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MUNICIPAL RESPONSIBILITIES FOR ENVIRONMENTAL PROTECTION IN INDIA: A CRITICAL REVIEW WITH EVIDENCE FROM KARNATAKA

Dasanuru Kusanna*

Abstract

Indian municipalities derive their powers and functions from the 74th Constitutional Amendment Act (CAA) of 1992, which authorises them to impose and collect taxes for socio-economic development, infrastructure, civic amenities, and essential urban services. One of their key responsibilities is to ensure basic civic amenities, public health, and environmental protection for urban residents. However, municipal solid waste management (SWM) remains a major challenge for Urban Local Bodies (ULBs). Despite efforts to manage solid waste and sewage disposal, municipalities often face a lack of public cooperation and encounter institutional hurdles in waste management. As a result, SWM continues to be a complex and pressing issue in urban governance. This article explores the key challenges faced by municipalities in Karnataka concerning SWM and proposes strategies to improve waste management mechanisms. It emphasises the need for municipalities to implement a "polluter pays" principle or introduce a solid waste cess to enhance environmental standards. Such measures would help municipalities effectively fulfil their health, hygiene, and environmental responsibilities, ensuring cleaner and more sustainable urban areas.

Key words: *Municipality, Environment, Sanitation, User fee, urban growth and legitimate responsibilities*

Introduction

The Constitution of India clearly defines the financial and administrative powers of urban local bodies (ULBs), leaving no ambiguity. However, in practice, ULBs often fail to acknowledge the three fundamental functions of the public economy: allocation, distribution, and stabilisation. While ULBs primarily focus on providing infrastructure and civic amenities, their approaches to functional allocation vary significant one. Most municipalities lack both the expertise and financial capacity to effectively manage fund allocation or address economic stabilisation and distribution functions. Although some municipalities have implemented redistribution measures in their regions, their weak fiscal management limits their ability to perform stabilisation functions on a larger scale. Consequently, ULBs are primarily responsible for delivering local public goods and services, with a particular focus on assisting low-income and vulnerable populations. The structure, financial powers, and operational mechanisms of ULBs differ significantly from those of the central and state governments, positioning them as supporting entities in economic development rather than independent financial decision-makers.

The Constitution assigns specific functional responsibilities to municipalities, particularly in environmental protection, public health, and sanitation. However, rapid urbanisation has exacerbated institutional challenges such as solid waste management, sanitation, and public health maintenance. A

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clean and liveable environment is essential for safeguarding public health. Balasubramanian (2018) highlights that rapid population growth, urban expansion, and increased economic activities have led to a sharp rise in solid waste production in India and globally. While India competes with other economies on the global stage, urban centres face significant challenges related to waste accumulation, which must be addressed to recover economic value from solid waste (Mridula et al., 2022). To tackle these issues, Tapan Narayana (2009) proposed adopting internationally recognised scientific waste management practices, including improved incineration methods. Recognising the urgency of the problem, the Central government introduced the Solid Waste Management (SWM) Rules, 2016, which outline strategies for managing municipal waste while maintaining environmental standards (CPCB, 2016). Karnataka integrated these regulations into its administrative framework through the Karnataka Solid Waste Management (KSWM) Rules, 2016, later reinforcing them through a comprehensive urban development policy in 2020. After three years of implementation, municipal authorities conducted a benchmark survey in each municipality to evaluate the effectiveness of the MSW policy in reducing waste-related challenges at the operational level. The findings from this survey will help strengthen policy measures and enhance waste management practices across the state.

Given these, this paper aims to examine the role of municipalities in SWM with the help of secondary data. The study mainly deals with solid waste management of Karnataka as below:

- To examine the role of ULBs regarding solid waste management, sanitation, maintenance of health and hygiene in the urban jurisdiction.
- To examine the scenario of solid waste management in Karnataka municipal areas.
- To examine policy initiatives brought by the State to address the solid waste management issues in the urban jurisdiction.
- To examine outcomes of the policy measures regarding solid waste management in Karnataka municipalities.
- To suggest rational measures for solid waste management in urban Karnataka.

This study is based on secondary data and published academic literature. The secondary sources include: (i) Solid Waste Management (SWM) implementation benchmark survey statistics of Urban Local Bodies (ULBs), (ii) municipal statistics from relevant administrative departments, and (iii) census data. Additionally, the study utilises other municipal records and census information to critically assess the implementation of SWM in Karnataka, including its strengths and limitations.

Introducing Reforms Related to ULBs

The concept of urbanisation refers to the socio-economic transformation from agriculture to industrial and service sectors. The process of urbanisation is a universal socio-economic phenomenon. It opens up new paths to developmental and cultural transformation. Urbanisation leads to the shifting of rural population through migration. Rural migrants settle down in urban areas in search of better livelihood options. For centuries, this process has been witnessed globally and this has been continuously established at various stages of development. To judge economic development, urbanisation is considered as one of the best indicators. Many institutional factors are also associated with rapid urbanisation. It is characterised by a natural increase in population, migration, expansion of industry,

trade, services, institutions and expansion of new towns and agglomeration centers. These factors have contributed to urban development and growth on a wider scale. The Constitution (1950) introduced certain provisions to establish self-rule in urban areas. It has been provisioned in a few Articles without drawing any broad scope. These provisions have failed to establish uniformity in the governance of Municipalities. Therefore, many national enquiry commissions have argued for the democratisation and stabilisation of ULBs. To encourage economic development and to bring about social and democratic justice at the urban level, the 74th CAA, 1992, was enacted and earmarked 18 functions in the Twelfth Schedule (Article 243 W)[1].

In other words, municipal functionalism can be defined as the civic facilities provided to civilians by municipal civic bodies. Such facilities are provided to people by the local bodies (both rural and urban). Civic amenities are also termed as public amenities, public facilities and essential services. Precisely, all the civic bodies are providing several services for the benefit of urban jurisdictions, as presented in Table-1.

Table 1: Consolidated Functional Characteristics of an Illustrative List of ULBs

No	18 Functional Characteristics	Total functional Responsibilities
01	Basic Services	03
02	Civic Amenities	05
03	Economic Promotion	01
04	Environmental Protection	01
05	Health and Sanitation	03
06	Social Service	01
07	Social Justice	02
08	Urban Planning	02

Source: 74th CAA 1992.

