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Municipal solid waste management in Bongaigaon City, Assam: Status, Problems and Challenges

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Abstract

Solid waste management is very essential for sustainable development of any nation. Waste is the outcome of human activity. The collection and treatment of solid waste have become an intense problem due to population growth, economic development, fast urbanization and living standards of the residents in the city. In 2018, the municipal solid waste generation in Bongaigaon city was 20 metric ton per day and now it is increased to 22 tons per day. Solid Waste is basically collected in a segregated manner i.e. wet and dry manner. In the study area out of 22 tones total generated waste about 19 tons per day were segregated and collected on daily basis, rest 4 tones waste create unhygienic condition in the area. It has been estimated that approximately 80-85 per cent waste is collected for transportation to the disposal sites. The remaining waste is either left on the streets, deposited in open plots, low-lying areas and drains or burnt in the open. No scientific method is adopted while disposing the waste. The waste transported from the collection points to the land-filling site was always found uncovered. This might cause of air pollution. The present paper is a comprehensive review summarizing the present solid waste management system in Bongaigaon City. The study also identified the associated challenges and deriving potential solutions for sustainable waste management. This paper is an attempt made to find out various suggestions for better management of solid waste.

Key Words: solid waste, urbanization, sustainable development.

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Introduction:

Solid Waste Management is a known term which refers to the management and disposal of waste in a systematic and scientific way. In India The Urban Local Bodies/ Municipality Boards is the main body which provides services of solid waste management and helps in keeping the country clean.

According to the Municipal Solid Wastes (Management and Handling) Rules, 2000, “municipal solid waste includes commercial and residential wastes generated in a municipal or notified area”. Municipal solid waste management is a very crucial area and closely associated with the economic status of a country and the living standard of its population. The solid waste management (MSWM) has become a global issue and is of a major concern, especially in developing countries today due to various environmental problems, such as air, soil and water pollution as well as generation of green-house gases (GHG) from land-filling sites. Management of waste (MSW) remains one of the most neglected areas in Indian small, medium and mega cities. There are six functional components of MSWM practice from the generation to final disposal and problems were being observed at every level of each element. Lack of money, organizational weaknesses, lack of coordination among agencies and general attitude of the people towards MSWM have made this service far from satisfactory level.

As per the report of World Bank (2012) MSW generation at global levels is approximately 1.3 billion tones per year and expected to increase to approximately 2.2 billion tons per year by 2025. The annual waste generation in East Asia and Pacific Region is approximately 270 million tons per year (World Bank, 2012). As per an estimate the urban authorities in Asia spend approximately 45 to 65 percent of their revenues on waste management. The main reason of increasing municipal solid waste in India at present is the rapid growth of urbanization and industrialization. Currently of the estimated 62 Million tones of MSW generated annually by 377 million people in the urban areas of India, out of total waste generation more than 80-85 percent is disposed of indiscriminately at land-filling sites in an unhygienic manner by the ULBs.

Assam is a beautiful state of North East India. The total geographical area of Assam state urban part is 1260 km² and it is the 12th smallest urban state by area in the country. It is having 44 lakhs population. The average waste generation in Assam is about 1411 metric tons of waste per day (Urban Waste management Policy, 2018). The present paper assessed the solid waste management practice of Bongaigaon District of Assam. Bongaigaon is situated in the western part of Assam. The main town Bongaigaon is under the Municipality Board and covers an area of 14.31 square kilometer. All together there are 25 wards under the Bongaigaon Municipality Board with a total population of 67,322 out of which 34,401 are males while 32,921 are females as per Census of India, 2011. The Bongaigaon Town Committee was first constituted in the year 1961 and was upgraded to a Municipal Board in the year 1977 (Project Report for Integrated Low-Cost Sanitation Scheme (ILCS) for Bongaigaon Municipal Board, Bongaigaon 2008).

