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Urban solid waste management: A case study of Ramanagara City Municipal Council

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Abstract
India is rapidly urbanising and it is evident from increasing out of the total population of 1210.2 million about 377.1 million are in urban areas. Karnataka is also experiencing rapid urbanization level this clear from urban population have increased from 22.95 per cent in 1951 to 38.67 per cent. Such massive transformations need for providing the infrastructure facilities such as drinking water supply, sanitation, solid waste management, storm water drainages, parks, roads, burial grounds, and sewerage etc. One of the most pressing problems faced by any urban centre is Municipal Solid Waste Management (MSWM). Rapid urbanisation and changing lifestyles have led to the generation of huge amounts of garbage and challenges in waste management in urban areas and it requires more amount of financial source for proper waste management services. In this regard present paper attempts to understand revenue sources of and expenditure on solid waste management, challenges of solid waste management and status of solid waste management in Ramanagara City Municipal Council. The study is based on both primary and secondary data. Study carried out in Ramanagara City Municipal Council. The primary data on collection and disposal of waste was collected from 450 households in the study area. Secondary data were collected from Ramanagara City municipal Council budget documents. The study enlightens the different sources of and expenditure on solid waste management and status and problems of solid waste collection and disposal in Ramanagara City Municipal Council.

Keywords: Expenditure pattern, revenue sources, solid waste management, solid waste collection, solid waste disposal, urbanisation.

Introduction

All over the world urbanisation is increasing in rapidly. According to United Nations estimates, the world became more urban than rural in 2008, for the first time in human history. Urbanization is happening everywhere in the world, although at differing rates. Therefore, we need to consider urbanization carefully (Todaro, M.P and Smith, S.C). India too is rapidly urbanising and it is evident from the increasing number of towns or cities from 5161 in 2001 to 7935 in 2011 and out of total population 1210.2 million about 377.1 million are having in urban areas, the net addition of population in urban areas over the last decade is 91.0 million (Government of India, Ministry of Housing and Urban Affairs). Karnataka also experienced significant urbanisation in recent decades. As per Census of India, urbanization level in Karnataka has increased from 22.95 per cent in 1951 to 38.67 per cent in 2011. Numbers of categories of urban local bodies have increased from 214 in 2014-15 to 314 in 2021-22 (Government of Karnataka, 2021-22) [9, 12]. Such massive transformations pose unprecedented challenges for providing infrastructure facilities such as drinking water supply, sanitation, solid waste management, storm water drainage, roads, parks, burial ground, and sewerage to meet needs of urban population. Increasing population coupled with industrialisation and urbanization results in increasing demand for infrastructure facilities.

Urbanization directly contributes to waste generation, and unscientific waste handling causes health hazards and urban environmental degradation (Vij, D. 2012) [20]. Proper solid waste management nurtures good health, enhance quality of the environment and quality of life in a community. As defined by Robinson (1986), solid waste refers to the by-products of household or commercial activities that have lost their value to the original owner but may hold significance for others (Kapoor, A. & Chakma, N. 2024) [15]. Solid Waste Management is one of the basic functions of Municipalities. Rapid urbanization, heterogeneous nature of waste, lack of awareness among the public and various other stakeholders, lack of appropriate infrastructure, disintegrated & unscientific approach of waste management has made the waste management as an unmanageable situation (Government of Karnataka, 2022-23) [13].

Solid Waste (SW) generation is an inevitable consequence of rapid urbanization, population explosion, changing lifestyle and modernization. The challenges of solid waste management are growing as consumption increases among urban population. The composition of waste has also transformed substantially in recent decades from organic waste and compostable waste to non-biodegradable. In addition, the usual practice of dumping mixed solid waste in quarries, lakes, streams, low lying areas, forests, open spaces, etc., generates a series of problems that have hazards consequences. Surface and ground water aquifers in such areas are heavily contaminated due to discharge of toxic leachates from such dumpsites. Quite often the waste dumped is burnt or catches fire, causing serious air pollution. Such sites also are perfect breeding sites for mosquitos and contribute to the spread of dengue, chikungunya, malaria, and other such deadly communicable diseases. Solid waste strewn is not merely major public health problem, but also contributes to spoiling aesthetics of pristine open areas such forests, farmlands, mountainous, wetland and coastal landscapes (Karnataka State Urban Solid Waste Management Policy, 2020) [16].

