



Assessment of Solid Waste Management in Kanpur SmartCity

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ABSTRACT

The purpose of this research is to define the existing state of municipal solid waste (MSW) in Kanpur city to identify the main obstacles its efficiency and the prospects for improvisation of the solid waste management system in the city. The usual approach to problem solving is to survey previous work done in this subject area of solid waste management. Various studies say that 95% of MSW is disposed of unscientifically in open dumps and landfills, creating problems to public health and the environment. The amounts of waste generation have been increasing in India with increasing urbanization. Since higher education campuses about 90% are such as autonomous cities, they can act as a model for solid waste management (SWM) and enhance sustainable development. SWM is the controlled generation, storage, transport, processing, and disposal of solid waste considering public health, conservation, economics, and environmental conditions. Many developing countries such as India are lacking behind in SWM from the developed countries which are using advanced technologies along with efficient management. This paper will analyze the issues related to SWM Kanpur streets for becoming zero waste streets. Lack of awareness and improper collection, exposed transportation, inefficient processing, and disorganized disposal of solid waste are the major reasons for it. Some techniques would reduce the amount of waste diverted to landfills and the problems arising on streets due to solid waste, thus leading to zero waste streets. This paper identifies a need to implement a robust SWM at the Kanpur city in India.

Keywords: Solid waste management, Zero waste streets, Recycling, Waste classification, Technologies, Municipal solid waste

INTRODUCTION

The management of MSW is going through a critical phase, due to the unavailability of suitable facilities to treat and dispose of the larger amount of MSW generated daily in metropolitan cities. Unscientific disposal causes an adverse impact on all components of the environment and human health. The management of MSW is going through a critical phase, due to the unavailability of suitable facilities to treat and dispose of the larger amount of MSW generated daily in metropolitan cities.

Solid waste management (SWM) is one of the basic services arranged and administered by the municipal authorities in the country to enhance the cleanliness of the urban center. Solid waste open dumping refers to the act of discharging or otherwise disposing of solid waste in an environment outside of proper pollution management functionalities.[1]

Annually, about 12 million tons of inert waste are generated in India from street sweeping and in the landfill sites, it occupies about onethird of total MSW.[2-9]

CLASSIFICATION OF SOLID WASTE

In a broad sense, the solid waste can also be categorized as dry and wet. As solid waste is broadly classified into solid waste, wet waste and biomedical waste.[10] A typical solid waste collected from the city shows presence of following materials: Card boards, carry bags, pins, containers, glass bottles, tin containers, plastic items, leather, papers, rags, etc.[11] The characteristics solid waste varies from different places. Factors such as income level, the sources, the population, social behavior, climate, industrial production, and the market for waste materials are influential [12].

National Environmental Engineering Research Institute has carried out studies in more than 50 cities and towns in India. The characterization of MSW showed that the waste consists of 30–45% organic matter, 6–10% recyclables, and the rest as inert matter [13].

STORAGE AND COLLECTION OF MSW

Location and extent of the study area Kanpur City is situated between the parallels of 25°26'N and 26°58' North latitude and 79°31'E' and 80°34' East longitude. It is situated on the most important national highways No. 2 and 25 and state highway. Covering an area of 291.78 km² which consists of 3,415,058 persons (as per 2011 projected population) [14].

Kanpur is the biggest city of the state and it is the main center of commercial and industrial activities formerly known as Manchester of the country is now also called the commercial capital of the state. It is known for its cotton and woolen textile and leather industries. Apart from leather and textile industry, the fertilizer, chemicals, hosiery, two wheelers, and engineering industries are also operating prominently in the city. Kanpur city is divided into six zones and further subdivided into 110 wards.

PRESENT STATUS OF SOLID WASTE MANAGEMENT

QUANTITY OF WASTE GENERATOR

Kanpur Municipal Corporation operates its functioning by dividing Kanpur City in **6 Zones** which consist of **110 wards** accordingly. Kanpur Municipal Corporation generates a total of **1165 Metric ton** approximately of Solid waste Per Day. Detailed survey was conducted for all the 110 wards Residential and Commercial area. Zone wise Survey detail is annexed in annexure

Table1.Waste Generated per day report in segregated form is indicated below.

Source of Waste	No. of HH/ Assessment	Per capita Waste generation (in grams)	Waste Generation in MTPD		
			Wet Waste	Dry Waste	Total
Domestic HH's	529014	450	623.24	414.86	1038.1
Commercial Complex & Bulk Waste Generator	75126		75.07	49.98	126.04
TOTAL	604140	450	698.31	464.84	1164.14

DOOR TO DOOR COLLECTION

1. The waste generated in the city are collected at the door steps every day.
2. Kanpur Nagar Nigam has engaged a vendor for the door to door collection of waste through tender process.
3. The tender for door to door is covering all the 110 wards of Municipal Corporation.
4. For the door to door work at present 294 LCV (Closed Bin Hopper Tipper) and 109 tricycle is involved.
5. Presently D2D Collection of generated waste achieved is 90%.
6. Under Smart City mission Procurement of 150 Nos. closed bin hopper Tipper of 3.3 cum. Capacity is in Tender process.