Overview of the Study Area:

Bongaigaon, a commercial and industrial hub situated in the western Assam is an important business area attracting the people not only from the North Eastern states but also from the state of West Bengal. It is the 4th largest city by the municipal area and population size after Guwahati, Dibrugarh, Jorhat and Silchar. Bongaigaon is also known as the gateway of western Assam. The city is situated between 26°28'N to 89°96'E. The city is located at a distance of 200 kms west from the capital of the state Dispur and occupies an important place in the communication network in north-eastern India as well as the neighbouring state West Bengal. This city is very well connected by road and railways. This is the main reason that has helped the district to emerge as an important center in trade and commerce in western Assam serving a vast area of its surrounding. The Bongaigaon Municipal Board is responsible for waste management of its jurisdiction. In

2018, the municipal solid waste generation in Bongaigaon town was 20 metric tons per day and now it is increased to 22 tons per day.

Objectives of the study:

The present study has following objectives:

- To assess the existing municipal solid waste management practices in Bongaigaon city.
- To suggest some approaches for waste reduction and better waste management in the city.

Data Base and Research Methodology:

Methodology is the central part of any research. The present paper is based on secondary data, which is collected from Bongaigaon Municipal Board, various reports of Government of Assam and other government, semi-government, non-government and private publications. The background information was related to, area, demographic characteristics, urbanization status and socio-economic profile as was compiled from the Census Handbook, the Census of India publications. The municipal solid waste management data collected from Bongaigaon Municipal Board, State Pollution Control Board and other publications. For the better presentation of data, simple percentage, average and other statistical techniques has been used. Further, suitable bar, pie chart has been made with the help of MS excel for better presentation of research.

Analysis of the Data:

Sources of Solid Waste Generation in Bongaigaon:

The primary generation of solid waste in the municipal areas is the local households, different market areas, institutions, commercial establishment such as hotels, motels, restaurants, hospitals, shops etc. Moreover the **floating population** also adds to the waste generation. Based on the primary observation of the DPR the sources are tabulated below:

Table 1: Sources of Solid Waste Generation in Bongaigaon Municipal Board area

Sr. No.	Sources of Solid Waste	Quantity (in Tonnes)	Percentage
1	Household Waste	12.00	40.00
2	Commercial Waste	8.40	28.00
3	Industrial Waste	0.60	2.00
4	Street Sweeping	5.22	17.4
5	Others	3.78	12.6

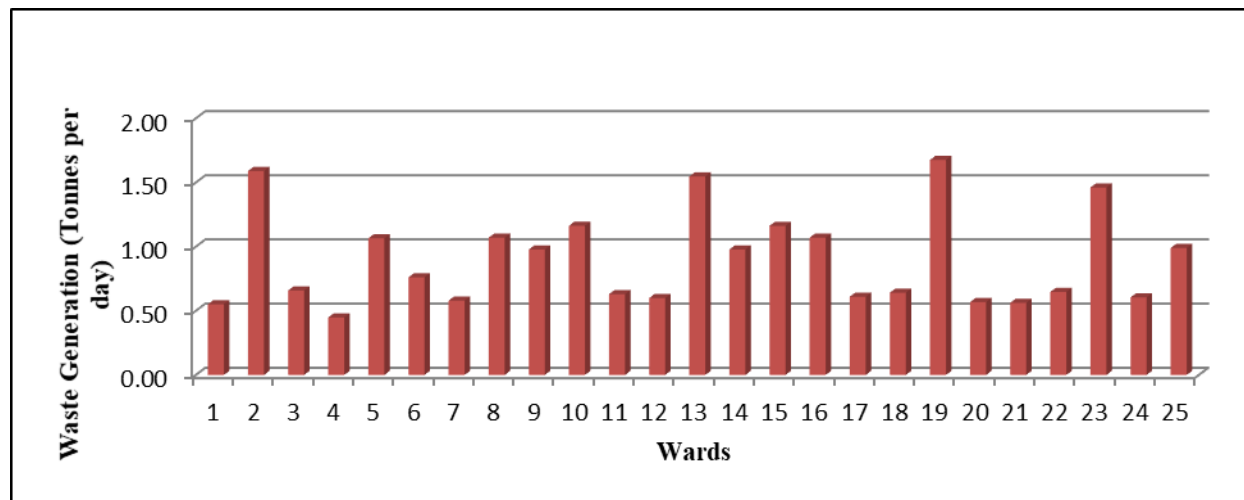
Source: Bongaigaon Municipal Board, 2021