Solid waste management problems also associated with lack of collection and segregation. The issues like lack of vehicles, inadequate man power, poor enforcement of rules, improper segregation of waste, failure to dispose of waste scientifically, lack of public cooperation and awareness, financial constraints etc. These issues lead to environmental pollution and health risks. Solid Waste Management (SWM) covers efficient collection, transportation, processing, recycling and disposal and monitoring of waste and its impact on environment (Karnataka Economic Survey, 2021-22). The framework for administration and management of SWM in India is broadly divided into three tiers - Central, State and Urban Local Bodies (ULBs). Other stakeholders that play a crucial role are households, businesses, industries, informal sector, Non-Governmental Organizations (NGOs), Community-Based Organizations (CBOs), self-help groups (SHGs), etc. Involvement of all these stakeholders is necessary at several stages of SWM (Government of Karnataka 2018, CAG Report) [11].

Solid waste management is one of the major challenges all over the world and in India also. About 72 million tons of solid waste is generated in the country, of which 43 million tons are collected and only 12 million tons of waste is scientifically treated. Remaining 31 million tons dumped in landfills without any treatment. Most of the urban local bodies adopt land-filling as the option for disposal of solid waste which is linked to water contamination, generation of greenhouse gases besides odour nuisance (Karnataka Economic Survey 2021-22).

The Government of India and Government of Karnataka have launched various schemes for proper management of solid waste in urban areas. The Swacch Bharath Mission (SBM) was launched on 2nd October 2014 to eliminate open defecation and ensure scientific management of municipal solid waste and convert all cities to garbage free city. The Government of India has launched the Smart Cities Mission on 25 June 2015, with the objective of promoting sustainable and inclusive cities that provide core infrastructure and give decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' Solutions. Solid waste management is one of the core infrastructures which is included in smart city scheme (Government of India, Ministry of Housing and Urban Affairs).

1. Review of Literature

Urban infrastructure is becoming highly inadequate with the continuous rise of urban population. Increased urbanisation necessitates provision of basic services, which in turn demand for higher amount of financial resource for creating infrastructure and other services in urban areas. Atreya, S. and Kumar, A. P., analyses the revenue source and financial efficiency of selected urban local bodies such as Bruhat Bengaluru Mahanagara Palike, Mysore City Corporation, Mangalore City Corporation and Davanagere Corporation. The study states that urban local bodies depend more on Central and State governments for financial needs. Chattopadhyay, S. (2015) [6] analysed the existing urban infrastructure finance, and discussed about reforms which are needed to strengthen the financial health of urban local bodies. The study stated that revenue resources of urban local bodies are not sufficient to meet the infrastructure demand, because of inadequacies in raising revenue from their own resources. This has led to over dependence on higher tier governments. The study suggested the possible reform strategies to enhance the municipal finance such as more local financial autonomy, encouragement of public private partnership, public participation, sustainable finance from user charges, efficiency in own revenue source base, local capacity building etc. Rajhans, R. K. and Halder, A. (2019) [17] aimed at identifying issues in the existing financing and assessment framework of urban local bodies. According to the study India requires quick step up in development of urban infrastructure to satisfy the increased demand of urban population and efficient utilization of economic contribution of the urban population. It is also observed that there are limited ways to enhance their own revenues and there is more gap between the performance level of the municipal bodies within the country. The study suggested that a state level municipal body should be established for funding to urban local bodies rather than direct funding by central and state government. Singh, S. (2012) [18], focused on challenges of financing of urban infrastructure and civic services. Reforms in financing of infrastructure are essential for meeting the growing challenges and problems. The study suggested that market-based financing and Public Private Partnership (PPP) are the best techniques to enhance the financial health of urban local bodies.