As shown in Table-1, environmental protection (01) and health and sanitation (03) are interrelated municipal functions; hitherto, these have been the obligatory functions.

Role of ULBs in Environment Protection (EP)

Before 1992, ULBs did not have any uniform legitimate directions regarding environmental protection and solid waste management (SWM). The directive principles of the States have mentioned it (Article 40), even though the States have failed to implement it effectively in terms of providing better sanitation facilities in the areas of civic bodies. Therefore, the 74th CAA assigned more legitimate powers

[1] They are: 1. Urban planning, including town planning,2. Regulation of land use and construction of building,3.Planning for economic and social development,4. Roads and bridges,5. Water supply for domestic, industrial and commercial purposes,6.Public health, sanitation conservancy and solid waste management,7. Fire services,8.Urban forestry, protection of the environment and promotion of ecological aspects,9. Safeguarding the interests of the weaker sections of society, including the handicapped and mentally challenged,10. Slum improvement and up-gradation. 11. Urban poverty alleviation,12. Provision of urban amenities and facilities such as parks, gardens, playgrounds,13. Promotion of cultural, educational and aesthetic aspects,14. Burials and burial grounds; cremations, cremation grounds and electric cremations,15. Cattle pounds; prevention of cruelty to animals.16. Vital statistics, including registration of births and deaths 17. Public amenities, street lighting, parking lots, bus stops and public conveniences, and 18. Regulation of slaughterhouses and tanneries.

and functions towards addressing the urban environmental management, community health and sanitation as lawful duties. They have become the obligatory functions of the ULBs. Out of 18 programmes, six address public health, sanitation, conservancy and solid waste management. Another eight programmes deal with urban forestry, protection of the environment and promotion of ecological aspects and the remaining four programmes are related to urban civic amenities and facilities such as parks, gardens, and playgrounds etc (see Table-1). Nevertheless, environmental and SWM aspects have become the collective implementation factors. Global-level Agenda 21 of the Rio World Conference on Environment and Development raised more discussions, acceptance, disagreements and adaptations regading environmental protection. Therefore, its measures were provisions for creating national strategies and wider applications.

India has passed the Model Municipal Law (MML-2003) for protecting urban environments. It has incorporated detailed measures to be taken by ULBs. Further, the Ministry of Environment & Forestry (MoEF:2016) has brought out rules and regulations on solid waste handling and facilitating the States to institutionalise the reforms as follows:

- MML advocates involving the PPPs, NGOs and Community-based organisations (CBOs) in service delivery mechanisms.
- It advocates imposing certain service charges to reflect operation and management (O&M) and capital costs.
- It advocates adopting more preventive measures on hazardous and bio-medical waste on par with the rule.
- It advocates following the rules and regulations of SWM.
- It advocates establishing state-level regulatory commissions on municipal service.

Rapid urbanisation is specifically subject to healthy and unhealthy aspects and their consequences on citizens.

Salient Features of Municipalities in Karnataka

Karnataka has been witnessing rapid urbanisation. Its urban population, according to the 1981 census which was 29 per cent, account for 38.57 per cent (2011) of the state's total population. By and large, the state’s share of the urban population remains above the national urban population. Rapid urbanisation has posed many challenges to the state in terms of providing the required level of civic amenities, infrastructural facilities, safety nets to the marginalised sections and environmental protections, etc. Presently, 316 Municipalities are working in different districts, as shown in Table-2 (See, Annexure).

Presently, municipalities are spread across the State and they occupy 5,886.78 Sq Km of the total geographical area of the State (3,565 Sq Km in 2001; 2,983 Sq Km in 1991). Out of which City Corporations (CCs) account for 29 per cent of area with 64 per cent of the total urban population. In terms of area coverage, CMCs are in third place in area with 24 percent and population-wise, they are in second place. TMCs are in second place in area and third place in terms of population. Town Panchayats (TPs) are in fourth place regarding the area and population as shown in Table-2 (see Annexure). By and large, municipalities are working under a four-tier system and they perform obligatory, discretionary and

special functions. The municipalities are not supposed to discriminate against citizens in providing civic amenities. However, in respect of delivering certain specific services, they can apply some degree of positive discrimination, i.e. providing specific facilities of goods or services to the most disadvantaged social groups of urban areas.

Rapid urbanisation and changing lifestyles of urbanites produce huge amount of household garbage and other wastes. Handling municipal solid waste (MSW) is a challenging task for the State. Disposing of MSW in an eco-friendly manner is causing a major hurdle concerning organisational, financial and environmental factors. They provide civic amenities and infrastructure facilities to urbanities. However, ULBs do not have access to sound financial resources. They depend heavily on the government's fiscal devolutions. With several financial difficulties, ULBs strive to discharge their duties regarding environmental protection.

To tackle MSW issues scientifically, the Ministry of Environment & Forest has issued MSW (Management and Handling) Rules (MoEF:2000) for providing rule-based measures to overcome the burden. Waste management programmes are related to sanitation administration with a focus on collection, segregation at the source, transportation and processing for creating economic value, as mentioned in the MSW Rules:

- Dumping of MSW in oceans, rivers, open areas, and compaction or bailing is not acceptable;
- The bio-degradable waste has to be processed using composting, vermin composting, anaerobic digestion or any other appropriate biological processing for stabilisation of wastes;
- Mixed waste containing recoverable resources should be recycled. Other technologies for treatment such as Pelletisation, Gasification, Incineration etc, require clearance from the Pollution Control Board before planning and implementation;
- Land filling should be the waste disposal method for non-biodegradable, inert waste and other waste, that is not suitable either for recycling or for biological processing (Karnataka SWM Policy: p-1).

Karnataka has introduced the SWM integrated policy for handling and providing eco-friendly conditions. In addition to this, the State has introduced a sanitation strategy in 2016. Sanitation is the basic necessity to human life for providing health in terms of one and all. The MSWM's primary objective is to provide and protect public health, enhance environmental standard and preserve natural resources (Water, Land and Air) for the future generations. It aims at providing directions to address waste management activities with a social approach, financially sustainable and economically viable. Thus, MSWM provides an integrated and self-contained operational framework for the use of appropriate technologies towards handling different types of solid waste and providing effective services.

