

Assessment and Management Strategy of Solid and Other Household Waste Products in Nagaon Municipal Area of Nagaon District, Assam

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ABSTRACT

Growing household waste production is one of the main environmental issues in fast developing urban areas. This work was done to find out what kinds of and how much solid waste households produce within ward no. 8 and 22, that fall under Nagaon Municipal Board (NMB), Nagaon, Assam. To do this, the investigators went out into the field for direct observation and also had interactions with the residents to grasp the ways they generate and dispose of waste locally. From the information gathered, it turned out that the bulk of the waste coming from the households was made up of biodegradable waste like kitchen waste, vegetable peels and leftover food. Besides these, non-biodegradable wastes such as plastic materials, packaging products, glass and metal items were also normally found. This piece of work furthermore emphasized on households' failure to separate their waste properly and the overall ignorance of the community with respect to sustainable waste management practices are the main reasons behind the inefficient methods of waste disposal. According to the results, proper separation of wastes, raising public/community awareness and better municipal waste management policies are necessary to minimize pollution to the environment and to encourage sustainable ways of waste handling. The research points out that properly managing waste at the level of the household can be very instrumental in keeping the urban environment healthy.

Keywords: Household waste, Solid waste management, Biodegradable waste, Non-biodegradable waste, Nagaon Municipal Board, Urban waste

INTRODUCTION

The rising generation of municipal solid waste (MSW) has emerged as one of the most important environmental and public health concerns affecting urban regions across the globe. The World Bank's report, what a Waste 2.0, indicates that in 2016, the global production of municipal solid waste was approximately 2.01 billion tons. This amount is expected to rise to 3.40 billion tons annually by 2050, primarily due to the effects of rapid urbanization, population growth and changing consumption habits (Kaza et al., 2018; Chen et al., 2020). The issue is especially severe in developing nations, where solid waste management systems are insufficient due to financial limitations, institutional deficiencies, insufficient technical expertise and the lack of effective regulatory frameworks (Guerrero et al., 2013). Rapid and often unplanned urbanization in cities of the developing world has led to a huge rise in the amount of waste produced per person from 0.4 to 1.62 kg per person per day. Biodegradable organic waste makes up 42-80.2% of the total waste stream (Dhokhikah and Trihadiningrum, 2012). A national sample survey (NSS) study found that almost 48.2% of households threw their trash in open areas in 2018, up from 38.6% in 2012. More than 58% of households said they had no way to get rid of their trash (Salve and Mishra, 2025). Khan et al. (2022) noted that poor management of solid waste in developing countries makes environmental damage worse by polluting the air and water, spreading vector-borne diseases, and contaminating soil.

In India, managing municipal solid waste has become a major challenge for urban local bodies (ULBs), which are mainly responsible for sanitation and waste disposal. The country generates over 100 million tonnes of solid waste each year from different sectors. Per capita waste generation varies between 0.2 kg and 0.6 kg per day, depending on household size and economic status (Balasubramanian, 2018). Despite the scale of the

