



Status and Challenges of Solid Waste Generation of Nagpur City

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Abstract: Solid waste management is a global environmental issue which concern about both economical and environmental problem. Nagpur is emerging as a mega city of population around 45 million is beset with problems of urban influx, inadequate infrastructure and management. Nagpur city being a densely populated with rapid growth of urbanization industrialization and wide spheres of human activities facing these problems immensely.

The present municipal solid waste 800 generation in Nagpur city is approximately metric tonnes/day. NMC has taken all initiatives to follow the compliance as mentioned in the Solid Waste Management Rules 2016. Open dumping of solid waste is practiced in most of the urban parts of city. However, still the deficiencies are observed in the proper planning of solid waste management which urgently needs to be accounted for corrective measures generally open dumping.

In this paper, an attempt is made to evaluate the major parameters of MSW, in addition to a comprehensive review of MSW generation, its characterization and treatment options as practiced.

The broad recommendations include segregation of Solid waste at the source and in the site of waste collection, regular collection of solid waste, removal of solid waste dumps on road sides etc.

It is for this reason it was thought worthwhile to carry out a systemic study of solid waste characterization and generation and if possible remediate measures for its control with few recommendation.

Index Terms - Solid waste, Open dumps, Recirculation, Regulations, Generation rate

I. INTRODUCTION

Nagpur city being a capital of Maharashtra is developing on a fast track basis in all the directions. There are various development activities like construction (roads & building) and industrialization are in progress within and outside the city area. Moreover, there are many industries and industrial set up available around and within a vicinity of Nagpur city like thermal power plants, sponge iron plants, rolling mills; ferro alloys factories and mining activities along with unmanaged vehicular traffic (heavy, medium and light vehicles) and transportation activities. Most of the transportation roads including national and state highways and within and outside city areas which are not properly constructed causing emissions in the form of dust particulate matters and gaseous emissions creating unhealthy conditions to the receptors like human beings within the city area. Moreover unpaved roads within the city as well as the construction activities being in progress are also creating dust nuisances and gaseous emissions may cause ill health to the people. The irregular and unmanaged road cleaning process as well as collection and disposal of solid wastes generated within and outside the city areas are also adding their inputs in creating air pollution in the city.

The city is facing acute problems related to solid waste, this is despite the fact that the largest part of the municipal expenditure is incurred towards the management of municipal solid waste. The current waste generation in Nagpur is 900 tons per day and likely to grow in the next few years due to the increasing population and will create a formidable challenge to the authorities unless an integrated approach is taken. Nagpur city is well connected with the other parts of India through roads as well as railways and air.

Since the beginning, mankind has been generating waste. With the progress of civilization the waste changes its composition and become more complex in nature. Due to industrial revolution not only air gets more and more polluted but the earth itself becomes more polluted with the generation of non-biodegradable solid waste. Population rise and urbanization also

become largely responsible for the increasing solid waste. This study attempts to highlight waste management as an inevitable part of Environmental management for any developing region.

The objectives of this study is to present an overview of the current waste management practices in Nagpur and also discuss the suitable methods to overcome the constraints. The study presents the result of a preliminary survey conducted over a period of 1 year 2020-2021, the nature and the methods adopted for the disposal.

With the development of the city, there is tremendous increase at a fast rate in the population of the city. This has resulted in the increase in the solid waste generation. As per the data compiled by NMC's health department (sanitation), the daily waste generated was approximately 1255 metric tonnes in 2018-2019 which is 172 metric tonnes more than the waste generated in 2014-15. There has been approximately 15.88% increase in the daily collection of garbage by Nagpur Municipal Corporation (NMC) in the last five years. Solid waste management is requires revamping to protect the public health.

The study has been undertaken to review the solid waste management in Nagpur and suggest the remedial measures to identified deficiencies in the field of solid waste management. The developmental plan of Nagpur (**Figure 1**) is attached herewith to show the urban and suburban areas which need to be covered under solid waste management plan.

