites across the city, which at one point went up to 60 in number. Many RWAs have developed their own bio-methanation units, pelletisation units, organic waste converters, and dry waste collection centers. These greatly reduce the amount of waste received by the BBMP processing centers.

There are many ward specific examples of good waste management practices in Bengaluru. One example is setting up of a dry waste collection centre by an NGO called 'Waste Wise' at Domlur which is involved in door to door collection of dry waste. It started in 2012, covering 75% of households and 50% of commercial areas and gained tremendous support from BBMP and various RWAs in the area. This initiative was



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observed to produce a sustainable model where both the residents and the informal rag pickers benefited. The former by selling their waste to the NGO and the latter by earning a better livelihood as a part of the NGO team.



Process map for waste management from the bulk generators

Another example is an initiative called **Hasiru Dala** which put up a proposal of **collecting segregated waste from households and give monetary incentives** to them in accordance with a scheme prepared under its proposal. It is also known to greatly reduce the amount of waste sent to landfills on a daily basis. This system was tested in ward 150 in the Bommanahalli zone of BBMP, which represents a standard ward in the city. **This system has garnered promising outcomes and needs to be extended to other wards.**



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Due to decentralization of the SWM system in the city, proper surveillance of private service providers becomes mandatory. The monitoring and implementation at each ward depends upon individual chief executives who are mostly occupied with functions such as maintenance of roads, drains, potholes, sanctioning of building plans etc. Hence, monitoring of SWM activities is left in the hands of junior staff members who have limited knowledge and experience. Moreover, collection of municipal solid waste from the bulk waste generators is not even a part of their service contract. Also, the **system of giving small and multiple contracts has a major disadvantage of fragmenting the accountability which supports the tendency to pass on the baton and the blame amongst the contractors.**

### State Policy for SWM

- Segregation of waste at source is the bedrock of the entire waste management system because it significantly optimises waste processing and treatment technologies.
- To the extent space is available within the ULBs, **decentralised waste processing systems especially for biodegradable waste should be encouraged.** This is partly being incorporated by **making in-situ processing of biodegradable waste, mandatory for bulk waste generators.**
- Electricity Distribution Companies (**DISCOMs**) **have been mandated to procure 100% power for waste to energy plants in the ratio of their procurement of power from all sources** including their own, at the tariff determined by the appropriate Commission.
- ULBs should **compare the options of processing of plastic waste in road construction and waste to energy options like co-processing in cement plants for non-recyclable plastic** bearing in mind factors such as proximity to cement plant, infrastructure costs, manpower, technology, availability of infrastructure for shredding/baling, economic viability among others.
- **Selection of landfill** sites shall be done as per CPCB “Guidelines for the Selection of Site for Landfilling”, 2003 with an **aim to minimise the health risk, adverse environment impact, cost of development, construction, operation** as well as to maximise public acceptability of the project.
- ULBs may also **incentivise producer/brand owners and retailers that use eco-friendly alternatives in their packaging. Their models must be widely publicised so that other agencies can adopt similar practices.**



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- The **ULB would charge a “user fee” from the residents and other waste generators**, the amount of which would be based on need and affordability criteria.
- Usage of **metal containers** of specified dimensions and capacity is proposed for **secondary storage**. The **usage of concrete bins would be discontinued as per the mandatory recommendation of the Committee constituted by the Supreme Court**.



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## **Chennai pioneers in Solid Waste Management**

As the flood waters started to recede in 2015, when the Chennai Corporation employees, with the help of volunteers cleared 1.32 lakh tonnes of garbage from the streets of Chennai, it was a grimy reminder of the impending crisis of solid waste management (SWM) in the city. Chennai is crisscrossed with canals and dotted with lakes and other water bodies. Studies have shown how these eco-spots became sites of waste disposal and sewage, fracturing flood sink and dismantling flood barriers and pointed out why Chennai floods were a man-made disaster.



According to **The Waste-to-Energy Research and Technology Council (WERT)** the city generates **6400 tonnes of garbage everyday which is the highest in the country, with an average per capita of 0.71Kg**. The process of waste management involves door to door collection, transportation, and disposal of solid waste in 2 currently active dump yards, situated about 15 km away from the centre of the city.