New Touchstone Initiatives for SWM

Primary waste means the primary spot, where the waste is generated. In this case, householders and other stakeholders are considered as the primary waste producers. Regarding segregation of SW, municipalities have been playing a pivotal role in educating residents on the importance of waste segregation. The authorities instruct them on what they have to do; what they should not do when it comes to waste segregation, storage and delivery. Municipalities have issued some guidelines for waste

collectors to follow. MSW policy provides guidelines towards handling the waste produced by non-householders such as commercial zones, hotels, educational institutions, fairs and markets, exhibition centers and construction debris i.e., sending them directly to treatment yards through an efficient transportation system.

Primary Solid Waste Collection

The state generated 3,278 tones of MSW per day (2000) and the same has increased to 6,500 MSW tones (2011) reflecting a growth of 98 per cent (CPCB). As shown in Table-3, municipalities have estimated 37.32 lakh waste generators in the state; among them, 34.04 lakh (91 per cent) are covered under a door-to-door collection system. In this regard, normative standards have been fixed for the collection, storage and transportation of MSW from households, including slums and other BPL settlements, without resorting to any form of racial or communal discrimination. Under the normative standards, two civic workers are deployed for collecting waste from 1,080 households (A civic worker for every 5,400 persons). By and large, 10,393 tones of MSW generated is collected (2018-19) per day totally by municipalities (Table-3), and around 62 per cent of SW is collected by city corporations, while 38 per cent by and from other municipalities as shown in Table-3. Bruhat Bengaluru Mahanagara Palike (BBMP) alone collects 4,006 tonnes of garbage generated per day, which is a huge volume to handle effectively. Presently, municipalities have 6,609 wards out of which, 5,926 wards (90 per cent) have been covered under the door-to-door waste collection scheme. The door-to-door waste-collecting mechanism scheme has achieved 85 percent of progress in urban areas (see Table -3, Annexure).

The solid waste collection at source is the most important process; how and where it is segregated effectively and scientifically from the primary waste generators is shown in Table-4 (see Annexure). It reveals the details of sources of segregation in the state. As depicted in the table, 58 per cent of wards (3,848) are dumping the waste without any proper segregation. As a result, real and acute problems arise due to the unscientific segregated MSW. In this regard, municipalities have achieved only less than 20 percent of progress. Remarkably, CCs and CMCs have achieved excellent success in this as they manage municipal waste scientifically. If they fail to do so, it becomes difficult to provide a satisfactory level of environmental protection. Table-3 (see Annexure) gives important answers to all these questions regarding MSWM i.e., whether municipalities are better off or not. The volume of MSW generated depends on several factors such as food habits, standard of living, and the level of commercial activities, seasons and festivities. It is important to note that municipalities have miserably failed to develop sound and effective disposal mechanisms; they are losing the recoverable value from solid waste.

Is Municipal Solid Waste Disposal a Cumbersome Task?

An assessment of the contents of municipal solid waste bins reveals organic waste, paper, glass, textile, plastic, metals, ash, thrash, building debris, food waste, medical/bio-hazardous waste, engineering waste, etc. In Karnataka, the urban population produces an average of 0.360 Kgs per capita waste per day (it varies from tier to tier), as shown in Table-5. By and large, an urban individual produces per capita waste of 2.785 Kgs per day (Table-5, Annexure), while a Corporation produces 4.690 Kgs per

capita waste (highest) and Town Panchayats 1.408 Kgs, as revealed in table-5. Most of the municipalities have MSW handling mechanisms in the form of composting, vermi culture, bio-mechanisation or other types of disposal. Around 85 municipalities, however, do not have proper waste processing mechanisms. Among them, 46 TPs do not have proper disposal mechanisms (Table-5, see Annexure). Municipalities process about 3,044 tonnes of waste. Comparatively, City Corporations process the highest quantity of waste, whereas other municipalities process lesser quantities of waste (Table-5). As shown in Table-5, they have only 30 percent of solid waste processing capacity. Due to various institutional and financial reasons, municipalities have been facing major difficulties regarding MSWM.

The increasing urban population and rapidly growing household income in India have changed the lifestyles of the residents (Narayana, 2009). Urban residents frequently change their consumption patterns. They buy too much packed food, other processed items and packed groceries. This results in the generation of too much of plastic waste, that ends up in their garbage bins. With no possible solution in sight to this problem, pressure builds on the secondary segregation process. Table-6 highlights the ground realities. Overall, Municipalities produce an aggregate of 998 tonnes of plastic waste per day, but they collect only 62 per cent of it. Among them, City Corporations with more populations and areas (Table-, Annexure 2) produce 645 tonnes of plastic per day of which around 60 per cent is sent for recycling and treatment. CMCs and TMCs collect 62 and 63 per cent of plastic waste respectively (see, Table-6, Annexure). These bodies also treat a very small percentage of plastic waste. Population -and area-wise, TPs are in fourth place, with most of these being elevated from the Gram Panchayat status. Due to peri-urban characteristics, their populations use a lesser amount of plastic and they collect 91 per cent of the waste for disposal (Table-6, see Annexure).

To reduce plastic use in day-to-day life, the state has introduced drastic legal steps. For instance, it has been reported that 859 tonnes of plastic covers were seized and Rs 298 lakh collected as fine for unscientifically producing plastic and 19 cases were booked against producers. No cases were, however, registered against any consumers (Table-6, see Annexure).

Is Bengaluru's Solid Waste Management a Big Problem?

Bengaluru urban district is a highly industrial, commercial and institutional hub. It contributes significantly to NSDP. A high per capita income encourages advanced consumption practices in the Bruhat Bengaluru Mahanagara Palike (BBMP) area that spreads over 713 Sq.km. Due to higher levels of consumption and other economic activities; obviously it generates more of MSW. In this area, 31.83 lakhs of households and commercial and others produce an average of 450-500 gm of waste per head, amounting to 4000 tonnes per day (TPD). Generally, the physical and chemical characteristics of MSW have changed with population density and their patterns of use. BBMP alone generates more plastic waste than the city corporation's total MSW generation, as revealed in Table-7 (see Annexure). The state has instructed all the municipalities to monitor and effectively reduce the use of plastic. As a result, the BBMP cracked down on illegal plastic production and collected Rs. 268 lakh as fine without any cases being booked against any illegal producers of plastic due to political interventions (see Table-7, Annexure).