As the number of cities increased and developed due to rapid urbanisation and economic development, the absolute quantity of waste generated put a burden on the existing waste management infrastructure and resources. As a result, disposal of this mounting waste in an efficient manner becomes a critical task to avert environmental degradation and associated health hazards. Kapoor, A. and Chakma, N. (March 2024) [15], analyzed the challenges involved in solid waste management in India. Inadequate handling of solid waste poses consequential challenges such as lack of proper collection and segregation, lack of land availability, financial limitations, lack of awareness in individuals and communities, etc. Suggested the funding sources for solid waste management like tax financing, waste to energy plants and composting and effective methods of solid waste management such as more focus on reusing, recycling, recovering resources from waste materials etc. Agarwal, A. et.al. (June 2015) [1] identified the challenges and issues involved in solid waste management like lack of segregation and collection at source, land scarcity, e-waste dumping, lack of awareness, risk of private sector participation such as lack of transparency, lack of cooperation between stakeholders, and problem of public private partnership such as lack of responsibilities etc. Suggested to adopt new technologies for waste management such as creation of awareness, refuse to use of plastic bag, segregation of garbage, composting, and stop to waste burning etc. Appasamy, P.P. and Nelliyat, P. (2007) [2] discussed financing ways such as local taxes, user charges, grants, subsidies, loans etc. for proper solid waste management. Beside these options discussed other two options such as public private partnership and carbon financing in detail for solid waste management.

This paper has been divided into five sections including the introduction and literature review, objectives, study area and methodology in the first section; second section depicts status of solid waste management in Karnataka; third section depicts financial status of solid waste management in Ramanagara City Municipal Council, revenue sources of

and expenditure on solid waste management in Ramanagara City Municipal Council; fourth section discusses solid waste management in Ramanagara City Municipal Council and suggestions, while the last section provides conclusion.

2. Objectives of the Study

Considering the responsibility and necessity of proper and scientific management of solid waste in urban area, the present study aims to understand the finance of solid waste management and to examine the status and challenges of solid waste management in Ramanagara City Municipal Council.

3. Study Area

Present study has concentrated Ramanagara City Municipal Council as its study area. Ramanagara CMC being relatively a new urban area provides a suitable background for understanding solid waste management practices. Ramanagara district was renamed as Bangalore South district on 23rd May, 2025 and Ramanagara city is the district headquarters. Bangalore South district was carved out of the erstwhile Bengaluru Rural district on 23rd August 2007, comprising five taluks such as Ramanagara, Channapatna, Kanakapura, Magadi and Harohalli and five urban local bodies such as three city municipal councils and two town municipal councils. Recently, in 2024, Harohalli was separated from Kanakapura taluk and formed a new taluk. Ramanagara taluk comprises Ramanagara City Municipal Council (CMC) and Bidadi Town Municipal Council (TMC), Channapatna taluk includes Channapatna City Municipal Council (CMC), Kananakapura taluk includes Kanakapura City Municipal Council (CMC), Magadi taluk includes Magadi Town Municipal Council (TMC). Ramanagara City Municipal Council has 31 wards and population of 95,167 of which 48,224 are males while 46,943 are females (2011 Census).

4. Methodology

The study based on both secondary data and primary data. Secondary data were collected from different sources like budget documents of Ramanagara City Municipal Council from 2019-20 to 2023-24, Economic survey of Karnataka, Karnataka State Urban Solid Waste Management policy, Government of Karnataka Report No. 4 of the year 2018 [11], Performance audit of Solid Waste Management in Urban Local Bodies, Report of the Comptroller and Auditor General of India. In Ramanagara City Municipal Council limit 9 wards out of 31 wards have been selected for data collection. 50 samples from each ward were selected, totalling 450 samples for analysing the objectives of the study.

Status of Solid waste Management in Karnataka

SWM was one of the eighteen subjects devolved to the ULBs under Article 243 (12th Schedule) of the Constitution of India. Section 87 of the KM Act, 1964 and Section 58 of the KMC Act, 1976 mandate management of solid waste as an obligatory function of ULBs. The 13th and 14th FCs identified SWM as one of the core sectors besides water supply, sewerage, and storm water drainage (Government of Karnataka Report 2018, CAG Report) [11].

There are totally 315 Urban Local Bodies (ULBs) in the State including BBMP. ULBs generate 11,085 tons of municipal solid waste every day. As per the Solid Waste Management Rules, 2016 of Ministry of Environment, Forest, and Climate Change of India, all ULBs are responsible for development of necessary infrastructure for collection, storage, segregation, transportation, processing, and disposal of municipal solid waste. Karnataka has formulated a policy on Integrated Solid Waste Management and the main objectives of this policy are a) providing directions for carrying out waste management activities in a manner which is not just environmentally and financially sustainable but also economically viable; b) establishing an integrated and self-contained operating system for Municipal Solid Waste Management (MSWM) which would include the development of appropriate means and technologies to handle various waste management activities and c) enhancing the ability of ULB's to provide waste management services to their citizens. (Karnataka economic survey 2023-24).