Photos showing door to door waste collection



SEGREGATION AT SOURCE

1. At present, **45 percent** of all households/ premises have segregation at source (wet, dry & domestic hazardous) in practice.
2. Animators are involved in continuous IEC activities to have stability in maintaining segregation at source in **D2D activities**.
3. For intensive IEC activities two NGO's has been engaged through the process of tender for IEC activities.
4. The population growth, development of residential colonies, vertical expansion of multi-storied apartments in the town causes increase in daily garbage generation, hence continuous IEC programs being conducted to practice waste generator to minimize the waste through 4R concept and to **achieve 100% segregation** practice.



SWEEPING OF PUBLIC, COMMERCIAL AND RESIDENTIAL AREA

As concern of solid waste management field staff, at present **1719 permanent staff** and **1930 contractual** and **2026 outsourced staff** is involved in S.W.M. activities

A. PUBLIC AREA SWEEPING

1. At present 100% Public & commercial areas have daily sweeping, including night sweeping
2. Public area means any area of a public building or its grounds ordinary open to members of the public, such as bus stand, bus stop, entrance way of railway station. Corporation office area. Ward office area, public toilet area, post office meeting area Municipal corporation parks and road side gym, road side footpath, play field etc.
3. In the said public area, Sweeping is being done once in day in the morning hours between 4 Am to 6 Am and area wise register containing the details of date & time of sweeping, name of the sweepers, name of the supervisor are being documented.
4. For the regular cleaning of 20 Ghats along river Ganges. A vender has been engaged under "National Mission for Clean Ganga" through this specified team regular cleaning of Ghats is carried out daily.

B. COMMERCIAL AREA SWEEPING

1. Commercial areas in a city are areas primarily composed of commercial buildings, such as a Godown , central business area, Main Street/roads, commercial strip, or shopping centre. The following are identified commercial area in Kanpur Municipal Corporation.
2. In commercial areas night sweeping is also along with day sweeping. List of Commercial Area for Night Sweeping.

C. RESIDENTIAL AREA SWEEPING

1. The Residential area roads / streets are being swept daily.
2. For the collection & Transportation of waste so generated is transferred directly to the Solid waste Management Plant through the Nagar Nigam vehicles.

Presently 41 Tipper , 08 Mini Tippers, 09 dumper places of 8 MT. ,09 dumper places of 4.5 MT. 09 JCB ,10 loaders and 09 Skid steer roller is involved in this Work.

LITTER BINS, WASTE STORAGE AND MATERIAL RECOVERY FACILITIES

Twin type litter bins (blue and Green) are placed in the public area, commercial areas and around the public buildings. In identified locations 670 Nos. of twin bins provided at 150m interval.

BULK WASTE GENERATORS

In Kanpur Municipal Corporation Bulk Waste Generators are identified by conducting random survey in three different times i.e., during working day, holiday and festival season All the identified BWG are issued notice for compliance with SWM Rule 2016. Accordingly register is being maintained and periodically the status of BWG is reviewed and updated. The identified BWGs are advocated to establish the wet waste processing mechanism at their own premises and a e being supervised by the municipal sanitary inspector.

USER CHARGES, PENALTIES & SPOT FINES AND ENFORCEMENT OF BANON PLASTIC

1. Affordable User charges are being collected from Residential, commercial, institutional, industrial establishment. Necessary By law framed & notified in the state.
2. Penalties & spot Fine are notified in gusset for non-segregation, anti-littering and non-compliance of SWM Rule 2016.
3. Implemented in 100 % premises including littering in storm water drains and water bodies through the Enforcement committee formed exclusively for this purpose
4. Notified on complete ban on all plastic bags in the State of Uttar Pradesh.
5. Enforcement came to force as per SWM Rule 2016

WASTE TO ENERGY

Waste to Bio-Diesel Plant, using 5.00 TPD Plastic waste is under construction. It is expected to start the plant by 15 th April 2021. Pavitra Wasste Management Pvt. Ltd. is establishing the Plant at SWM Plant campus. CUGL is setting up a CNG plant by Capturing methane from Organic waste it would become operational till Dec 2024.

SCIENTIFIC LANDFILL

A scientific landfill site of 50,000 mt area is constructed in SWM plant.

C&D WASTE MANAGEMENT

Facilitation of use/ processing or recycling of C&D waste (primarily for bulk waste generators). Gazette Notification related to the Management of C&D Waste already published. At present, there are 6 Nos. of designated places for the collection of C&D Waste. Under NCAP Programme a 100TPD C&D Waste Processing Unit is under process. The tender has been finalized and work order for the establishment of plant has been issued. It is expected to be functional by 15 th october 2024.

CITIZEN GRIEVANCE REDRESSAL AND FEEDBACK SYSTEM

For the redressal of SWM related grievances, Swatchata App launched by SBM has been promoted to the citizens by effective IEC activities. The Corporation has its own Mobile App "Smart City Kanpur" to facilitate the Citizens to deliver various services which includes Grievance redressal mechanism with feedback facility. More than 5000 HH

downloaded the Mobile Apps and 100% of complaints received were resolved. Toll free Number provided for receiving public grievance.