Solid Waste Generation:

The significant increase in municipal solid waste (MSW) can be attributed to the population explosion, industrialization and urbanization. Due to this a significant increase in municipal solid waste (MSW) generation has been recorded not only in India but all over the world. Solid waste generation, in terms of kg/capita/day has shown a very positive correlation with economic development and prosperity at local to global level. Due to rapid industrial growth and in migration of people from villages to urban areas, the population in cities is increasing rapidly. It is observed that waste generation increasing annually in proportion with the rise of population due to rapid growth of urbanization. The per capita generation of MSW has also increased tremendously with the improved of life style and social status of the populations in urban centres. In

2018, the municipal solid waste generation in Bongaigaon city was 20 metric tonne per day and now it is increased to 22 tones per day.

Figure 1: Solid Waste Generation in Bongaigaon Municipal Board area

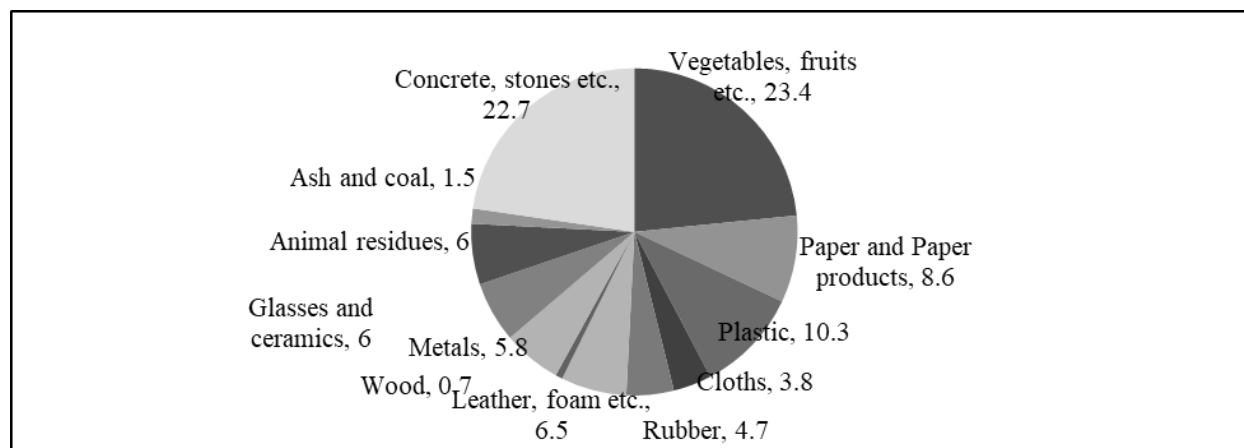


Source: Bongaigaon Municipal Board, 2021

In the Bongaigaon Municipal Board area out of 25 wards, ward number 19 is the top producer, followed by ward 13 and 23 (Figure 1). It may be mentioned here that the three wards 19, 13 and 23 covering the area of Bhakarivita, North Bongaigaon and Bakharapara have a large population and also some market area. The present study also revealed that high income group (HIG) people generate larger amount of non-biodegradable waste in comparison to people of middle and low income groups. Another important thing found from the present study is that as the population increased with time and solid waste also has been increased. There is a positive correlation between population growth and rate of waste generation. It can be seen from Figure 1 that per capita generation rate is high in some wards. This may be due to high living standards and rapid economic growth.