problem, about 90% of municipal solid waste in India is still dumped improperly in open areas and unregulated landfills. This practice poses serious risks to human health and the environment and it contaminates the food chain (Meena et al., 2023). Acknowledging these difficulties, the Ministry of Environment, Forests and Climate Change (MoEFCC), GoI announced the Solid Waste Management Rules (SWM Rules) in 2016, which replaced the previous Municipal Solid Wastes (Management and Handling) Rules of 2000. These rules required all municipalities and local bodies to separate sources, collect waste door-to-door, process it and dispose of it scientifically (Balasubramanian, 2018; Pal and Bhatia, 2022). During 2014, the Swachh Bharat Mission (Clean India Mission) aimed to expedite the development of public sanitation and solid waste management infrastructure in Indian cities and towns (Pal and Bhatia, 2022). Nonetheless, studies show that many ULBs, especially in Tier-2 cities and smaller towns, still face institutional and financial challenges. They also lack the infrastructure, expertise and effective planning needed for solid waste management (Kumar, 2024). Most Indian cities only collect about 70–80% of the municipal solid waste they produce. The rest is left on the streets or in small open dumps (Devi et al., 2016). This governance deficit was further highlighted by a national-level analysis conducted by Salve and Mishra in 2025 which showed that waste disposal into open areas actually increased from 38.6% of households in 2012 to 48.2% in 2018 and that over 58% of households reported having no garbage collection arrangements despite ongoing policy interventions. In the northeastern part of India, the state of Assam embodies the waste management issues of less resourced regions and small and medium towns. Over the past 20 years, cities and towns like Guwahati, Tezpur, Jorhat and Dibrugarh have seen rapid population growth and increased rural-to-urban migration. As a result, the amount of solid waste generated has significantly increased, surpassing the capacity of current municipal management systems (Choudhury and Dutta, 2017; Gogoi, 2013; Saikia and Nath, 2015). Despite increasing public demand for better services, municipal boards and town committees in Assam, which serve as the main urban local bodies in charge of sanitation and waste disposal, often lack the institutional capacity, financial resources, necessary for proper solid waste management (Sinha, 2014). Nagaon, a well-known district headquarters town is not an exception to these difficulties. (Sarma and Sarma, 2015) noted that towns like Nagaon have seen exponential population growth due to the constant migration of people from nearby rural and semi-urban areas to urban centers along with a continuous shift in economic activity from the agricultural to the industrial and service sectors. Rising garbage volumes and limited administrative and financial resources provide challenges for the Nagaon Municipal Board, which is tasked with managing solid waste within its jurisdictional wards (Debnath, 2020).

Several empirical studies have focused on the generation of household solid waste at the ward and municipality level in India. These studies reveal valuable insights but the geographic coverage of the findings is uneven. Roy et al. (2022) did a big survey on the field of 5, 000 households in 32 urban local bodies in West Bengal and discovered that waste generation rates, waste composition, and segregation behavior varied widely not only between different income groups but also different types of settlements. Recently in a ward, level study in Ujjain, Madhya Pradesh, Kalyanasundaram et al. (2025) recorded an average daily per capita household waste generation of 141.0g to 146.7g through garbage weighing, with organic wastage contributing more than half of the total. Similarly, Harisha and Chandrashekar (2025) targeted residential sectors in the city of Tumakuru, Karnataka and discovered the per capita waste generation to be different from one income group to another, the overall average being 1.66 kg/capita/day, in addition to identifying seasonal changes in the winter and summer waste generation levels. In Assam, (Borkotoki et al., 2024) interview 180 families in Biswanath Chariali municipality gathered samples of wastes and found that the total waste generation is 280.77 metric tonnes per month. Among this total, 201.62 metric tonnes was organic waste. However, critical review of the literature shows that most of the studies on municipal solid waste at ward level in India have been conducted in metropolitan cities or Tier-1 and Tier-2 urban centers in southern, western and northern India. There is a striking lack of empirical evidence from small municipal board towns in the northeastern region (Ao and Ngullie, 2024). As the above review indicates, though a substantial number of research works have been focused on municipal solid waste management in Indian cities, ward level empirical studies on household waste generation have been still mainly restricted to metropolitan and Tier1 urban centres. Small municipal board towns in northeastern India have hardly received any attention from scholars. Nagaon town, administered by Nagaon Municipal Board, containing several administrative wards with diverse socio-economic and demographic characteristics is a very good example for such a study. However, to date no systematic comparative study of household waste generation across its wards has been done. For one thing, without ward-wise baseline data related to quantities, composition and disposal of

household waste, the Nagaon Municipal Board is left without data for effective planning, mobilizing resources and carrying out the Solid Waste Management Rules 2016 at local level. Second, it is known from literature that income, family size, occupational structure and consumption behavior affect household waste generation. The present study was carried out with the following objectives:

- Survey different types of household waste caused by the inhabitants in ward no. 8 and 22 under the NMB.
- Find out the percentage of biodegradable and non-biodegradable waste generated at home in the selected areas.
- Insight into the waste disposal methods of households including the practices they follow when handling and disposing of their daily household waste.

MATERIALS AND METHODS

The present study takes a systematic survey of the households in order to understand waste generation and disposal practices. The study area comprises of two wards namely ward no. 8 and 22 under Nagaon Municipal Board. Besides primary data collection, the study also makes use of secondary data. The survey methodology of taking the samples of households by door-to-door waste check is a standard practice and is being followed in this study as well (Salve and Mishra, 2025; Yadav and Singh, 2023).