WASTE PROCESSING FACILITY (MUNICIPAL SOLID WASTE MANAGEMENT PLANT)

The daily generation of Municipal Solid waste is around **1150 to 1200** TPD as now. The waste from Primary Collection (Door to Door) is transferred to 06 transfer station constructed under smart city mission.

- 1- Bhagwat Das Ghat
- 2- Krishna Nagar
- 3- Janta Nagar Police Chowki
4. Chunniganj
- 5- Gujaini
- 6- Panki – Kalyanpur Marg

Apart from the transfer station for more closure coverage of LCV, 20 vehicle mounted compactors are also placed at 20 different places of the city.

All the so collected waste from transfer stations and vehicle mounted compactors are transferred to Municipal Solid Waste Management Plant of 1500 TPD at PANKI BHAU SINGH. All waste arrives at plant is weighed electronically through weighbridge and a log of daily waste collection is maintained at SWM Plant. The Mix waste arrived at plant is primarily sieved at presorting section, where the bio-waste and dry waste is separated accordingly.

BIO-WASTE PROCESSING:

The Bio waste from presorting section is send to composed pad for composting process. Formation of windrows, spreading of culture and turning of windrows takes places and after a cycle of 28 days , this compost waste is transferred to final processing section, where it is sieved through 35 mm to 16 mm trammel and finally after curing period of 7 days it is sieved through 4 mm trammel for final product of City Compost. Presently **50 to 70 M.T.** of City Compost is produced daily.

DRY WASTE PROCESS

The segregated dry waste from presorting section is transferred to RDF Section. Around 30 M.T. of dry waste is transferred daily to ESSEL Power Plant, Jabalpur. Cement Industries M.P. and Rajasthan through different vendors. A Material Recovery Facility centre of 15 TPD is also developed at plant with following machines:-

1. Baling Machine
2. Shreding/Grinding Machine
3. Fatka Machine
4. Aglo Machine
5. Extrusion Machine
6. Double Head Gatta Machine
7. Washing & Drying Unit

BIO- REMEDIATION & BIO- MINING

Solid waste management **Plant Panki Bhau Singh** is being functional **since 2010**. The extent of the dumpsite is quaaabout **46 hectare**. The SWM plant become **non-functional from 2014 to 2019**. The legacy waste accumulated in the dumpsite was notified in the year 2019. The quantity ascertained in the **dumpsite is about 18 lakhs cum**. The reclamation of legacy waste through Bio Mining Process started in March 2020. At present 9 hectare of the legacy waste has been processed and disposed for reclamation of the dumpsite.

BEFORE THE PROJECT

Kanpur had a typical waste management system which included the following elements:

- Waste generation and storage
- Throwing garbage on roads, a little segregation and recycling by rag pickers
- Primary waste collection and transport to a transfer station or community bin
- Street sweeping and cleansing of public places
- Management of transfer station or community bin
- Secondary collection and transport to the waste disposal site
- Waste disposal in landfills
- Collection, transportation and treatment of recyclable at all points on the solid waste pathway (collection, transportation disposal.) [15]

RECYCLING

Recycling is convert secondhand fabrics into new products. It reduces the devouring of new natural resources, reduces strength custom, and reduces air contamination and water pollution. Recycling is the key component of new waste decline and is the triennial component of the “Reduce, Reuse, Recycle” waste. Source break-up is high-quality process where various classifications of recyclables and organics are divided at beginning, that is to say, at the point of production, to promote talk over again, reusing, and make ready to bear [16]. Informal areas by various groups of society are risking an main duty in reusing of solid waste in Kanpur. All the shoppers of the recyclable articles concern the casual subdivision and only a few stiff manufacturers are complicated in utilizing recyclable essence as natural resources. However, in the intentional areas, reusing is not trained widely and efficiently except that sure urban regions.

CONCLUSIONS

Rapid urbanization and population growth in the major area of Kanpur create a mammoth generation of MSW and the authority is unable to manage properly accompanying the dislike management system, economic support, other resources, infrastructures, and technological capabilities. Door-to-door collection structure needs to receive support from all stakeholders accompanying proper awareness, motivation, and commitment campaign. Existing on-section storage practices should be changed immediately by adopting properly devised and maintained secondary disposal sites or transfer stations or handover points, place it is applicable based on the prevailing socioeconomic aspects. Efficiency of wastes transportation to the ultimate disposal sites (UDSs) must be improved with the participation of private sector accompanying strict agreements and conditions. Pdislike situation of UDSs demands improvement by providing a sanitary landfill mechanism in the existent sites. Recycling can be widespread with expansive varieties of articles both in the formal and informal sectors. Government support should be provided in composting, a prosperous sector for managing a giant amount of organic wastes in Kanpur. Since skilled is no sole resolution, the projected techniques maybe used to select an joined reliable waste administration plan based on the local needs, socioeconomic backgrounds, concerning details skills to guarantee the reputation of the selected system, and the material sustainability.

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