Physical Component of Solid Waste:

Municipal solid waste is a heterogeneous mixture of degradable and non degradable waste materials such as paper, plastic, cloth, metal, glass, organic matter etc. generated from households, street, commercial establishment and market areas. The proportion of physical component plays a vital role in the formulation of solid waste management plans. In this context, an in-depth spatial analysis of the composition of waste generated is very crucial, it is because of the composition and type of waste owing to the existing land use pattern, economic status and so on (Anand, 2010). The diversified nature and properties of waste is an indicator of the socio-economic status and socio-cultural factors of the inhabitants such as variation in property, food habits, living standards, literacy, climate and income, etc.

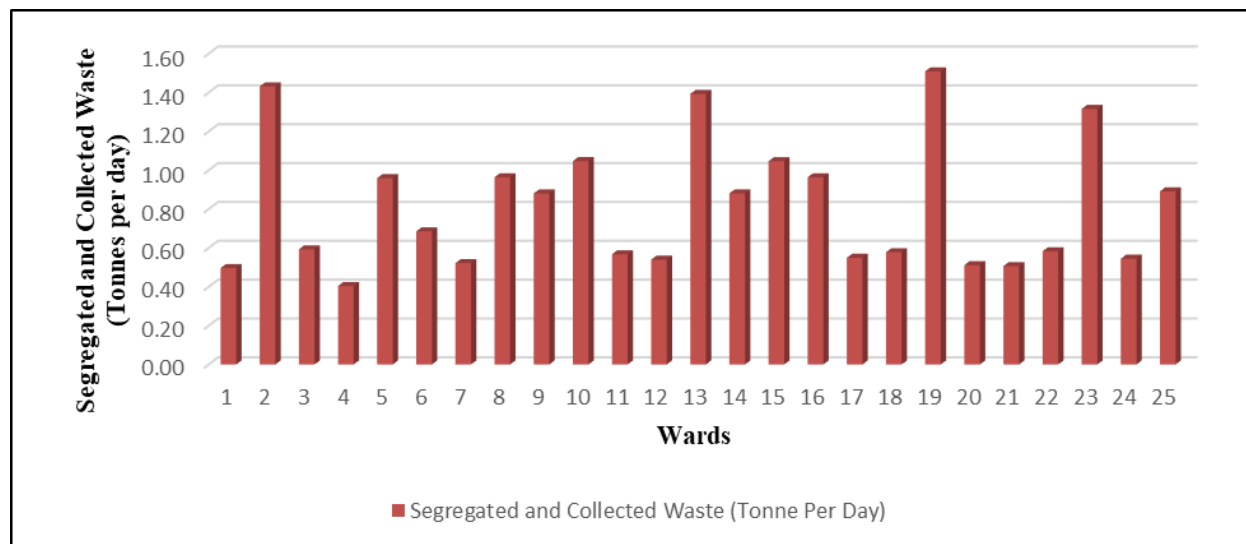
Figure 2: Physical Composition of Solid Waste of Bongaigaon Municipal Board area

Source: Thakuria M.N. (2009)

In Bongaigaon Municipal area the biodegradable and recyclable material is available in high quantities like vegetables, fruits etc (23.4 percent) plastic (10.3 percent), paper and paper products (8.6 percent), but it is not properly processed, because of lack of knowledge, man power, machinery and financial support by the Government. In the municipal area construction and demolition debris are also in high proportion (22.7 percent), but is not properly processed. If the bio-degradable and recyclable matter will be handled properly it will reduce the heavy burden from the landfill site which is facing city presently (Figure 2).