Descriptions of the Study Area

Study Area

Nagaon, the administrative headquarters of Nagaon district in Assam, India, was selected as the study area. Located about 123 km east of Guwahati, the town is administered by the Nagaon Municipal Board, comprising 26 municipal wards. It covers an area of approximately 9.22 km² at an elevation of 61 m above mean sea level (26°20'39" N, 92°41'39" E). According to the Census of India 2011, Nagaon had a municipal population of 117,722. Rapid urbanization and population growth have increased municipal solid waste generation, making the town a suitable site for assessing household solid waste generation and management practices (Chinta et al., 2019). Like other urban centers of Northeast India, small and medium towns of Assam including Nagaon are facing problems in municipal solid waste management due to factors such as inadequate collection infrastructure, absence of segregation at source and limited disposal facilities among others (Dutta, 2013; Pradhan et al., 2012). The choice of these two wards was purposive as it was meant to compare the pattern of generation and disposal of household wastes in the wards which are different in terms of characteristics but under the same municipal board.

Primary Data Collection:

Sampling Design

In both the wards, the selection of the households was done by a purposive sampling method. This method of waste assessment at the household level is also in line with the waste assessment studies of households in other municipal areas of Assam and India (Borkotoki et al., 2024; Meena et al., 2023). Given the labour-intensive nature of the seven-day continuous household-level waste weighing protocol requiring daily door-to-door visits and sustained cooperation from household members the study was designed as a preliminary, comparative assessment between the two wards rather than an exhaustive ward-level census. Households were purposively selected to capture variation in housing type, family size and locality within each ward, and only those willing to participate in the full seven-day weighing exercise were included. This direct-measurement approach naturally limits household coverage compared to one-time interview-based surveys, consistent with other detailed waste-characterization studies relying on physical weighing rather than self-reported estimates. Accordingly, findings from the 12 households in ward no. 8 and 15 households in ward no. 22 should be seen as indicative of household-level waste patterns, not statistically representative of the full ward populations. The two wards together comprise approximately 500 households, of which 27 (15 from ward no. 22 and 12 from ward no. 8) were covered under this weighing exercise. Given the effort required for daily physical weighing, a larger sample was not practically feasible within the scope of this study. The findings serve as a preliminary baseline, and future studies with a larger, randomly selected sample are recommended for more generalizable ward-level estimates.

Door-to-Door Survey

The chief data were obtained by conducting a door-to-door survey of the selected households in both wards. This mode of door, to, door data collection has been identified as a very effective way for waste quantification and characterization at the household level (Sulthana et al., 2024; Trivedi, 2009). The survey involved:

- i Quantifying the amount of household waste produced daily from each selected household.
- ii Recognizing the types and composition of waste materials (biodegradable, non-biodegradable, recyclable, hazardous etc.).
- iii Recording the waste disposal methods followed by the households.

Field Observation and Interviews

The purpose of field observation was to comprehend the ground level waste management conditions in both wards including the state of collection points, drainage conditions and cleanliness of the surroundings. Semi structured interviews with household members were also done to get information about their waste generation behaviors, segregation practices and level of awareness about waste management. Face-to-face interviews and household observations have been confirmed as necessary in Indian municipalities for understanding actual waste disposal behaviors that go beyond self-reported data (Rai and Umashankar, 2021).

Secondary Data Collection

Secondary data for this study was sourced from Nagaon Municipal Board, Nagaon, Assam. Data such as the overall amount of waste collected by the board from the entire 26 wards of Nagaon town from March to April, 2026 were used. Waste collection frequency and quantity data on a ward basis, information regarding the dumping sites used for disposal of household wastes, existing infrastructure and modes of waste collection and transportation. Municipal records especially secondary data help in connecting the results obtained at household level with the overall framework of urban waste management (Manuja et al., 2019; Salve and Mishra, 2025). Various published works dealing with municipal solid waste management in Assam were also read for preparing a comparative framework of the present study (Dutta, 2013; Pradhan et al., 2012).