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The Greater Chennai Corporation (GCC) has tried many fancy ways to promote segregation of waste, as indicated in the new SWM rules, 2016. The GCC offered gold coins and watches to residents in order to incentivize waste segregation at the household level, but all in vain. Consequently, **Chennai became the first city in India to contract out MSWM services to a private foreign agency, ONYX, a Singapore based company. The contract with the company brought several new methods and technologies including containerization of household waste before collection, mechanization of handling tasks by lifting, tipping and compacting devices, day and night services of collection, professional equipment for collectors, training program for workers and transfer stations which greatly extended the rule of segregation at source to nearly 95% of households.**

But there were many setbacks to the aforementioned, wherein abolition of open storage scheme was not entirely successful due to lack of financial resources, non-cooperation of the population and inaccessible narrow lanes. Transportation became difficult due to less availability of vehicles, drivers and finances. **This experience in Chennai suggests that effective management can be singularly accomplished by the private sector but the issue of cost effectiveness needs to be dealt with prior and intelligent planning.**

Some of the best practices of the city also include source separation which greatly reduces the waste accumulating at the landfill, thereby increasing the lifetime of the landfills. Also, **biodegradable waste is being composted in a decentralized manner at ward level by vermicompost and bio methanation plants and manure produced is used for GCC parks and greeneries besides open sale to the public. Source separated thin plastics are subjected to shredding in all units/zones and it has been used for laying bituminous roads. The source separated non-biodegradable waste which is collected on a weekly basis is also recycled.**



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## **State Policy For SWM**

- Greater Chennai Corporation (GCC) should arrange for **door-to-door collection of segregated solid waste from all households including slums and informal settlements, commercial, institutional and other non residential premises.**
- GCC should also devise a system to collect waste from vegetable, fruit, flowers, meat, poultry and fish market on a day to day basis and **promote setting up of decentralised compost plant or bio-methanation plant at suitable locations.**
- They should prescribe user fee with appropriate revision/ modification from time to time and collect it either on their own or through an authorised agency and also **provide training on solid waste management to waste-pickers and waste collectors.**
- Waste **deposition centres at least one in number, for the area of twenty square kilometers or part thereof should be established for domestic hazardous waste** and directions should be issued for waste generators to deposit domestic hazardous wastes at these centres for safe disposal.
- They should also **facilitate the formation of Self Help Groups (SHGs), provide identity cards and encourage the SHGs' integration in the solid waste management services.**
- An annual report to be submitted by the treatment facilities to the Local Bodies and by the Local Bodies to the State Pollution Control Board about the status of Solid Waste Management in the State.
- Facilitate identification and allocation of suitable land as per clause (f) of rules 11 of SWM Rules of Tamil Nadu State for setting up solid waste processing and disposal facilities to local authorities in respective districts in close coordination with the Secretary-in-charge of State Urban Development Department.



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## **National Policies for SWM**

### **Solid Waste Management Rules (SWM), 2016**

Extension of the jurisdiction of the SWM Rules from municipal areas, which was a limitation of the 2000 Rules, to beyond municipal areas by the Centre and State Governments, is in line with the Swachh Bharat Abhiyan which aims to provide sanitation facilities to every family, which shall be inclusive of toilets, solid and liquid waste disposal systems, village cleanliness and safe and adequate drinking water. **The 2016 Rules have introduced new changes like waste segregation at source and made the RWAs and market associations directly responsible for waste segregation.** The new rules also see duties assigned to various ministries like Urban Development, Chemicals and Fertilizers, Agriculture, Power and a few others, which were missing in the previous rules.

- The Ministry of Housing and Urban Affairs, being the nodal Ministry on the subject has been assigned the task to **formulate the National Policy and Strategy on SWM including policy on WTE plants in consultation with stakeholders** and provide technical and financial support to States, UTs and local bodies.
- Likewise, **the Ministry of Chemicals and Fertilizers shall provide market development assistance for compost plants to make them economically viable** and improve the gainful utilization of waste.
- Ministry of Agriculture & Farmers' Welfare, shall provide **flexibility in fertiliser control order for manufacturing and sale of compost**. This helps make the process of SWM much easier and efficient by forming suitable policies which will optimize waste generation, treatment and disposal.
- The Ministry of Power shall **fix tariffs or charges for the power generated from the Waste to Energy (WTE) plants based on solid waste and ensure compulsory purchase of power generated** from such Waste to Energy plants.
- The **Ministry of New and Renewable Energy shall facilitate infrastructure creation for Waste to Energy plants and provide appropriate subsidies** or incentives for such plants.
- Detailed duties and responsibilities have been assigned to the Secretary, State Urban Development Department, the Commissioner Municipal Administration,



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Director of Local Bodies, local authorities and village Panchayats of census towns and urban agglomerations.

New criteria and standards for waste treatment facilities and pollution control are expected to facilitate the smooth functioning of such facilities while coping with the myriad issues related to pollution.