Segregation and Waste Collection:

The Bongaigaon Municipal Board is responsible for waste management in their jurisdiction. Segregation of municipal solid waste is one of the most effective ways to achieve the recovery of material. Normally household and commercial waste can be segregated into two broad categories, dry waste, much of which can be recycled and wet waste for composting. Segregation at source has three advantages; it makes both the wet and dry wastes more readily re-usable, it thus reduces the amount reaching the landfill site, and hence reduces transportation and dumping costs. Source segregation of garbage is very essential for promoting sustainable waste management strategy. Around 100 waste receptacles have been installed by the Municipal Board in different wards for secondary collection. There is around 8-9 open waste collection points found in the study area which are directly affecting surrounding area. Solid Waste is basically collected in a segregated manner i.e. wet and dry manner. Figure 3 showing the segregation and collected waste in different wards of the city. The figure showing that out of 22 tones total generated waste about 19 tones per day were segregated and collected on daily basis, rest 4 tones waste create unhygienic condition in the area. During the rainy season the uncollected waste block the drainage, partial collection of waste witnessed flash floods in different part of the city and it also making the drinking water polluted. In winter season, this produces bad smells and makes the nearby air unsafe for respiration.

Figure 3: Segregated and Collected Waste in Different Wards of Bongaigaon Municipal Board area

Source: Bongaigaon Municipal Board, 2021

Transportation of Waste:

The waste management practices cannot be carried out without proper transportation system of the generated waste. Transportation is the vital link between the collection and disposal of garbage. Different types of vehicles are used for collection of waste from residential houses, markets, hotels, commercial areas, parks and garden to processing or disposal sites. The transportation of waste is a capital-intensive task; the transportation cost is around 30-45 per cent of the total SWM budget. In the study area waste has been transported through uncovered small trucks and tractors-trailers assigned by Municipal Board. It is observed that waste transportation from specific point to the land-filling sites is done once in a day. The loading and unloading of waste are done manually/mechanically by JCB. The Bongaigaon Municipal Board is using various types of vehicles i.e., 74 Try-cycles, 6 Tractor trolley, 4 auto tippers, 2 E-Rickshas, 4 Dumpers, 1 JCB, 3 Skid Loader and 2 Cesspool cleaner tank were involved in waste transportation work. It has been estimated that approximately 80-85 per cent waste is collected for transportation to the disposal sites. The remaining waste is either left on the streets, deposited in open plots, low-lying areas and drains or burnt in the open. It is observed that the available transport volume is inadequate for the Municipal Board area, the vehicles operate in two shifts and usually make 3-4 trips per shift depending upon the distance of the disposal site.

Staff Strength:

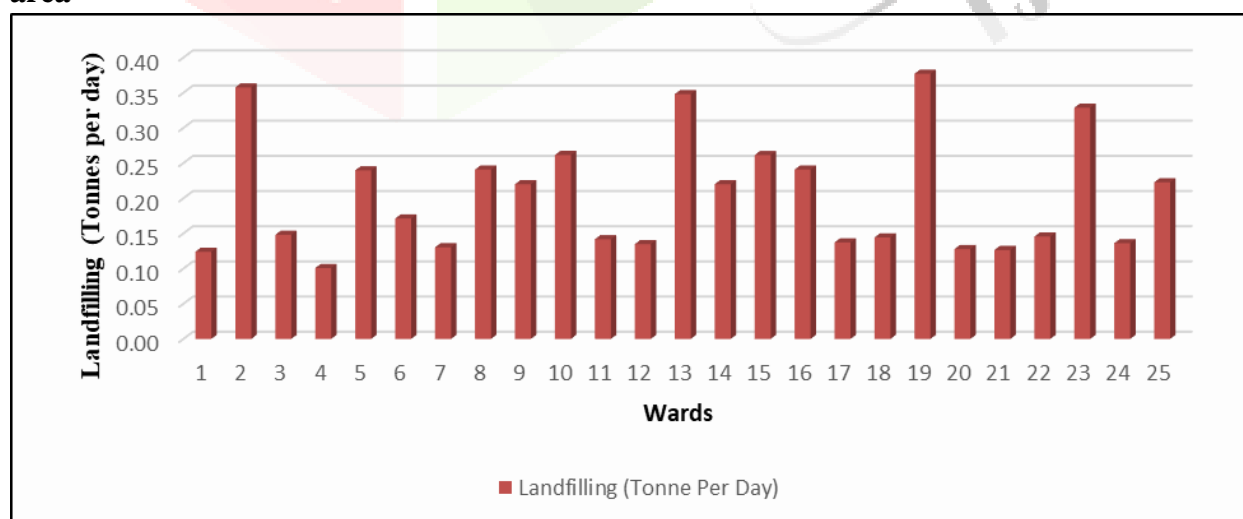
Without a system of primary collection of waste from the door to door, street sweeping is the most common method in India for depositing waste as primary collection. However, only important roads and markets are swept on regular basis. Some streets are swept on alternate days or twice a week. It has been observed that some are swept occasionally or not at all. No action plan is executed to ensure that all streets may sweep every day. Some places have a two-tier system: some sweepers sweep only the streets and make small heaps, while another set of people pick up the waste in handcarts or tricycles. The lack of coordination between sweepers and waste collectors results in many heaps being left unattended, thus creating unsanitary conditions. As per information provided by the Bongaigaon Municipal Board 1 sanitary officer, 88 regular safai-karamcharies, 182 casual sweepers, 20 field labours and 6 tractor drivers are appointed for solid waste management. The urban local body has used RCC bins and metallic containers to store the wastes and 270 regular and casual safai-karamcharies were engaged to handle the generated waste from various sources. The sweeping crew collects the wastes from road sides and deposit in the nearby community bins by using tricycles. Door to door