The Karnataka State Pollution Control Board (KSPCB), is fortifying scientific MSW management in Karnataka by enforcing SWM Rules 2016. About 11,044 tonnes per day (TPD) of MSW is generated in the state, of which 50-55% is wet/organic waste, 30-35% is dry waste, and 10-20% is Construction and Demolition (C&D) and inert wastes. By 2031, the municipal SW generation in Bengaluru alone is projected to exceed 13,000 TPD. (Karnataka economic survey 2021-22).

Financial provision of solid waste management in Ramanagara City Municipal Council

Sustainable financing is paramount to ensure discharge functions of any organisation. Major types of expenditure are capital and revenue expenditure, which take care of fixed costs for land, plant, machinery, daily expenses of managing municipal solid waste, refurbishment costs, O&M costs, and contingent costs, etc. (Government of Karnataka Report, 2018, CAG Report) [11]. This section provides a detailed analysis of various expenditures o managing solid waste in Ramanagara CMC.

1. Revenue sources for Solid Waste Management in Ramanagara City Municipal Council

Various sources of financing for solid waste management in Ramanagara City Municipal council are observed, namely own revenue sources, Central Government and State Government grants. Own revenue sources include solid waste management cess with property tax, vehicles such as sucking and jetting vehicles hire charges and equipment charges. Table 1 shows the total finance from own revenues, State government, and Central government grants for solid waste management during 2019-20 to 2023-24. Finance for solid waste management have been decreased during 2019-20 to 2023-24. During 2020-21 the CMC collected more receipts (1290.83 per cent) and it declined to -76.28 per cent in 2022-23. Over this period there is high variation 116.03 per cent is found in total finance for solid waste management.

Table 1: Finance/Revenue for Solid Waste Management in Ramanagara CMC In rupees

Year	Finance for SWM	Growth Rate
2019-20	1,92,357.00	-
2020-21	26,75,351.00	1290.83
2021-22	1,55,48,469.00	481.17
2022-23	36,87,327.00	-76.28
2023-24	1,45,43,073.00	294.41
	Average Growth Rate	497.53
	Std. Dev.	577.38
	CV	116.05

Source: Budget documents Ramanagara City Municipal Council

According to table 2 during 2021-22 SWM receipts occupied 5.59 per cent to total receipts. In During 2019-20 to 2023-24 SWM receipts have been increased from 0.08 per cent to 5.59 per cent. There is high variation 95.72 per cent found in finance available to solid waste management in Ramanagara CMC.

Table 2: Share of Finance for SWM to Total Income of Ramanagara CMC in Rupees

Year	Finance for SWM	Total Income	Percentage
2019-20	1,92,357.00	25,57,08,701.00	0.08
2020-21	26,75,351.00	27,20,92,950.00	0.98
2021-22	1,55,48,469.00	27,81,98,479.00	5.59
2022-23	36,87,327.00	26,80,91,837.00	1.38
2023-24	1,45,43,073.00	36,39,71,682.00	4.00
		Average Percentage	2.40
		Std. Dev.	2.30
		CV	95.72

Source: Budget documents Ramanagara City Municipal Council

2. Expenditure on Solid Waste Management in Ramanagara City Municipal Council

Solid waste management expenditure involves expenses for vehicle rent, drivers, tippers, loaders, cleaners, and helpers, repairs and maintenance of solid waste management vehicle, land fill site rent, expenses on poura karmika's safety materials, medical checkup insurance, wages and upahara programme and vehicle insurance, fuel expenses etc. As indicated in Table 3 expenditures on solid waste management by Ramanagara City Municipal Council have increased from 29.25 per cent in 2020-21 to 37.38 per cent in 2023 -24. In 2021-22 and 2022-23 have declined to 17.15 per cent and -19.80 per cent respectively. During the period high variation 157.96 per cent found in growth expenditure for solid waste management.