In the initial days, due to the enforcement of the law, retailers and vendors had advised consumers to use alternative bags for fear of being fined. After a few months, however, they gradually switched over to the use of plastic again. Most of the consumers do not abide by the law due to lethargy. By and large, areas under other municipalities have no proper monitoring system or any mechanism controlling the use of plastic. Surprisingly, cases are found booked only against plastic producers in these areas (Table-7, see Annexure). It is generally observed that public behaviour towards the use of plastic in their daily life has not changed, an indication that municipalities have failed to control the menace of plastic use. They do not have an effective legal administration system and are very slack in enforcing the law.

SWM: Eradication Approaches Followed by ULBs

Several urban firms are engaged in the production activities; naturally, they produce industrial waste, which is released into public streams/drains polluting the environment. likewise, residents, commercial entities and other production agents also produce different forms of domestic waste, polluting underground drains. They have equally contributed to environmental degradation. Karnataka has come out with some scientific benchmark guidelines for handling MSWM (2020) from householders towards a better livable eco-friendly environment. They are as follows:

- Compulsory awareness creation among citizens and other stakeholders.
- Ensuring the responsibilities of citizens and various stakeholders towards minimising multi and manual handling of waste before treatment at the final disposal yards.
- Ensuring operating frameworks with appropriate structures for effective resource utilisation and scientific disposal of waste.
- Promoting recoverable value from MSW, developing primary treatment facilities and segregated disposal facilities by ULBs.
- Promoting stakeholders' involvement in organising establishing coordination between householders, communities, and NGOs for identifying appropriate technical solutions to various waste management related issues. These are the broader action plans designed by the state for ULBs. Apart from these, the state itself has come up with people-friendly approaches towards involving stakeholders in MSWM, as per with MSW Rules, 2000.
- Ensuring that the MSWM policy gives more prominence to the sharing of Information, Education and Communication (IEC) on how to segregate waste primary source by householders and various stakeholders.
- Undertaking Programmes for Efficient and Effective street and culvert cleaning, removal of debris and other forms of waste by civic workers; ensuring that this waste is directly transported to secondary disposal yards.

Presently, the waste disposal methods followed by municipalities include incineration, land filling and composting. However, these methods are, in general inefficient and directly harm the environment. Waste management does not involve much of technicalities and can be handled very safely if the waste is properly segregated at source or where it is generated.

District-wise Ban on Plastic Use in ULBs Areas: Partially Successful

The inevitable fallout of urbanisation is the accumulation of solid waste and its improper management, leading to environmental hazards (Fourth SFC, P99). The SWM legal framework has directed all municipalities to handle solid waste in three ways: waste collection from source of segregation, transportation and disposal at land filling areas. These are enforced under Integrated Solid Waste Management Rules (2016), making SWM as an obligatory function on the part of ULBs. Per capita waste generation is estimated at 450-500 gm for city corporations (CCs), 400 gm for CMCs, 350 gm for TMCs and 250 gm for TPs and NACs, respectively. Plastics use is ubiquitous in daily human life, from food packaging and household appliances to clothing and construction materials, offering convenience and durability. In 2018-19, Karnataka Municipal Administration (KMA) conducted a bench mark survey to assess the level of plastic use in urban areas. As depicted in Table-8, 998 tonnes per day (TPD) of plastic waste was generated and more was generated in municipal corporation areas. BBMP alone contributed 42 percent of plastic waste to MSW of the state's total and the remaining 58 per cent of plastic waste was contributed by those other than the BBMP areas as presented in Table-8(column-A). Out of total plastic waste generated, only 62 percent was collected by ULBs in the state as presented in Table-8 (column-B). In BBMP areas, out of its generated plastic waste it collected only 52 per day cent and the remaining 48 per cent was dumped in different corners of cities. For ensuring a plastic free environment in cities, the state initiated several legal actions, and in this regard, it seized 859 TPD banned plastic across urban areas, imposing a fine of Rs.298 lakh, the highest in BBMP area, as revealed in table-8 (column-C & D). Only 19 cases are reported to have been booked against illegal users (column-E). On the other hand, 573 TPD of plastics has been recycled in different urban centers (Column-G). Thus, to a limited extent, plastic use has been controlled with these kinds of efforts some portion of plastics are disposed of, but what is that plastic use continues to be ubiquitous in daily societal life due to people's negligence.

The Fourth SFC identified 33 non-taxes for ULBs for improving their revenue status (p-164), with SWM cess being one among them. All ULBs are not collecting user fee from SW generators as an uniform cess; out of 281 ULBs, 193 units collect it as revealed in table-9. In 2018-19, out of 281 ULBs across the districts, 193 units (69 per cent) collected Rs. 11,562 lakh as SW cess (user fees); in this regard, BBMP alone has contributed Rs. 5,604 lakhs to the State totals, as presented in table-8. Almost all European nations are collecting user charges towards addressing the MSW by adding it in tax bills, but in India, it is very difficult to collect such cess from the local taxpayers. Particularly, local tax payers show more disrespect and prejudice towards making such payments to municipalities. Basically, these municipalities do not have a strong and sound tax base for raising more revenue to meet the anticipated municipal expenditure. Therefore, sometimes such civic bodies are not able to meet the street cleaning expenses. There is no alternative option for it; they have to slowly persuade urban people to pay user fees towards enhancing their non-tax revenue. Obviously, it can help waste producers handle municipal waste with care at source.

Municipal Waste and Rag Pickers

Rag picking is often regarded as a grim and degrading occupation, considered by some to be even more demeaning than beggary. Rag pickers do not enjoy a "tolerable minimum standard of living" (Koji Taira, p.3), and they are frequently stigmatised by society and deprived of basic civic facilities. As a highly vulnerable occupation, rag picking exposes individuals particularly women and children to significant health hazards. Since the 1970s, there have been global discussions aimed at addressing the challenges faced by rag pickers from a human rights and welfare perspective (Usha Rani et al., 2023, p. 2). In line with this, India has introduced several public policies to address the plight of rag pickers. Rag picking is an informal practice involving the collection and sale of recyclable waste, contributing to the economy by promoting resource recovery. Despite their economic value, rag pickers occupy the lowest tier of the urban labour market. A majority of them are women and children from marginalised communities, many of whom are illiterate, unskilled, and migrants.