Data Analysis

Collected data were first combined and then simple statistical tools like percentages, averages and comparative tables were used for analysis. Total waste generated per household was divided by the number of members in each household to get the per capita waste generation rate. Waste composition analysis was done by sorting waste into categories biowaste, plastic, paper glass, metal and others and then the percentage share of each category was worked out. A comparative analysis between ward no. 8 and 22 was performed to identify variations in waste generation patterns and disposal practices.

RESULTS AND DISCUSSION

Municipal Solid Waste Generation:

This study was conducted with the aim of understanding how household waste is generated and managed in two wards in 8 and 22 under Nagaon Municipal Board, Nagaon, Assam. To get a clear picture of the situation, data from both primary sources such as household surveys and secondary sources such as municipal records were relied upon.

Table 1. Total waste collected by the NMB in the month of March 2026 from all 26 wards of Nagaon town.

Total waste collected in the month of march by the municipal board from all the 26 wards =52.91 tons or 52,910 kg	Types of waste (in %)	
	Dry waste	Wet waste
	40%	60%

According to data collected from the municipal, aggregately around 52.91 tons or 52,910 kilograms of municipal solid waste was collected in March from all the 26 wards of Nagaon town. The waste comprised of both biodegradable and non-biodegradable elements. The breakdown of the total waste collected was as 60% represented wet waste (biodegradable) and 40% accounted for dry waste (non-biodegradable). The wet waste is primarily food residues, vegetable peels, garden waste and other biodegradable materials whereas dry waste consists of plastics paper metals, glass, packaging materials etc. The significantly higher share of wet waste shows that organic waste is the main component of municipal waste in Nagaon town, which is a common scenario in many developing urban areas.

Collection System of Nagaon Municipal Board

The municipal board stands as a pivotal player in the collection and proper disposal of town's municipal solid waste. They have adopted a door-to-door waste collection method, i.e. municipal trucks go to individual households for waste pick, up. The board is currently having 26 trucks for waste collection, which is equal to the 26 wards of Nagaon town. Waste segregation at the source is given impetus by equipping each truck with two separate containers. Besides, household collection, the municipal has also placed segregated waste bins at public places like hospitals, schools, colleges, shopping complexes and market places. For waste collection services, the board imposes a monthly charge of around ₹60 per household.

Household Waste Disposal Practices:

The survey showed that the municipal board offers regular waste collection services but not all residents use the service properly. In brief, it was found that about 60% of households get their waste collected by the municipal system and 40% of households throw their waste in open land and streets or dumping areas without the authority's regulation. Waste dumping in the open can cause soil contamination, bad smell, breeding of disease-causing organisms and pollution of the environment. As a result, it is very important to increase people's awareness of the proper ways of waste segregation and disposal at grass root level.

Table 2. Total waste collected per day from the individual houses in ward no. 8 of Nagaon Municipal Board.

Sl. No.	Name of the household	Per day waste collection (approximately in gram)							Average of 1 week (g)	Net weight (g)
		Mon	Tue	Wed	Thu	Fri	Sat	Sun		
1	HH801	1000	1000	1000	900	800	1000	1500	1028.57	10,428.52
2	HH802	900	800	900	900	800	900	1500	957.14	
3	HH803	1500	1500	1000	1500	1000	1000	2000	1357.14	
4	HH804	1500	1500	900	800	700	1000	1500	1128.57	
5	HH805	900	700	700	800	800	900	900	814.28	
6	HH806	1500	1000	1000	800	800	1000	1500	1085.71	
7	HH807	700	800	800	700	900	800	1000	814.28	
8	HH808	400	500	500	500	600	400	700	514.28	
9	HH809	700	600	700	700	600	600	800	671.42	
10	HH810	600	500	400	500	600	600	700	557.14	
11	HH811	900	700	700	800	900	900	1200	871.42	
12	HH812	600	600	600	500	600	700	800	628.57	

Table 3. Total household waste generation in ward no. 8 over one week.