Table 3: Expenditure on Solid Waste Management in Ramanagara CMC

in Rupees

Year	Expenditure on SWM	Growth Rate
2019-20	3,08,37,036.00	-
2020-21	3,98,56,849.00	29.25
2021-22	4,66,92,876.00	17.15
2022-23	3,74,49,638.00	-19.80
2023-24	5,14,47,556.00	37.38
	Average Percentage	16.00
	Std. Dev.	25.27
	CV	157.96

Source: Budget documents Ramanagara City Municipal Council

During 2021-22 SWM expenditure absorbed more 15.60 per cent in total expenditure and was less (13.66 per cent) in 2022-23. During 2019-20 to 2023-24 SWM expenditure stays between 13 per cent to 15 per cent (Table 4). Not much variation 5.69 per cent in expenditure on SWM during 2019-20 to 2023-24 in Ramanagara CMC.

Table 4: Share of SWM Expenditure to Total Expenditure in Ramanagara CMC in Rupees

Year	Expenditure on SWM	Total Expenditure	Percentage
2019-20	3,08,37,036.00	21,10,23,427.00	14.61
2020-21	3,98,56,849.00	25,99,44,319.00	15.33
2021-22	4,66,92,876.00	29,92,59,043.00	15.60
2022-23	3,74,49,638.00	27,41,24,567.00	13.66
2023-24	5,14,47,556.00	36,75,88,686.00	14.00
		Average Percentage	14.64
		Std. Dev.	0.83
		CV	5.69

Source: Budget documents Ramanagara City Municipal Council

Status of solid waste management in Ramanagara City Municipal Council

Solid waste management has three basic components, namely, collection, transportation, and disposal (Balasubramanian, M. 2018) [4]. The SWM Rules 2016, 4(a) mandates door-to-door collection, proper segregation, transportation, and disposal of SW in all the ULBs (Karnataka economic survey 2021-22). Table 5 represents disposal methods of solid waste by households in Ramanagara City Municipal Council. As reported by households, waste is disposed of by giving to waste collection vehicles, in community dustbins, in road side drains or on roads, and in open spaces. Among 450 sample households most of the households (85.33 per cent) give waste to waste collection vehicles, followed by 35.56 per cent throws waste in road side or roadside drains, and 10.89 per cent throws in open spaces.

Table 5: Disposal of Waste by Households in Ramanagara City Municipal Council

Sl No.	Ward Name	Door to door collection by municipal staff	Store and throw in community dustbins provided by the municipality	Throw in road side drains/on roads	Throw outside the house in open spaces and left unattended	Store and burn	Total
1	Chamundipura	50	0	5	4	0	50
		(100.00)	(0.00)	(10.00)	(8.00)	(0.00)	-
2	Aralepete	50	0	6	0	0	50
		(100.00)	(0.00)	(12.00)	(0.00)	(0.00)	-
3	Shettihalli Beedi	45	4	20	0	0	50
		(90.00)	(8.00)	(40.00)	(0.00)	(0.00)	-
4	Gousiya Nagara	39	0	39	0	0	50
		(78.00)	(0.00)	(78.00)	(0.00)	(0.00)	-
5	Nalband Wadi	30	0	33	0	0	50
		(60.00)	(0.00)	(66.00)	(0.00)	(0.00)	-
6	Phoolbagh	29	0	14	35	0	50
		(58.00)	(0.00)	(28.00)	(70.00)	(0.00)	-
7	Yarab Nagara	41	0	2	10	0	50
		(82.00)	(0.00)	(4.00)	(20.00)	(0.00)	-
8	Geethamandira Badavane	50	0	27	0	0	50
		(100.00)	(0.00)	(54.00)	(0.00)	(0.00)	-
9	Vidyapeetha Badavane	50	0	14	0	0	50
		(100.00)	(0.00)	(28.00)	(0.00)	(0.00)	-
Total*		384	4	160	49	0	450
		(85.33)	(0.89)	(35.56)	(10.89)	(0.00)	-

Note: Multiple responses, total may not be 100%.
Source: Survey data

Table 6 reveals the number of times waste collected during a week by the CMC. As shown in the table 8, 49.78 per cent household reported that the CMC collected waste through vehicles at door level three to four times in a week, followed by 40.67 per cent twice or once, and 9.56 per cent five to six times in a week. The study observed irregular door to door collection of waste, and hence households throw waste on roadside and open spaces which causes accumulation of waste.