According to a benchmark survey conducted by the municipal administration, there are approximately 2,420 rag pickers across Karnataka. However, the Bruhat Bengaluru Mahanagara Palike (BBMP) has not disclosed its data, highlighting significant gaps in municipal reporting. As detailed in Table 8 (see Annexure), Belagavi accounts for the highest proportion of rag pickers (13.3%), followed by Bagalkot (9.6%), Vijayapur (8.5%), and Davanagere (7.9%). Other districts also report varying numbers, as reflected in the annexed table. Beyond environmental and hygiene concerns, municipal waste management also gives rise to numerous socio-institutional and legal issues affecting the lives and livelihoods of rag pickers.

Higher Literacy Does Not Help Reduce Municipal Waste Generation: A Topple Syndrome

Indian states have made significant progress in improving literacy rates in both rural and urban areas, which is often considered a useful indicator of societal behaviour and civic engagement. This study assumes that literate individuals are more likely to participate in maintaining an eco-friendly environment in their localities. Based on this assumption, it examines whether literacy correlates with active involvement in Municipal Solid Waste Management (MSWM). According to the 2011 Census, Karnataka recorded a literacy rate of 75.4%, with 68.7% in rural areas and 85.8% in urban areas. Among urban areas, Yadgir reported the lowest urban literacy rate at 72.01%, while districts like Udupi and Dakshina Kannada recorded literacy levels exceeding 90%. Other districts such as Bagalkot, Raichur, Koppal, Bellary, Chamarajanagar, and Kalaburagi registered literacy rates between 75% and 79%, while most of the remaining districts recorded rates above 80%. However, urban female literacy remains low in Yadgir (63.92%) and Raichur (67.10%), despite relatively higher male literacy in these regions. Overall, gender-wise literacy rates are reported to be satisfactory.

Despite these improvements in literacy, the study finds no visible link between general literacy levels and participation in municipal solid waste management. In practice, even literate individuals often do not actively engage in waste segregation or eco-friendly practices. This suggests that higher literacy does not necessarily translate into civic responsibility regarding waste management. Cultural attitudes

and behavioural norms, particularly the reluctance to physically handle waste due to notions of purity v/s pollution, continue to pose significant challenges for municipalities.

To address the issue, the state of Karnataka has prioritised effective municipal waste management and issued detailed operational guidelines to local bodies. These include standardised procedures for the procurement of equipment, and the collection, storage, and transportation of municipal solid waste. For instance, it has recommended a manpower ratio of 1.0 for the primary collection of waste, and 1.1 for slum areas and below-poverty-line (BPL) households.

In contrast to developed countries where public attitudes toward MSWM are generally cooperative, urban residents in many developing and underdeveloped countries tend to remain indifferent. In India, this indifference is further compounded by entrenched social norms and a general aversion to handling waste. Consequently, municipalities are often forced to collect unsegregated waste directly from households, which complicate further processing and disposal. Further, Karnataka's municipalities have made sustained efforts to promote source-level waste segregation through public awareness campaigns and community outreach. However, these efforts have met with limited success. A prevailing public sentiment—"we pay taxes, so waste management is the municipality's responsibility"—reflects a passive and non-participatory attitude among urban residents. This mindset continues to undermine the effectiveness of MSWM. The challenges are especially pronounced in larger urban centres, where City Corporations (CCs) and City Municipal Councils (CMCs) face greater waste volumes and logistical difficulties.

Study Observations on MSW Management in Karnataka

MSWM is a basic sanitary service and municipalities must provide effective services towards maintaining better health and hygienic condition across urban jurisdictions. They can encourage increased community participation. The majority of environmental problems are manmade, that can be resolved through the perception and attitude of individuals or total participation of the community. These are intermingled/collective behaviours of the society. Generally, people's attitudes cannot be changed by mere education, as they are associated with many socio-cultural and psychological issues. Sometimes individual or community psychological levels contribute a lot to neutral attitude to SWM. Suppose anybody wishes to change his/her attitude; it will happen when they accept new knowledge or happen by societal demonstration. The level of consistency between environmental attitudes and behaviours is affected by a person's involvement and awareness. Along with these behaviours, the individual's commitment is also upheld by his/her sense of responsibility. Suppose any resident could be judged with a wide vision that 'my waste is my living problem'; then he/she will realise the importance of segregation of solid waste properly at the source. About SWM, any collective initiative shall emerge through knowledge of urbanites that could find a solution to the problem.

Generally, people's attitudes and literacy level have not established any relationship with alleviating the solid waste problem at large. Solid waste generators' overall attitudes and perceptions could be judged based on various parameters.

The third to fifth generations exhibit adequate education; they can judge or assess why municipalities have been insisting that people segregate the primary solid waste at source. In fact, they

have developed some kind of lethargic attitude towards involving themselves in contributing to solving MSW problems. Because of poor understanding by the household members and other institutional establishments at their doorstep, segregation ideas get defeated. The study has identified the following major difficulties faced in handling solid waste:

Waste Generation and Disposal Practices by Different Sectors

- ***Households and Domestic Workers***: The housemaids generally visit 3–4 houses per day. As part of their routine activities, they attend all the houses and pack all the waste in one plastic cover and dump it in the house bins. Sometimes, the waste is thrown into roadside pits or kept in the house without segregating for at least two more days.
- ***Markets and Street Vendors***: The markets produce a variety of wastes. Generally, vegetable sellers and shopkeepers do not segregate their waste or dispose of it properly. Particularly during the festival season, occasional sellers rush to the markets and occupy the city footpaths. They leave unsold items on the streets. This waste creates more problems in terms of its proper disposal. Retail outlets and vegetable vendors behave in a lethargic way when it comes to proper waste disposal.
- ***Industrial and Commercial Establishments***: Industries and meat producers and sellers do not segregate their waste, which causes difficulties for civic workers. Marriage halls and hotels are often negligent towards disposing of solid and liquid waste. Building and other construction debris gets dumped illegally in open yards without proper segregation.
- ***Healthcare Sector***: Many city hospitals and dispensaries do not follow the guidelines concerning the disposal of their clinical and biochemical wastes.