New rules have mandated segregation of waste at source for all kinds of waste generators. Rules have also pushed towards **cross coordination between various authorities and bodies involved in the different stages of SWM. Manufacturers selling items in non-recyclable packaging will have to assist the authorities in solid waste management and devise a system for the collection of all such packaging.**

### The Smart City Mission

The Smart Cities Mission aspires to drive economic growth and improve the quality of urban life by inculcating smart solutions for e-governance, energy, water and waste management, urban mobility, skill development, among others. It is an ambitious policy whose goals cannot be achieved without a proper SWM system. Although **the Mission enumerates certain indicators such as waste to energy fuel, waste to compost, treatment of wastewater, reduction and recycling of construction and demolition waste for proper waste management, it also states that there is no standard definition of a smart city and its determinants can change on the basis of and in the context of the city in question.** This has broadly two implications. One, State governments have the power to improvise the rules and practices according to their needs and two, that **not only the government and municipalities but also professionals in the public domain have a pivotal part to play in attaining the goals of an efficient waste management system.** By adopting sustainable solutions for their everyday problems, they can lead the pathway for sustainable lifestyles for the city, which can greatly reduce the waste generation in cities.



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## **Swachh Bharat Abhiyan**

Apart from making India open defecation free and ensuring proper sanitation and cleanliness, the Swachh Bharat Abhiyan (SBA) also focuses on the problem of SWM in India. One of the objectives of **SBA is to completely start the scientific processing, disposal, reuse and recycling of Municipal Solid Waste**. Various campaigns were launched under SBA to push for efficient solid waste management.

- Segregation at source campaign launched in 2017 mandated segregation of waste at the source to ensure proper treatment and disposal of waste.
- **City Compost Policy** launched in 2017 had a **vision that all organic solid waste generated in cities is converted into compost or biogas by October 2019 by providing subsidies**. Fertilizer markets were also asked to co-market compost with chemical fertilizers.
- **Swachhata Pakhwada** launched in 2014 whose **focus is on involving people and bringing about behavioural and attitudinal change through innovative activities** so that the ultimate goals of the SBM could be achieved and sustained. Under the Pakhwada programme, different cities and ULBs undertook awareness programmes and campaigns, urging residents, commercial centres, hospitals and institutions to ensure cleanliness and hygiene.
- Swachhta hi Seva campaign launched in 2017 seeks to mobilise people to come out and get directly involved with the Swachh Bharat Mission for sanitation to contribute to Mahatma Gandhi's dream of a Clean India.
- Swachh Survekshan launched in 2015 which aims to foster a healthy competition among cities for improving cleanliness standards. Started by the Ministry of Housing and Urban Affairs (MoHUA), the **“Swachh Survekshan” survey ranks cities on cleanliness and other aspects of urban sanitation**.

## **Swachhata App & Swachhata Helpline**

The Swachhata App is a mobile and web application which has been initiated by the Ministry of Housing and Urban Affairs with the association of the Swachh Bharat Mission. Anyone with the App can file a complaint if they come across dumped waste or overflowing dustbins or any other inefficient sanitation related services. Once a complaint is posted through the App, it will be forwarded to the concerned municipal authority, as all urban local authorities have been mapped to the App. The Government



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also started the four digits Swachhata Helpline (1969) to facilitate citizens with better solid waste management services through a simple phone call.



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## RECOMMENDATIONS

### Logistical Synergy

- First and the most obvious suggestion is to **recognize the contributions of informal rag pickers in the waste management industry. Providing a framework for their work can greatly minimize the extent of various occupational health hazards arising out of abysmal working conditions** and would also allow them to yield greater economic returns by continuing to save municipal expenditure and **minimize the environmental impacts of uncollected waste.**
- A **holistic approach in planning and coordination between the involved sectors and stakeholders is much needed**, lack of which is apparent in the case of Mumbai. As the financial resources are often poor, the staff inadequate and untrained, the equipment obsolete and insufficient; **there is a general lack of motivation to provide qualitative and timely services amongst the authorities which needs to be tackled.**
- **Integration of waste management at a fundamental level in urban planning** is a much-debated issue at the United Nations. Municipal authorities in India monitor most civic functions except urban planning and regulation of land use which is in the hands of development authorities. **Creating formal links between them could result in proper planning and increase coordination for better implementation of laws and regulations.**

### Instilling Behavioural Change

- **User fees (fees or tax levied by the government on all kinds of waste generators for maintenance of various SWM practices like door to door collection, processing etc.)**, which according to the new SWM rules is at the disposal of the local bodies, **should be incentivized.** Waste generators offering segregated waste to the collectors may be charged a reduced fee as compared to unsegregated waste in place of a fixed rate across all kinds of waste generators.
- **Segregation of waste must not be compromised at any stage of waste management** because it might influence stakeholders from other stages to deviate even further from the practice of waste segregation. Therefore, **public**



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**awareness programs** should be organized regularly and advertised to encourage participation of various stakeholders in these events.