Table 6: Waste Collection Times per Week

Sl No.	Ward Name	1 to 2 Times	3 to 4 Times	5 to 6 Times	Total
1	Chamundipura	19	31	0	50
		(38.00)	(62.00)	(0.00)	(100.00)
2	Aralepete	16	24	10	50
		(32.00)	(48.00)	(20.00)	(100.00)
3	Shettihalli Beedi	16	10	24	50
		(32.00)	(20.00)	(48.00)	(100.00)
4	Gousiya Nagara	15	34	1	50
		(30.00)	(68.00)	(2.00)	(100.00)
5	Nalband Wadi	38	12	0	50
		(76.00)	(24.00)	(0.00)	(100.00)
6	Phoolbagh	43	7	0	50
		(86.00)	(14.00)	(0.00)	(100.00)
7	Yarab Nagara	6	39	5	50
		(12.00)	(78.00)	(10.00)	(100.00)
8	Geethamandira Badavane	30	20	0	50
		(60.00)	(40.00)	(0.00)	(100.00)
9	Vidyapeetha Badavane	0	47	3	50
		(0.00)	(94.00)	(6.00)	(100.00)
Total		183	224	43	450
		(40.67)	(49.78)	(9.56)	(100.00)

Source: Survey data

Table 7 reveals opinion of households about problems faced by households due to heap of waste on road side and open spaces. Among 450 sample most households (67.56 per cent) experiencing problems due to waste on roadside and open spaces and 32.44 per cent households as they reported as no problems due to solid waste. As households, stated that waste on roadside cleared once or twice in a month by the CMC but waste in open spaces is not cleared. Due to this reason, the households face problems. As a consequence of irregular door to door collection of waste, waste stack on roadside and drains, and open spaces households face problems *viz*. animals and birds' problems, foul smell, insects' problems etc. 99.34 per cent of households experiencing by animals and birds' problems followed by

86.84 per cent by bad smell, 58.55 per cent by insects' problems and 1.64 per cent by some other problems. In Phoolbagh ward most households followed by Gousiyanagara, Yarabnagara, Geethamandira Badavane and Aralepete facing problems due to improper waste management.

Table 7: Nature of solid waste related problems in Ramanagara CMC

Sl No	Ward Name	Yes	Animals and birds' problem	Bad smell	Insects' problem	Other	Total
1	Chamundipura	20	20	18	6	0	20
		(40.00)	(100.00)	(90.00)	(30.00)	(0.00)	-
2	Aralepete	26	26	24	11	1	26
		(52.00)	(100.00)	(92.31)	(42.31)	(3.85)	-
3	Shettihalli Beedi	20	20	19	13	0	20
		(40.00)	(100.00)	(95.00)	(65.00)	(0.00)	-
4	Gousiya Nagara	47	47	35	36	3	47
		(94.00)	(100.00)	(74.47)	(76.60)	(6.38)	-
5	Nalband Wadi	36	36	30	21	0	36
		(72.00)	(100.00)	(83.33)	(58.33)	(0.00)	-
6	Phoolbagh	50	50	50	28	0	50
		(100.00)	(100.00)	(100.00)	(56.00)	(0.00)	-
7	Yarab Nagara	39	39	38	30	0	39
		(78.00)	(100.00)	(97.44)	(76.92)	(0.00)	-
8	Geethamandira Badavane	38	36	25	22	0	38
		(76.00)	(94.74)	(65.79)	(57.89)	(0.00)	-
9	Vidyapeetha Badavane	28	28	25	11	1	28
		(56.00)	(100.00)	(89.29)	(39.29)	(3.57)	-
Total*		304	302	264	178	5	304
		(67.56)	(99.34)	(86.84)	(58.55)	(1.64)	-

Source: Survey data

Urban local bodies are responsible for discharge the function of disposal of waste generated in urban areas (Government of Karnataka Report 2020, CAG Report) [10]. Solid Waste Management is an essential service and a mandatory function of the municipal authorities across the State and they are required to keep the cities and towns clean in an environmentally sustainable manner (Karnataka State Urban Solid Waste Management Policy, 2020) [16].

In the study area 43.56 per cent of households (Table 8) are dissatisfied about waste collection in Ramanagara CMC. It is to be noted that only 20 percent of households reported that they are satisfied about SWM. Across wards in Phoolbagh, Gousiyanagar, Yarab nagara and Vidyapeetha Badavane more than 50 per cent of households revealed their dissatisfaction on SWM.