SOLID WASTE PRODUCTION

The data on solid waste generation in Nagpur is based on the figures of solid waste collected by the NMC. This data may be underestimated because solid waste collection may skip some areas and might have not properly collected the solid waste from the different areas of Nagpur. Previously the contract of the work of garbage collection was given to private operator Kanak Resources Management Limited (KRML). The KRML was assigned the work to collect the solid waste from door-to-door in 2008 (**Figure 2**). It was supposed to lift and segregate garbage (wet and dry separately) and NMC was paying Rs. 1306 per metric tonnes for the door-to-door collection of garbage and transporting it to Bhandewadi dump yard. KRML was giving poor service, therefore new contract has been given for collecting solid waste from different zones, may be included some suburban area. NMC has approx. 77 acres land in Bhandewadi, of which 52 acres is being used for dumping garbage while 25 acre is for sewage treatment plant. The dumping area is already full to its capacity and no alternate site is still selected for this purpose.

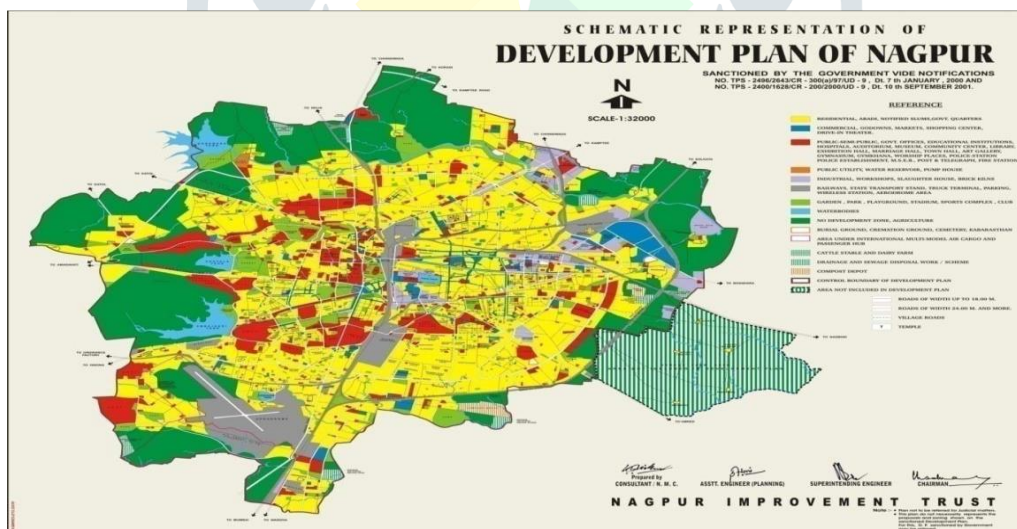


Figure 1: Map of Nagpur City



Figure 2: Door to Door Collection

EXISTING STATUS OF WASTE COLLECTION

Nagpur city has divided into 10 zones. NMC is having privatized collection system i.e, Kanak resources management limited (KRML) and this KRML do the work of transportation of solid waste. Different types of collection of waste is been practice in city.

- House to house collection
- Community bin system
- Bell Ringing System

House to house Collection: In the house to house collection, refuse generated and stored in individual premises is collected by several method, some of which are describe below”

1. **Curb service:** The house owner is responsible for placing the refuse containers at the curb on the scheduled day, when the workmen from solid waste collection vehicle collect and empty the vehicle and place them back at the curb. The house owner is required taking back the empty container to their houses.
2. **Alley service:** The containers are placed at the alley line from where they are picked up by the workmen from solid waste collection vehicle who deposit back the empty containers.
3. **Set- out service:** The workers of solid waste collection vehicles collect the containers from individual houses and empty them in the collection vehicles. The house owner is required to take back the empty containers.
4. **Backyard service:** Solid waste workers carry a bin, handcraft or sack or cloth to the yard and empty the solid waste container in it. The handcart or bin is subsequently taken to solid waste collection vehicles where it is emptied.

A modified form of house to house called ‘Block collection’ is also sometimes adopted in some developing countries. In this system, the collection vehicle stops at selected location on specific days. The house owner brings his waste and deposits the same in the vehicle, which then moves ahead and the process is continued till the vehicle is full.

Storage of waste at individual premises should be in containers of specific size, capacity and design. The house-to-house collections works efficiently, if the location of bins in individual premises is carefully planned and fixed. Indian cities are by and large outgrowth of small towns and have narrow streets and crowded localities. It is therefore difficult to provide specific locations outside the house for waste containers and these must therefore be stored within the houses. This poses a number of sociological and aesthetic problem.