waste collection system has been started in some wards of Bongaigaon Municipal Board area. The shopkeepers and the people of some areas of different wards are provided dustbins by the Municipality board and there is provision of door-to-door collection of waste in separate bins for degradable and nondegradable waste. The BMB has always laid stress on quality of service. But due to lack of adequate staff and vehicles the collection and disposal of waste is not upto the mark. The collection efficiency is about 80 to 85 per cent. The reason behind the poor collection efficiency is shot fall of man-power and improper management of work force.

Sanitary Landfilling:

The disposal of waste is a very important aspect of the solid waste management (SWM) practices and it requires special attention by the Urban Local Bodies (ULBs) through effective and efficient planning and management. The waste collected from various dustbins or dhalaos are disposed off by various methods such as open dumping, sanitary landfill, composting, Incineration, pyrolysis etc. Only open dumping and sanitary landfills are widely practised in developing countries and India is not exception. Solid waste disposal methods, regulation and implementation are varied around the world. A landfill is a facility which is designed for the safe disposal of solid wastes. The bottom liners and a top Cover, of the landfill are considered as the most critical components. Penetration of Leachate into the soil is the major problem in landfills (Alekhya et al., 2013). To transfer the wastes the Bongaigaon Municipal Board uses 6 Tractor trolley, 4 auto tippers, 2 E-Rickshas, 4 Dumpers, 1 JCB, 3 Skid Loader. Every day, the tractor trolley performs 4-5 trips each while the Dumpers and Auto tippers, E-Rickshas perform only 2 trip each in a day. The collected wastes are disposed off about 2-4 Kilometres away from the source of waste generation. The collection drive starts at 7 A.M and continues till 2 P.M in the afternoon under the supervision of BMB authority under a predesigned schedule. Collected wastes are finally disposed by simply dumping and land-filling processes. No scientific method is adopted while disposing the waste. The waste transported from the collection points to the land-filling site is always found uncovered which may cause air pollution. Figure 4 showing that ward no 19, 2, 13 and 23 deposit maximum waste at land-filling sites on daily basis. The Bongaigaon Municipal Board (BMB) area construction and demolition waste is used for landfilling.