- Help from schools may prove vital to **mobilize the students by explaining about household waste segregation and inculcating such habits in the younger generation for easy implementation at household level.**

### Research, Planning and Customized Service Delivery

- Meticulous research and planning is required to **customize the waste management system for a city by carefully analyzing the composition of municipal waste and then select the appropriate system for treatment.**
- There is enough evidence in the country to **promote privatization of the waste management sector. Municipal authorities may take up the function of only facilitators and regulators.** It is also stipulated that the **contracting process for the private sector would include competition, transparency and accountability.**
- Preparing **citizen's report cards would involve them to bring about a positive change in each ward of our mega cities.** An example of this is a monitoring system put in place in the Punjabi Bagh area of Delhi in which **citizens helped in monitoring the service delivery for various services like street sweeping, manhole cleaning, removal of construction waste, nuisance of burning leaves, storm water drain cleaning, removal of silt on roads,** etc. This was an interesting model built around third-party service providers which presented a relevant case study on **how to channelize the citizen data to create long lasting change.**



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## Replicating and Adapting Examples

- **Dhaka** offers an excellent example of a waste management plan prepared and implemented in management cycles with the support of development partners. **Implementation of a ward-based approach to waste management in which citizens form an active part of the waste management efforts, receive training, promote public awareness, monitor system performance, and help in troubleshooting** is one of the very best practices in a South Asian country which can work as a replicable model for cities in India.
- **Shanghai** classifies MSW into four categories: recyclable, hazardous, wet, and dry waste. Various **methods to raise awareness on MSW classification are undertaken to increase people's willingness and public knowledge of MSW classification. Volunteer incentive and punitive mechanisms are also adopted to ensure the effective implementation** of the MSW policy. Indian cities facing the problem of citizen awareness may be able to take away a few ideas for better implementation of their MSW policies.
- To overcome their serious waste problem, **Colombia** came up with the idea of **ECOBOT – A recycling initiative that promotes the culture of recycling plastic across the country. It works by not only informing the citizens about the virtues of recycling, but by actually incentivizing and giving rewards for every recycled item.** ECOBOT is basically Reverse Vending Machine which is located in public spaces and encourages the process of recycling the PET bottles. Every time someone deposits a transparent plastic bottles (PET) or the caps, they receive a **coupon offered by associated companies called 'Ecopartners'** ranging from restaurant coupons to movie tickets to shopping dollars. All the plastic that is collected is sent to recycling plants instead of landfills. This is an **innovative idea which can be adapted by India, in order to endorse collection and segregation of plastic and raise awareness about the benefits of recycling plastic waste**, by incentivising plastic recycling, which remains one of the chief non renewable sources ending up in the landfills.
- **Malang**, a city in Indonesia, generates more than 55,000 tonnes of waste every day. A health company in Indonesia, Medika saw this as a huge social opportunity and created **Garbage Clinical Insurance which inspires low-income households to recycle their trash and trade the garbage**



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**for medical services and medicines.** This is an **excellent example for the policy makers in India for cities like Mumbai** where almost 60% of the people live in slums.

- The growing environmental awareness among the Dutch population has resulted in an aggressive **National Policy framework that works to eliminate landfilling and maximize material and energy recovery.** ROTEB, **the municipal waste management department of Rotterdam, is run as a public company although its budget comes from the municipality.** In Rotterdam, the **waste streams are separately collected** through depots, drop-off containers or house-to-house collection, and **directly transported to upgrading/recycling enterprises.** **Indian cities that are looking to revamp the role of the municipal bodies in order to improve the state of MSW or the ones that are looking to cope with the need for landfill sites and the problem of effective waste segregation at the administrative level, can consider adapting this method** of waste segregation and treatment for establishing effective and sustainable SWM systems.



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## **CONCLUDING REMARKS**

Three decades of economic growth since 1990 have changed the composition of waste in India and **improving SWM has become an imperative and urgent reality of our times**. Potential solutions and policies should be based on the clear understanding of all the factors involved which should be addressed with the supply of optimum capital and manpower. Although, **public awareness and participation is believed to be the prime factor influencing the SWM system as can be observed by drawing a comparison between the cities of Mumbai and Bengaluru, inadequate implementation of rules and regulations still remains one of the major reasons for improper waste management in the country as is evident in the case of Delhi and Chennai.**

Recycling, composting and waste-to-energy solutions are integral parts of the system but **waste reduction must be a way forward to build a sustainable living environment**. An **efficient solid waste management mechanism should integrate the dimensions like various stakeholders, the private sector agents and the informal sector for effective results in the management of solid waste in urban cities, particularly the mega cities**. There is no doubt that waste management in cities needs to radically change from current practices and appropriate methods should be adopted after critically analysing the composition of the waste generated.

It is obvious that there is a large gap between policy and implementation, however, it is also argued that in the end, it comes down to a case of political will.



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