Institutional and Regulatory Framework

- Municipal Model Law (MML) urges municipalities to adhere to and follow its guidelines towards enhancing environmental, infrastructure, and other services. Article 243 S (1) has provided for the constitution of a ward committee under each corporation with a population of over three lakh. Unfortunately, most of them have not constituted such committees for utilising the services of community-based organisations (CBOs), NGOs, and PPPs in MSWM.
- There is no proper state-level regulatory commission for monitoring municipal services, provisioned in the MML.

Financial and Human Resource Constraints

- The devolution of funds remains a perennial issue facing the municipalities, which is a major hurdle to integrated municipal waste management.
- The absence of competent and qualified technical professionals is another serious issue.
- The management of sanitary workers, according to the Manual Scavenger Act, is another major setback to them.

Infrastructure and Land Use Challenges

- The landfill sites are causing serious problems in all the municipalities, as they do not have their own land to dump the waste.
- Acquiring land from private owners can be highly unaffordable due to their prohibitive costs and escalating prices.

Implementation and Enforcement Gaps

- Lack of adherence to waste segregation norms across all sectors.
- Weak enforcement of waste disposal regulations and penalties.
- Failure to involve community-based organisations and partnerships despite existing policy provisions.

Concluding Remarks

Municipalities in India are vested with mandatory powers and functions related to environmental protection, solid waste disposal, and hygiene maintenance. However, in a federal economy, the revenue-raising powers and expenditure responsibilities of the Centre and States are structurally distinct. While the Constitution provides the Centre and States with broader revenue streams, Urban Local Bodies have a limited tax base and often face resource constraints, particularly in managing municipal solid waste. In this context, the National Green Tribunal (NGT) of the Supreme Court has made serious observations as follows:

"Referring to data furnished by the government, NGT pointed out that Karnataka was only processing 9,153[2] tonnes of solid waste out of 15,334 tonnes generated daily. There was a gap of 6,181 tonnes per day, which the state claimed was being directly sent to landfills. Similarly, the state was processing only 1,929 million litres of sewage out of 3,356 million litres of sewage generated per day, leaving a gap of 1,427 million litres. The state estimated the cumulative quantity of waste at 179.9 lakh tonnes spread over 196 landfill sites across various cities and towns with over one lakh population"[3].

Further, NGT observed that "A total of 1.38 lakh tonnes of waste have been remediated and another 178.5 lakh tones still needs to be remediated."[4] Finally, the NGT found that "the dump sites in operation, as well as legacy waste dumpsites, occupy a huge area of valuable public land, resulting in air, water and land pollution and causing damages to the environment and public health. They emit an intolerable smell and cause a hazardous environment for inhabitants in the vicinity." [5] More than 37 cities have been releasing their sewages directly into rivers unlawfully, causing major water pollution. ULBs must address this issue on a priority basis for reducing water pollution. Scientific measures are required to save the existing rivers for future generations.

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[2] The state municipalities have been handling only 60 percent of SW generated and the remaining SW is thrown down on the streets, remote corners, and bushy areas or nearby sewages.

[3] Times of India (TOI), October 16, 2022

[4] Ibid source

[5] Times of India (TOI), October 16, 2022

Municipalities across India are grappling with a severe financial crisis, compounded by institutional inefficiencies, which hampers their ability to deliver efficient municipal solid waste (MSW) disposal services. Considering these challenges, state governments must assume a greater role by allocating targeted grants to support local bodies in improving their waste management systems. At the national level, the Union Finance Commission (UFC) should also provide enhanced financial assistance to municipalities to address persistent MSW-related challenges. Simultaneously, municipalities could adopt the "polluter pays" principle, wherein waste generators are held accountable for the cost of managing the waste they produce (Narayana, 2009).

According to Solid Waste Management (SWM) guidelines, 281 Urban Local Bodies (ULBs) in Karnataka have committed to reform initiatives aimed at improving waste management practices. However, a lack of technical expertise and inadequate inter-municipal collaboration has hindered the development of effective recycling and waste segregation strategies. As a result, municipal waste management remains fragmented and largely ineffective across most ULBs, except for the BBMP. There is an urgent need for integrating solid waste management operations through coordinated planning and technical capacity-building at all levels.

The Fifteenth Union Finance Commission (FUFC) has acknowledged the critical importance of effective solid and liquid waste management as essential components of public health, hygiene, and environmental sustainability in urban India. It identified solid waste management, quality water supply, water conservation, water recycling, and rejuvenation as key national priorities essential to the long-term sustainable development of cities (FUFC, p. 208). To streamline funding, the FUFC categorised urban areas into two groups: million-plus cities (Category I) and non-million-plus cities (Category II).

BBMP, being a million-plus city, received ₹2,304 crore under this framework for SWM and sanitation, of which ₹768 crore was earmarked for air quality improvement. Recognising the pressing need for action even in smaller cities, the FUFC allocated 40% of the grants as untied and 60% as tied to specific purposes, enabling non-million-plus cities in Karnataka to receive ₹6,409 crore for SWM and sanitation. In the post-COVID-19 context, additional grants were provided to support hygienic and health monitoring programmes at the urban local level. This financial support offers a timely and strategic opportunity for ULBs to strengthen SWM systems in alignment with the National Green Tribunal's (NGT) directives on environmental and sanitation standards.

The Municipal Act mandates the formation of ward committees at the Corporation level. This provision should be extended to other tiers of ULBs to deepen decentralisation and community engagement. However, most municipal corporations have not adequately utilised the potential of Community-Based Organisations (CBOs), Non-Governmental Organisations (NGOs), and Public-Private Partnership (PPP) models. Furthermore, public awareness campaigns on waste management have had limited reach due to design and implementation gaps.