Figure 4: Waste Received at Landfilling site from Different Wards of Bongaigaon Municipal Board area

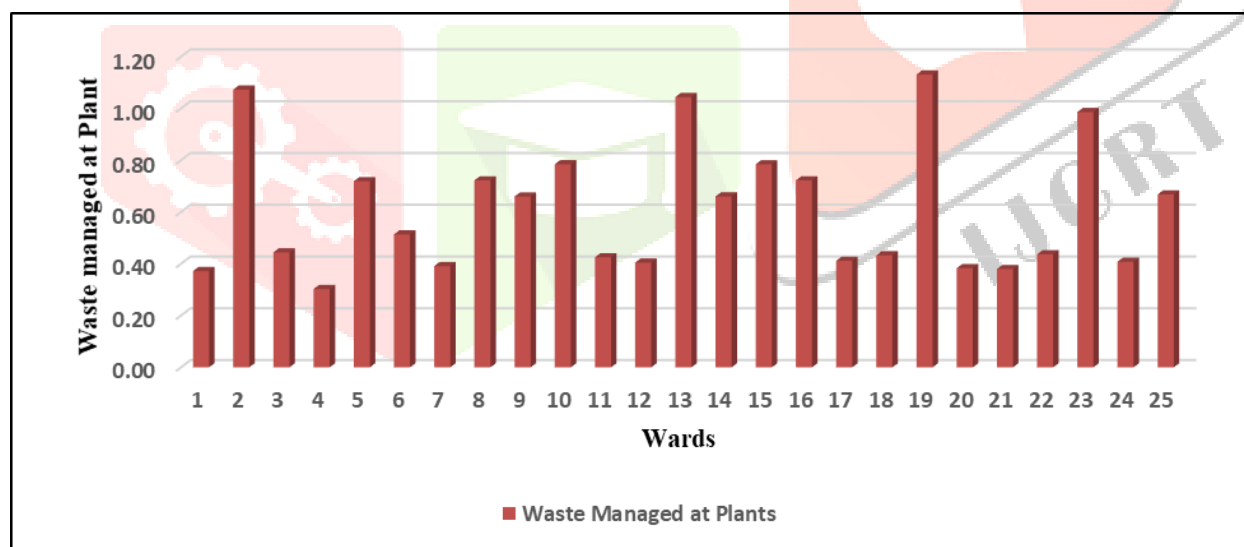


Source: Bongaigaon Municipal Board, 2021

Waste Processing:

The biodegradable wastes shall be processed by composting, vermi-composting, anaerobic digestion or any other appropriate biological processing for stabilization of wastes. The objective of processing of MSW is to reduce the weight and volume of waste that has to be disposed of in a landfill. Processing and treatment processes for MSW include physical processes for separation of different fraction, chemical processes like combustion and biological processes like composting and bio fuel generation. Most of large cities in developed and developing countries have solid waste treatment facilities where the waste is processed prior to disposal (Goel, 2008). Composting is to provide much awaited answers to the growing problem of municipal solid waste but operational and other problems began to appear. The history of waste processing in India dates back to 1934, when Mr. Howard, a British Sanitary Engineer put garbage in the form of windrows (known as 'Indore Process') followed by 'Bangalore Process' carried out by Prof. Acharya and his team at IARI during the late 1940's and early 1950's (CPHEEO, 2000). Composting of municipal garbage started in a big way in the late 1970's when about a dozen mechanical compost plants were set up across the country. Due to technical problems and financial losses all of them were closed down, except the Karnataka Compost Development Corporation (KCDC) in Bangalore. During 1984 a plant for processing 300 tonnes garbage to produce about 3 MW of power was set up in Delhi with technical assistance from Denmark. In Bongaigaon Municipal Board (BMB) area the wet waste treated in Drum Composting, Bed Composting, Organic waste coverts and Pit composting for compost. Dry waste is sent to MRF facilities i.e. Material Recovery Facility for recycling. Figure 5 showing that ward no 19, 13, 2 and 23 deposit maximum waste at composting plants on daily basis. Ward no 4, 1, 20, and 21 deposit least waste at composting plants. The Bongaigaon Municipal Board (BMB) area construction and demolition waste is used for landfilling.

Figure 5: Waste Managed at Composting Plants in Bongaigaon Municipal Board area



Source: Bongaigaon Municipal Board, 2021

Findings:

In the present paper, an attempt has been made to study the existing municipal solid waste management practices in BongaigaonTown. The following are the major findings of the study.