Sl. No.	Household	Daily average waste (kg)	Weekly total waste (kg)	Monthly estimated waste (kg)	Annual estimated waste (kg)
1	HH801	1.03	7.20	30.86	375.43
2	HH802	0.96	6.70	28.71	349.36
3	HH803	1.36	9.50	40.71	495.36
4	HH804	1.13	7.90	33.86	411.93
5	HH805	0.81	5.70	24.43	297.21
6	HH806	1.09	7.60	32.57	396.29
7	HH807	0.81	5.70	24.43	297.21
8	HH808	0.51	3.60	15.43	187.71
9	HH809	0.67	4.70	20.14	245.07
10	HH810	0.56	3.90	16.71	203.36
11	HH811	0.87	6.10	26.14	318.07
12	HH812	0.63	4.40	18.86	229.43

The pattern of household waste generation in ward no. 8 varied noticeably among the different families. Household HH803 recorded the highest average daily waste generation at 1.36 kg (1357.14 g), while household HH808 recorded the lowest at 0.51 kg (514.28 g). Based on this, the estimated weekly household waste generation ranged from about 3.60 kg to 9.50 kg, the estimated monthly generation ranged from about 15.43 kg to 40.71 kg, and the estimated annual waste generation ranged from about 187.71 kg to 495.36 kg. Overall, waste production among households in ward no. 8 remained fairly moderate and consistent compared to ward no. 22, reflecting relatively stable household consumption patterns.

Table 4: Total waste collected per day from the individual houses in ward no. 22 of the Nagaon Municipal Board.

Sl. No.	Name of the house hold	Per day waste collection (Approximately in gram)							Average in 1 week (g)	Net weight (g)
		Mon	Tue	Wed	Thu	Fri	Sat	Sun		
1	HH2201	600	550	600	600	600	550	600	585.71	17,789.95
2	HH2202	900	900	880	1000	900	800	1000	911.42	
3	HH2203	600	600	600	700	600	600	700	628.57	
4	HH2204	1000	900	1000	1000	1000	1000	900	971.43	
5	HH2205	600	550	600	600	600	500	600	578.57	
6	HH2206	4000	4000	5000	5000	4000	4000	4000	4285.71	
7	HH2207	1000	2000	1500	1000	2000	2000	2000	1642.85	
8	HH2208	1000	3000	2000	2000	1500	2000	1500	1857.14	
9	HH2209	500	500	500	600	500	600	500	528.57	
10	HH2210	1000	1500	2000	2000	1000	2000	2000	1642.85	
11	HH2211	1000	1000	1000	1000	1000	1000	1000	1000	
12	HH2212	1000	1000	1000	2000	1000	1000	2000	1285.71	
13	HH2213	500	400	500	400	500	500	400	457.14	
14	HH2214	700	600	700	600	600	700	800	671.43	
15	HH2215	800	700	800	600	700	800	800	742.86	

Table 5. Total household waste generation in ward no. 22 over one week under NMB.

Sl. No.	Household	Daily average waste (kg)	Weekly total waste (kg)	Monthly estimated waste (kg)	Annual estimated waste (kg)
1	HH2201	0.59	4.10	17.57	213.78

Sl. No.	Household	Daily average waste (kg)	Weekly total waste (kg)	Monthly estimated waste (kg)	Annual estimated waste (kg)
2	HH2202	0.91	6.38	27.34	332.67
3	HH2203	0.63	4.40	18.86	229.43
4	HH2204	0.97	6.80	29.14	354.57
5	HH2205	0.58	4.05	17.36	211.18
6	HH2206	4.29	30.00	128.57	1564.28
7	HH2207	1.64	11.50	49.29	599.64
8	HH2208	1.86	13.00	55.71	677.86
9	HH2209	0.53	3.70	15.86	192.93
10	HH2210	1.64	11.50	49.29	599.64
11	HH2211	1.00	7.00	30.00	365.00
12	HH2212	1.29	9.00	38.57	469.28
13	HH2213	0.46	3.20	13.71	166.86
14	HH2214	0.67	4.70	20.14	245.07
15	HH2215	0.74	5.20	22.29	271.14

Likewise, the waste generation pattern in ward no. 22 was different among the households, and the variation was much higher compared to ward no. 8. Average daily waste generation among the surveyed households ranged from about 0.46 kg (457.14 g, HH2213) to 4.29 kg (4285.71 g, HH2206) per household. Based on this, the estimated weekly household waste generation ranged from about 3.20 kg to 30.00 kg, the estimated monthly generation ranged from about 13.71 kg to 128.57 kg, and the estimated annual waste generation ranged from about 166.86 kg to 1564.28 kg per household. This broad spectrum in waste generation can be attributed to variations in household size, consumption habits, lifestyle choices and the economic status of the residents. It should be noted that the unusually high value recorded for household HH2206 stands out from the rest of the sample and may reflect either a larger household size or the inclusion of some non-domestic waste, this observation should be verified and treated as a possible outlier in the dataset.