Addressing the issue of plastic waste requires a stringent and sustained approach, supported by community participation and robust enforcement. Municipalities must implement regular control measures and foster public engagement by leveraging digital and social media platforms. Effective communication strategies can encourage citizens to fulfil their civic responsibilities, particularly in

source-level waste segregation. Such collective efforts are vital for promoting public health, environmental sustainability, and securing a better urban future for the coming generations.

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Annexure

Table 2: Urban Local Bodies in Karnataka: 2001 to 2025

Sl. No.	Categories of ULBs	In Numbers				Area Covered in Sq Km	% age share of Urban Population
		2001	***2011***	***2019-20****	***2024-25****		
1	City Corporations (CCs)	6	8	11	11 (3)	986.43 (29)	64
2	City Municipal Councils (CMCs)	40	44	58	61 (13)	1388.35 (24)	19
3	Town Municipal Councils (TMCs)	81	94	117	126 (40)	1493.38 (26)	12
4	Town Panchayats (TPs)	90	68	91	114 (36)	1246.22 (21)	5
5	Notified area Committee, Sanitary Board (NAC/SB)	8	5	04	4 (1)	NA	-
	Total	225	219	281	316 (100)	5886 (100)	2,89,56,441 (100)

* Including BBMP ,

Note: Figures given in parenthesis are percentages to total

Source: List of ULBs, UD,DMA, GoK. Bangalore

Table 3: Primary Municipal Solid Waste Generation and Disposal in ULBs:2018-19

Types of ULB	No of Estimated Population	No of Waste Generators (HH, Commercial etc..)	No of Waste Generators Covered under Door to Door programme (DWC-Every day) in Lakhs	Total amount of Solid Waste generated per day (in tonnes)	No of Wards in municipal areas	No of Wards Covered under Door to Door	Wards with 100% Door to Door collection
CC's	18402761 (64)	1366784 (37)	13.37	6410 (62)	684 (10)	684 (12)	668 (12)
CMC's	5501587 (19)	1161162 (31)	10.60	2130 (20)	1810 (27)	1716 (29)	1163 (21)
CMC's	5501587 (19)	1161162 (31)	10.60	2130 (20)	1810 (27)	1716 (29)	1163 (21)
TMC's	3544088 (12)	853551 (23)	7.38	1360 (13)	2673 (40)	2406 (41)	2270 (41)
TP's	1435484 (5)	350887 (09)	2.70	494 (05)	1442 (22)	1120 (19)	1034 (18)
Total	28883920 (100)	37,32,384 (100)	34.05	10393 (100)	6609 (100)	5926 (100)	5605 (100)

Note: Figures given in parentheses are percentages to total

Source: Consolidated Solid Waste Statistics, Dept of Municipal Administration. Govt of Karnataka.

Table 4: Source of Municipal Solid Waste Segregation in ULBs: 2018-19

Source Segregation	CCs	CMCs	TMCs	TPs	Total
No of Wards without source segregation	161 (24)	979 (54)	1651 (62)	1057 (73)	3848 (58)
No of Wards with Partial Segregation	447 (65)	429 (24)	422 (16)	153 (11)	1451 (22)
No of Wards with 100% source segregation	76 (11)	392 (22)	535 (20)	214 (15)	1217 (18)
Total	684 (100)	1810 (100)	2673 (100)	1442 (100)	6609 (100)

Note: Figures given in parentheses are percentages to total,

Source: Consolidated Solid Waste Statistics, Dept of Municipal Administration. Govt of Karnataka

Table 5: Quantity of Wards Processed and Disposed Scientifically in ULBs: 2018-19

Nature of Waste processed	CCs	CMCs	TMCs	TPs	Total
Per capita Waste produced by waste population (per day in Kgs)	0.348	0.387	0.384	0.344	0.360
Per capita Waste produced by waste generators (per day in Kgs)	4.690	1.834	1.593	1.408	2.785
Quantity of Waste processed in tonnes	2276	405	278	84	3044
Mode of Processing (Composting/Vermi/ Bio-methanisation/Others) not reported by ULB's	01 (NA)	09	29	46	85
Quantity of waste disposed of in SLF	3752	344	1132	44	5271

Source: Consolidated Solid Waste Statistics, Dept of Municipal Administration. Govt of Karnataka

Table 6: Effects of Plastic Ban in ULBs: 2018-19

Implementation	CCs	CMCs	TMCs	TPs	Total
Quantity of Plastic Waste Generated	645	194	126	33	998
Quantity of Plastic Waste collected/TPD	385 (60)	121 (62)	80 (63)	30 (91)	616 (62)
Quantity of banned plastic seised	314	208	323	15	859
Fine collected (Rs in lakhs)	268	19	10	2	298
No of cases booked	10	4	0	5	19
No of Door to door waste collection (DWC) Existing	243	48	54	23	368
Quantity of plastic waste recycled/reused	358	59	142	14	573
No of Rag pickers involved in PWM	507	906	712	295	2420

Note: Figures given in parentheses are percentages to total

Source: Consolidated Solid Waste Statistics, Dept of Municipal Administration. Govt of Karnataka

Table 7: Plastic Ban Effects in BBMP: 2018-19

ULB's	Quantity of Plastic Waste Generated	Quantity of Plastic Waste collected/ TPD	Quantity of banned plastic seized	Fine collected (Rs in lakhs)	No of cases booked	No of Rag pickers involved in SWM	Quantity of plastic waste recycled/ reused
BBMP	403 (38)	208 (35)	228 (42)	253 (48)	Nil	NA	130 (27)
Other CC's	645 (62)	385 (65)	314 (58)	268 (52)	10	507	358 (73)
Total	1048 (100)	593 (100)	542 (100)	521 (100)	10	507	488