Further, if the house-to-house collection is to be effective, the individuals should use standard container. This is difficult to achieve due to the low purchasing power of citizens. The municipal agencies are unable to provide and maintain such a large inventory of containers due to their poor financial conditions.

In India, the daily volumetric contribution of waste per household is small and as the waste requires frequent collection (to prevent decomposition at sources) the vehicle will be required to make a large number of halts. This increases the cost of collection in house-to-house collection system.

Community Bin System: This system is commonly adopted in India wherein community bins are located at street corners, and at specific frequencies along the straight roads. The residents are expected to bring their waste and deposit the same in the community bins. The capacity of the community bins should be at least 50% in excess when collection is made daily and 100% in excess when collection is made on alternate days. The spacing of the containers should be fixed on the basic of the per capita quantity and the population contributing the waste. However the distance between the containers should never be more than 100 meters. In the case of larger spacing, the worker tend to avoid transportation of waste to the community bin and private workers start operating in such areas.

Bell Ringing System: It is observed that in some cities a modified form of the house-to house collection system is adopted. In this system the collection vehicle is provided with a bell and on reaching on specific points it is rung. Residents from the adjoining areas come to the vehicle and deposit the waste in the vehicle. This system can work efficiently if the movement of the vehicles is appropriately and continuously controlled and the citizens also cooperate.

In some cities, workers with large sized handcarts move along the streets and residents deposit the waste in these carts. Often the workers use a bell to inform the resident of his arrival. As he moves slowly, residents can still find him in the vicinity and deposits his waste in the handcart. He waits at specific points and deposits the waste in the waste transport vehicle when it arrives.

PROBLEMS WITH SOLID WASTE COLLECTION AND MANAGEMENT

The Times of India (7th April 2019) reported that due to poor monitoring, the agency not only failed to cover entire corporation limits, but has also been unsuccessful in collecting segregated waste at source. Similar observations have been made by the team of author.

Apart from this there are many areas where the NMC is not available and citizens are forced to dump garbage either in open areas or along the roads. The planning of garbage collection was not done considering future increase in the localities along with the increase in population.

NMC has admitted that they cannot treat the solid waste considering its huge quantity, and that the actual quantity is much more than the quantity that is collected. According to them, many areas, especially outskirts, are still not covered in NMC's door-to-door garbage collection.

It was also observed that the garbage collection has improved manifold in the last three years when Swachh Bharat Mission was launched. However, due to lack of long-term planning, the solid waste management is not successful completely. There are also many areas and slums which are not covered in door-to-door garbage collection.

It was also observed that the garbage segregation and treatment is poor. The garbage treatment area is recently affected by the fire in garbage heaps, creating the nuisance of smoke and smell in the nearby area. Inadequate composting also causes the pollution of air due to bad smell and harmful microorganisms from the garbage. This has affected the nearby area. Many public health problems may be due to this polluted air.

The manual on solid waste management by Bhide and Sundaresan (2001) is a good guide for solid waste management and every contractor doing solid waste management should be given this manual to study and follow the methods.

THE MAJOR ISSUES FOR SOLID WASTE MANAGEMENT IN NAGPUR

- Lack of long term planning for solid waste management including treatment and disposal
- Many areas, especially outskirts of the city are not covered by solid waste collection programme (**Figure 3**).



Figure 3: Problem of Solid waste in Nagpur City

- Many slum areas are not covered by door-to-door collection of solid waste.
- Failure of solid waste collection, some areas in Nagpur have opened dumping, creating health problems to the people.
- Lack of solid waste segregation and treatment facility.
- Lack of alternate site for solid waste segregation and treatment facility.
- Even now, the solid waste collection is not for dry and wet at source. The waste collector persons mix the dry and wet solid waste while putting in the truck.
- Even in areas covered by door-to-door collection, garbage is seen lying by the road sides, which are not picked up by the waste collectors.
- Until now no monitoring system was present. But now all waste collector vehicles are provided with GPS and their movement can be monitored. However, this system should be done sincerely and should be continued in future.
- Proper marketing of compost prepared from the wet solid waste and reuse of recyclable material segregated from the solid waste. One such solid waste segregation plant in Bajaj Nagar is shown in **Figure 4**.