Comparative Analysis:

From the figure 1 & 2, when we compared the two wards, we found some really large differences in how households produced waste. Ward 22 had up and down changes and bigger quantities of waste produced while ward 8 showed more down to earth and steady waste producing patterns over the year. The reasons for this could be many like the size of the household, their lifestyle and consumption patterns, economic means, and level of environmental awareness. This kind of difference points out the need for very specific such as ward, based in order to raise the efficiency of municipal waste management.

Figure 1. Annual estimated waste (Approx. in kg) of ward No. 8

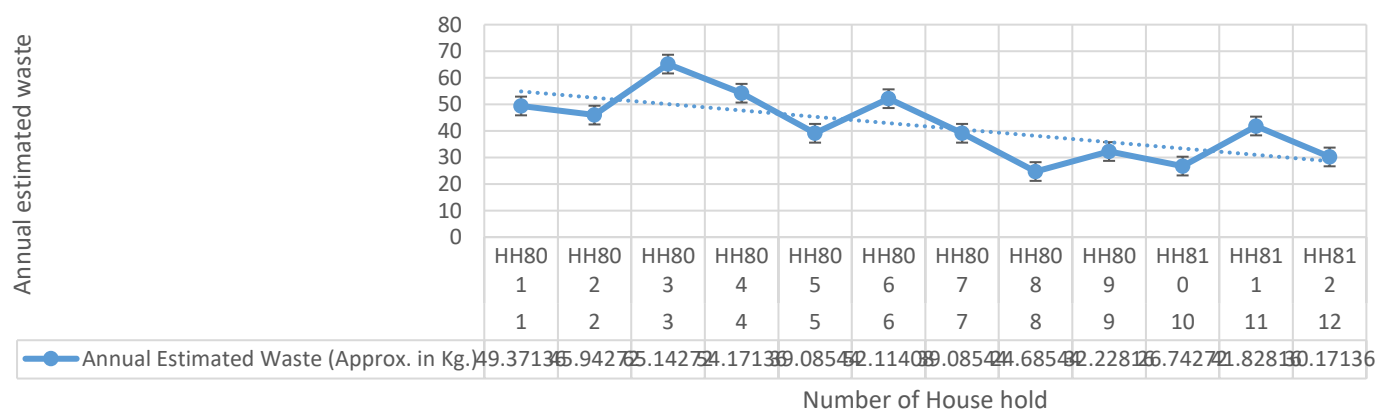
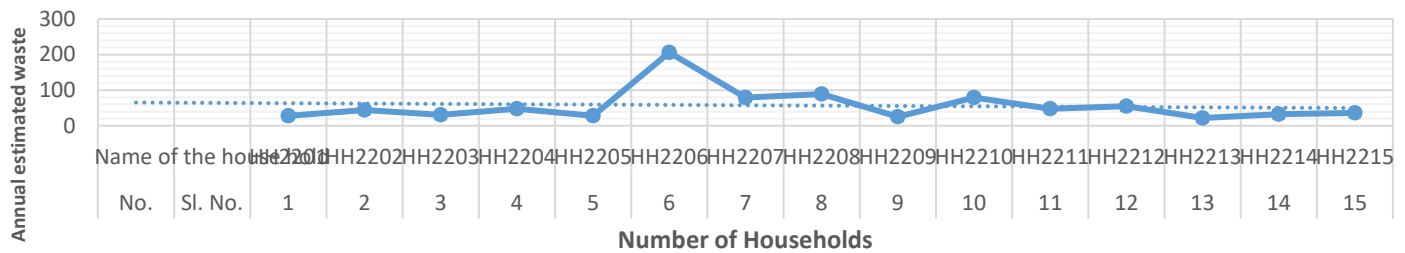


Figure 2. Annual estimated waste (Approx. in kg) of ward No. 22



Composition of Household Waste:

The household waste collected during the survey mainly consisted of four major categories of waste materials i.e. plastic waste, vegetable peels, paper waste and other household waste.