Note: Figures given in parentheses are percentages to total

Source: Municipal Administration Documents, 2019

Table 8: District-wise Plastic Ban Enforcement in Karnataka: 2018-19

Sl. No	Districts	No of Wards	Plastic Ban implementation						
			Quantity of plastic waste generated (TPD)-	Quantity of plastic waste collected (TPD)-	Quantity of banned plastic seised (TPD)-	Fine Collected By the users (in Lakhs)-	No. of Cases booked	No of Rag Pickers involved in SWM	Quantity of plastic waste recycled/ reuses (TPD)-
			Column-A	Column-B	Column-C	Column-D	Column-E	Column-F	Column-G
1	Bangaluru (R)	123	14(1.4)	8(1.3)	5(0.6)	4.3(1.4)	0	45(1.90)	0.8 (0.1)
2	Bengaluru (U)	344	415(42)	215(35)	231(27)	254(85)	0	13(0.5)*	215(38)
3	Ramanagara	135	15(1.6)	69(1.5)	9(1.1)	2.4(0.8)	0	53(2.2)	0.6(0.1)
4	Tumkur	235	28(2.8)	17(2.7)	13(1.5)	3.4(1.2)	0	112(4.6)	2.8(0.5)
5	Kolar	166	26(2.6)	15(2.5)	2(0.2)	2.8(0.9)	0	50(2.1)	0.0
6	Chikkaballapur	158	12(1.2)	7(1.2)	9(1.0)	1.0(0.3)	0	115(4.8)	1.8(0.3)
7	Chitradurga	162	16(1.6)	10(1.6)	17(2.0)	1.2(0.4)	0	84(3.5)	0.0
8	Davanagere	154	28(2.8)	17(2.7)	4(0.4)	0.1(0.0)	0	190(7.9)	4.0(0.7)
9	Shivamogga	187	34(3.4)	20(3.3)	1(0.1)	0.1(0.0)	0	56(2.3)	0.6(0.1)
10	Mysuru	250	88(8.8)	87(14.1)	18(1.8)	5.5(0.1)	4	78(3.2)	65.7(11.5)
11	Mandya	186	8(0.8)	6(1.0)	0	0.0(0.0)	0	33(1.4)	0.0
12	C.R.Nagara	109	5(0.5)	4(0.7)	1(0.1)	0.1(0.0)	0	15(0.6)	0.0
13	Kodagu	68	0	0	15(1.8)	0.3(0.1)	0	19(0.8)	0.0
14	Hassan	184	25(2.5)	21(3.4)	15(1.7)	1.3(0.4)	0	31(1.3)	0.0
15	Chikamagaluru	148	0	0	23(2.7)	4.4(1.5)	0	7(0.3)	0.0
16	D.Kannada	253	27(2.7)	16(2.5)	3(0.4)	0.8(0.3)	6	54(2.2)	4.5(0.8)
17	Udupi	120	6(0.6)	6(0.9)	262(30)	0.1(0.0)	0	0	0.8(0.1)
18	Kalaburgi	247	14(1.2)	13(2.2)	26(3.0)	0.6(0.2)	0	131(5.4)	209.0(36.5)
19	Yadagiri	154	2(0.4)	19(0.2)	1(0.2)	0.9(0.3)	0	10(0.4)	0.0
20	Raichur	260	12(1.2)	7(1.2)	13(1.5)	0.6(0.2)	0	51(2.1)	0.0
21	Koppala	200	5(0.5)	3(0.5)	1(0.1)	0.0	1	48(2.0)	0.0
22	Bidar	172	10(1.0)	5(0.8)	10(1.2)	1.1(0.4)	0	156(6.4)	0.0
23	Ballari	379	55(5.5)	37(5.9)	87(10.1)	0.2(0.1)	6	60(2.5)	6.6(1.2)
24	Belagavi	734	37(3.7)	12(1.9)	20(2.3)	3.5(1.2)	0	323(13.3)	3.0(0.5)
25	Bagalakote	362	15(1.5)	17(2.7)	23(2.7)	2.0(0.7)	0	232(9.6)	23.0(4.0)
26	Vijayapur	265	10(1.0)	7(1.1)	22(2.5)	0.4(0.1)	0	206(8.5)	9.6(1.7)
27	Dharwar	156	45(4.5)	15(2.5)	14(1.7)	4.8(1.6)	0	101(4.2)	0.0
28	Gadag	204	5(0.5)	4(0.6)	2(0.3)	0.6(0.2)	0	67(2.8)	3.0(0.5)
29	Haveri	223	18(1.8)	15(2.4)	6(0.7)	1.1(0.4)	0	45(1.9)	0.0
30	U.Kannada	271	25(2.5)	22(3.6)	5(0.6)	1.0(0.3)	2	35(1.4)	22.4(3.9)
	Total	6609	998(100)	616(100)	859(100)	298 (100)	19	2420(100)	573.1(100)

Note: Figures given in parentheses are percentages to total

Source: Consolidated Solid Waste Statistics, Dept of Municipal Administration. Govt of Karnataka.

TPD: Tonne per day

* Under reported

Table 9: District-wise User Fees Collected by ULBs in Karnataka: 2018-19

Sl. No.	Districts	User fees collection		
		User fees enforced ULBs	Amount collected in 2018-19 (Rs in Lakh)	district percentage share in state total
1	Bangalore Rural	0	11	0.10
2	Bengaluru Urban	0	5604	48
3	Ramanagara	4	58	0.50
4	Tumkur	1	144	1.24
5	Kolar	2	26	0.23
6	Chikkaballapur	4	4	0.04
7	Chitradurga	1	0.4	0.00
8	Davanagere	6	148	1.28
9	Shivamogga	9	304	2.63
10	Mysore	9	1232	11
11	Mandya	4	47	0.40
12	Chamarajanagara	2	0.27	0.00
13	Kodagu	3	6.42	0.06
14	Hassan	8	93	0.80
15	Chikkamagaluru	7	26	0.22
16	D.Kannada	7	1096	9
17	Udupi	5	155	1.34
18	Kalaburagi	9	231	2.00
19	Yadagir	3	6	0.05
20	Raichur	7	49	0.42
21	Koppal	9	23	0.20
22	Bidar	6	41	0.35
23	Ballari	6	161	1.39
24	Belagavi	27	347	3.00
25	Bagalakote	8	114	0.99
26	Vijayapura	10	695	6
27	Dharwad	6	484	4.19
28	Gadag	9	102	0.88
29	Haveri	9	104	0.90
30	U.Kannada	12	249	2.16
	Total	193 (69%)*	11562	100.00

Note: Figures given in parentheses are percentages to total

Source: Consolidated Solid Waste Statistics, Dept of Municipal Administration. Govt of Karnataka.

* Against 281 ULBs

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