MANAGEMENT STRATEGY

- Long-term planning for solid waste management should be done for every 10 years.
- Ample resources should be made available on the basis of long-term planning.
- Ward wise or zone wise demarcation of the area for collection of solid waste (**Figure 5**), from where also the solid waste should be collected. These areas would serve for residents to drop any additional waste like garden waste.



Figure 4: Municipal solid waste plant in Bajaj nagar, Nagpur



Figure 5: Waste collection from different zones

- Apart from trucks, small hand carts may also be arranged in each area for collecting the waste from streets, gardens and from homes if the door-to-door collections fail on some days.
- Segregation of wet and dry solid waste at source in homes, offices, institutions.
- Expert solid waste segregation, treatment and disposal system should be available at solid waste collection & disposal area.
- Solid waste collection and disposal area should be away from the residential area, and should have facilities for control of smell and disinfection of area. .
- Selection of proper dumping site in different wards with bins properly demarcated as red, yellow and green.
- Proper equipment for collection system
- Safety equipment to the workers collecting solid waste.
- Proper selection of route for transportation of solid waste

- Solid waste should not spill during transportation.
- Solid waste collection system should immediately respond to the citizen's call to collect solid waste, or dead animals or any sanitary problem. Phone number should be displayed on vehicles for contact.
- Solid waste collector should not collect money for giving their service.
- Continuity of application of GIS system for collection of day to day data for planning, management and record keeping
- Proper monitoring of solid waste generation, collection, segregation, transportation and disposal.
- Dress code for workers for road cleaning with time and also for workers in collection system.
- Proper colour codes for transportation vehicles and drivers
- Allocation of responsibilities within the corporation with proper division name.
- Timing of workers for road cleaning and collection system.
- As per the solid waste management rules, the colour coding for collection of solid waste is green for organic, non-biodegradable for yellow, white for paper, grey for metals, blue for plastic, hazardous for red, and e-waste for black (**Figure 6**).



Figure 6: Provision made for separation collection of solid waste

Conclusion

Nagpur is second capital of Maharashtra. It is also one of the smart cities to be developed in India. Nagpur is expanding fastly and also its population. Therefore solid waste management problem need to be improved from the present status to make the city Swachh. For this, long-term plan considering the growth of population and city need to be prepared and resources should be made available step by step. This would make the Nagpur city a smart and swachh city to live in.

The dire need is to plan the solid waste management on long term basis of 25 years considering the increasing population and expanding city limits. The solid waste management plan should cover entire Nagpur City – urban and suburban areas – to make the city environment clean and green and livable. Another important point is that alternate sites should be selected away from the residential areas considering long-term plan. At the same time, the processing of solid waste should be efficient with respect to minimization, recycle and reuse in order to conserve the resources.

In order to have a satisfactory, efficient, and a sustainable system of solid waste management, the following aspects need consideration.

- Targeting waste reduction at source
- Technological interventions
- Efforts towards institutional and regulatory forms.

Solid waste management is a vital, ongoing and large public service system, which needs to be efficiently provided to the community to maintain aesthetic and public health standards.

Solid waste management involves various activities like collection, storage transportation, and treatment and disposal. It is necessary to develop an efficient environment friendly and sustainable solid waste management system for which rigid and accurate database are needed. These data are useful in analyzing the existing situation. Suggesting the improvement and also to developed appropriate solid waste management system for future.

Development in the waste management system is in slow paced, nevertheless, a sincere one, however, it needs upgradation in the areas of processing and disposal. Political and financial hurdles and lack of cooperation by the public in general have created bottlenecks in improving its efficiency.

However for any waste management to be successful, the government should step up and take the required initiatives. Even though financial constraints are a part of the systems, the government can make a formal and sincere commitment for an integrated solid waste management approach, fully recognizing the advantages of the existing informal recycling network. Waste recycling can be promoted through consumer campaigns that will encourage citizens to cooperate in waste separations and to purchase recycled products. Also authorities should encourage composting and bio gasification of wastes, which will reduce the volume of the waste to be disposed. Finally, no solid waste management can be effective without proper monitoring of its disposal activities. Therefore, its effectiveness should be tested on a regular basis.

ACKNOWLEDGMENT

The authors are thankful to the Dr. P. N. Charde, Principal, Sevadal Mahila Mahavidhyalaya for granting permission to attend and present the paper.

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