Plastic Waste

Plastic waste was a major non-biodegradable waste in the two wards. The most common plastic items were plastic bags, shampoo sachets, plastic bottles, cups, tooth brushes, food packaging materials and disposable containers. Plastic waste is a serious environmental threat because it degrades very slowly and can persist for centuries, mismanaged plastic can leach contaminants into soil and water, harm wildlife through ingestion or entanglement and when burned, release hazardous pollutants including dioxins and furans that pose risks to health and the environment (Rogers and Jaspers, 2025; Velis and Cook, 2021).

Vegetable Peels

Vegetable peels constituted a large share of the biodegradable waste produced by households. Such wastes are generated when cooking and could include potato, carrot, cabbage, and onion peels among others. These peels are organic wastes that can be composted effectively during composting, microbial action releases nutrients such as nitrogen, phosphorus, potassium, and calcium in forms that are more soluble and bioavailable to plants, which can improve soil fertility and support sustainable waste management (Chetty and Sum, 2020; Joseph, 2018; Parihar and Choudhary, 2022).

Paper Waste

Another common component in household waste was paper waste. It comprises items such as newspapers, cardboard boxes, tissue papers, packaging materials and office documents. Paper waste is environmentally less harmful compared to plastic since it is usually biodegradable and recyclable. Recycling waste paper helps conserve natural resources and can reduce deforestation, but paper that is wet, food-contaminated, or coated can be difficult to recycle (Basak et al., 2024; Vukoje and Rozic, 2018).

Other Household Waste

Many other household wastes were also found during the survey. Some of them are used tea leaves, ear buds, gift wrappers, price tags, instant noodle packets, soap wrappers, eggshells sweet boxes and cold drink bottles. This type of waste includes both biodegradable and non- biodegradable components. Therefore, proper segregation of waste is necessary for efficient waste management (Ibietela et al., 2020).

Waste Transportation and Treatment

Municipal waste is first divided into recyclable materials, organic waste and non-recyclable waste after collection. Proper segregation not only makes recycling more effective but also reduces the volume of waste that has to be dumped in landfills. Waste that has been collected is first transported to suitable waste treatment facilities like recycling centres, composting units or landfills (Kaur et al., 2015). Some of the most popular waste treatment technologies for municipal waste management are incineration (Buekens, 2013), compaction (Chaerul and Tompubolon, 2019), pyrolysis (Hasan et al., 2025), gasification (Mehdi et al., 2023), composting (Kumaresan et al., 2024), sanitary landfilling (Liu et al., 2014), land treatment etc.

Implementation of the 3R Principle

The Nagaon Municipal Board makes use of the 3R principle Reduce, Reuse, and Recycle as one of the strategies for sustainable waste management. All the waste collected is brought to Katimari Grant in Nagaon district of Assam, where recyclable materials are separated and further processed. After sorting, the recyclable materials are transformed into new products that are again introduced into the municipal waste management system. Using the 3R principle drastically reduces the volume of waste going to landfill sites and at the same time, encourages the use of resources in a more sustainable way (Sang-Arun et al., 2013).

CONCLUSION

This survey looked at household waste generation in ward no. 8 and 22 under the Nagaon Municipal Board, and the findings show just how much of a growing challenge solid waste management has become in urban areas. Most of the waste coming from households is biodegradable mainly food waste and vegetable scraps though non-biodegradable items like plastic, glass, and metal also make up a fair share. One of the biggest issues the study found is that most households simply don't segregate their waste at source. This makes the job much harder for municipal authorities, who then have to deal with mixed waste rather than pre-sorted materials. Two things seem to be driving this, people generally aren't aware of eco-friendly disposal practices, and there's a real shortage of proper segregation infrastructure at the household or ward level. Together, these gaps make the whole waste management system far less efficient than it should be. Fixing this isn't something either side can do alone it needs households and the municipal authority working together. That means running public awareness campaigns, encouraging waste segregation right at the household level and improving the municipal collection system itself. If these steps are taken, pollution can be brought down significantly and the city can move toward more sustainable waste practices. It is important to note that this study was based on a limited sample size, and hence the findings should be treated as a preliminary baseline rather than a fully representative picture. Future studies with a larger, randomly selected sample are recommended to obtain more accurate and generalizable ward-level estimates.

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