Table 8: Households Satisfaction level about Solid Wase Management Service by the Ramanagara City Municipal Council

Sl No.	Ward Name	Completely dissatisfied	Somewhat dissatisfied	Somewhat satisfied	Satisfied	Very satisfied	Total
1	Chamundipura	0	18	7	25	0	50
		(0.00)	(36.00)	(14.00)	(50.00)	(0.00)	(100.00)
2	Aralepete	4	20	7	19	0	50
		(8.00)	(40.00)	(14.00)	(38.00)	(0.00)	(100.00)
3	Shettihalli Beedi	3	15	12	20	0	50
		(6.00)	(30.00)	(24.00)	(40.00)	(0.00)	(100.00)
4	Gousiya Nagara	13	30	5	2	0	50
		(26.00)	(60.00)	(10.00)	(4.00)	(0.00)	(100.00)
5	Nalband Wadi	5	25	11	9	0	50
		(10.00)	(50.00)	(22.00)	(18.00)	(0.00)	(100.00)
6	Phoolbagh	29	19	2	0	0	50
		(58.00)	(38.00)	(4.00)	(0.00)	(0.00)	(100.00)
7	Yarab Nagara	10	30	7	3	0	50
		(20.00)	(60.00)	(14.00)	(6.00)	(0.00)	(100.00)
8	Geethamandira Badavane	3	26	18	3	0	50
		(6.00)	(52.00)	(36.00)	(6.00)	(0.00)	(100.00)
9	Vidyapeetha Badavane	0	13	28	9	0	50
		(0.00)	(26.00)	(56.00)	(18.00)	(0.00)	(100.00)
Total		67	196	97	90	0	450
		(14.89)	(43.56)	(21.56)	(20.00)	(0.00)	(100.00)

Source: Survey data

1. perceptions of Households about solid waste management

Survey results revealed that in Ramanagara City Municipal Council (CMC), households demand for provision of proper collection and disposal of solid waste. According to households, waste is not collected regularly at door level. Due to irregular waste collection, households face problems like bad smell, insects' problem, infection, problems from

dogs and birds etc. Therefore, households need proper collection and disposal of solid waste every day at door level and also is should be collected in morning, so that working people can give their household waste.

Conclusion

India is rapidly urbanising and it is evident from increasing number of towns or cities from 5161 in 2001 to 7935 in 2011 and in India out of the total population of 1210.2 million about 377.1 million are in urban areas, the net addition of population in urban areas over the last decade is 91.0 million**.** Karnataka has also been experiencing significant urbanisation in the recent decades. As per Census of India, urbanization level in Karnataka increased from 22.95 per cent in 1951 to 38.67 per cent and the number of categories of urban local bodies increased from 214 in 2014-15 to 314 in 2021-22.

Increased urbanization requires proper provision of infrastructure services such as drinking water supply, sanitation, solid waste management, sewage systems, urban transport, primary health services, and environmental regulation to keep up with the demands of economic development and population growth. As per the Solid Waste Management Rules, 2016 of Ministry of Environment, Forest, and Climate Change, all ULBs are responsible for developing necessary infrastructure to collection, store, segregate, transport, process, and dispose municipal solid wastes. In order to carry out their activities sustainable financing is paramount. Therefore, adequate financing is necessary in proper management of solid wastes in urban areas, this study analysed finance and problems of solid waste management in an urban area of Karnataka.

The Ramanagara City Municipal Council receives incomes from own sources and grants from State and Central Governments through various schemes for solid waste management. During the period from 2019-20 to 2023-24 expenditure on solid waste management exceeded income from managing solid waste. There is a deficient in income from solid waste management compared to its expenditure. For provision of better solid waste management service there is a requirement of enhancement of both income sources and expenditure on solid waste management in the Ramanagara City Municipal Council.

The survey and observation revealed that there are several problems in the solid waste collection and disposal system. Waste in roadside and open spaces not cleared regularly by the CMC due to this garbage is lying scatter on the roadside, drainages, and open spaces. Households in Yarabnagara and Phoolbagh stated that waste has disposed at near their residences, as a result of this they are experiencing with bad smell, dogs, and birds' problems. Therefore, the households demand for proper solid waste management service by the Ramanagara City Municipal Council.

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