1. In 2018, the municipal solid waste generation in Bongaigaon city was 20 metric tons per day.
2. The study finds that out of 25 wards under Bongaigaon Municipality area, ward number 19 is the top producer, followed by ward no13 and 23.
3. The present study revealed that high income group (HIG) people generate larger amount of non-biodegradable waste in comparison to people of middle and lower income groups. Another important fact found from the present study is that as the population increases with time the solid waste is also increased.
4. The study also finds that the biodegradable and recyclable material is available in Bongaigaon Municipal area in high quantities are such as vegetables, fruits etc (23.4 percent), plastic (10.3 percent), paper and paper products (8.6 percent).
5. The study reveals that around 100 waste receptacles have been installed by the Municipal Board in 25 wards for secondary collection. There is around 8-9 open waste collection points found in the study area which are directly affecting surrounding area. Solid Waste is basically collected in a segregated manner i.e. wet and dry manner.
6. In the study area out of 22 tones total generated waste about 19 tones per day were segregated and collected on daily basis, rest 4 tones waste create unhygienic condition in the area. During the rainy season the uncollected waste block the drainage, partial collection of waste witnessed flash floods in different part of the city and it also making the drinking water polluted.
7. In the study area waste has been transported through uncovered small trucks and tractors-trailers assigned by Municipal Board. It has been estimated that approximately 80-85 per cent waste is collected for transportation to the disposal sites. The remaining waste is either left on the streets, deposited in open plots, low-lying areas and drains or burnt in the open.
8. It is observed that the available transport volume is inadequate for the Municipal Board area.
9. Collected wastes were finally disposed by simply dumping and land-filling processes. No scientific method is adopted while disposing the waste. The waste transported from the collection points to the land-filling site was always found uncovered. This might cause of air pollution.
10. In the study area the wet waste treated in Drum Composting, Bed Composting, Organic waste covers and Pit composting for compost. Dry waste is sent to MRF facilities i.e. Material Recovery Facility for recycling.

Suggestions:

Considering the results of this paper, the following suggestions should be incorporate by BMB for better management of solid waste in the study area:

- Daily collection of waste from waste receptacles should be there. Special attention should be given to the colonies with the people of lower income group particularly vulnerable and critical sites.
- Open waste storage sites and other unhygienic street bins should not be allowed.
- Old vehicles should be replaced by new vehicles specifically designed for waste transportation in order to increase the carrying capacity.

- Consumer campaigns should be organized for encouraging citizens to co-operate in waste segregation and promoting the purchase of recycled products. Also, citizens should be requested to pay a more realistic fee for waste services in return for the guarantee that these services would indeed be provided.
- RWAs, Community groups and Non Governmental Organizations (NGOs) involvements is necessary in the form of information, motivation and technical assessment. Besides this, involvement of the users is essential for sustainable benefits.
- Responsibility and accountability of MCD staff should be fixed. Fair and transparent functioning should be ensured. Measures should be taken to promote the consumption of recyclable items by the people.

Conclusion:

Though efforts are taken for effective waste management system in India still it is facing severe problem due to enormous quantities of waste generated each day. This is mainly because the Municipality Board in India lack in making effective plans and strategies for proper disposal of solid waste. The reason may be lack of adequate technology and adequate manpower. Improper management of solid waste has caused many health hazards for the people and with the increase of population the waste generation has also increased specially in the urban areas. Therefore the efficiency of solid waste management need to be enhance and hence, it becomes important for each Municipal Board to have proper plans and strategies to deal with the issue. However, without public awareness and participation the Municipal Board alone cannot do this. Thus, the state government through the Urban local Bodies/Municipal Boards should take initiative to spread awareness among masses to minimize wastage and littering and to encourage reuse and recycling. Apart from this more fund should be allotted to ULB/Municipality boards for improving the efficiency of the municipality boards.

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