

# PRESENT SCENARIO OF MUNICIPAL SOLID WASTE MANAGEMENT IN DEHRADUN CITY

Harimohan Bhandari<sup>1</sup> & Mamta Mishra<sup>2</sup>

<sup>1</sup>Research Scholar, Dept. of Geography, M.B.G.PG College, Haldwani, Uttarakhand

<sup>2</sup>Assistant Professor, Dept. of Geography, M.B.G.PG College, Haldwani, Uttarakhand

## Abstract

Municipal solid waste has become a serious environmental problem in major cities all over the world. The problem of solid waste management (SWM) is also influencing the urban environment of Dehradun city. Therefore the present study was under taking to enlist the causes of solid waste management. Dehradun is the capital of Uttarakhand having population 5,78,420 (as per census of India 2011). Under the general expansion of human population and rapid urbanization in the city, the amount of solid waste is increasing drastically. However, the public authority capacity to implement the municipal solid waste management service is limited. As a result, many municipal solid wastes are not collected, treated/disposal off appropriately, which has caused public health issues and environmental problems. The study was mainly concentrated to investigate the present status of municipal solid waste management in Dehradun city. In order to carry out the study a detailed survey was carried on existing facilities of solid waste management such as manpower resources and management system. A detailed study comprising the methods of practices associated with general quantity of waste, collection, storage, transportation and disposal of solid waste in the city. The relevant data was obtained from Dehradun Municipal Corporation and individual field visits.

**Keywords:** *Municipal solid waste*, environmental problem, urbanization, collection, storage, transportation and disposal.

## Introduction

Municipal solid waste (MSW) includes household's garbage and rubbish, street sweeping, construction and demolition debris, sanitation residues, trade and non-hazardous industrial refuse and treated bio-medical solid waste.<sup>[1]</sup> The quantity of municipal solid wastes generated in Dehradun has been consistently rising over the years. This can be attributed to the rapid population growth, mass migration of population from rural to urban areas, increase in economic activities in general in the city and the change in lifestyle of the people.

Dehradun city, after becoming state capital, has been growing rapidly but the infrastructure development is not in a position to keep pace with development. Solid waste management is among the key infrastructure that is substantially deficient. The Municipal Solid Waste (Management And Handling) Rules, 2000 that mandate seven essential steps to be taken by municipal authority which include storage of waste at source in a segregated manner, primary

collection of waste from the door step, street sweeping on a daily basis, secondary storage in covered containers, transportation in covered vehicles, processing of organic matter through composting or waste to energy and disposal of waste at an engineered landfill. Dehradun Municipal Corporation (DMC) has an area of 300 Sq. Km and a population of 5,74,840 as per 2011 census. Along with intrinsic population growth the rural to urban mass migration account for additional population pressure on the city. Change in lifestyle of the people has resulted in increased wasteful consumption, leading to a change in the composition and increase in the quantum of solid waste generated. According to the day to day record maintained by Dehradun Municipal Corporation, it is observed that, the city generates about 350 MT/Day solid wastes and the average quantity of waste collected and transported to dump site at present is 280 MT/day. The DMC, however admits that they can transport only 80% of the waste regularly and rest of the backlog is cleared through special drive carried out from time to time.

## Study Area

Dehradun is situated in the North-Western part of the state. The Dehradun city lies between  $29^{\circ}57'$  to  $31^{\circ}2'$  North latitudes and  $77^{\circ}35'$  to  $79^{\circ}20'$  East longitudes. Dehradun Municipal Corporation has an area of 300 Sq. Km. The population of Dehradun city as per census of 2001 was reported 4,26,674 and increased to 5,74,840 as per 2011 census. The growth rate of Dehradun city is 34.72 % .The region is situated between the lesser Himalaya and the Siwalik which is prominently known as 'Duns'. It is flat floored valley in the western part of the Himalaya which is 25 km wide and 75 km long. The height varies from 300 to 900 meters from the mean sea level.

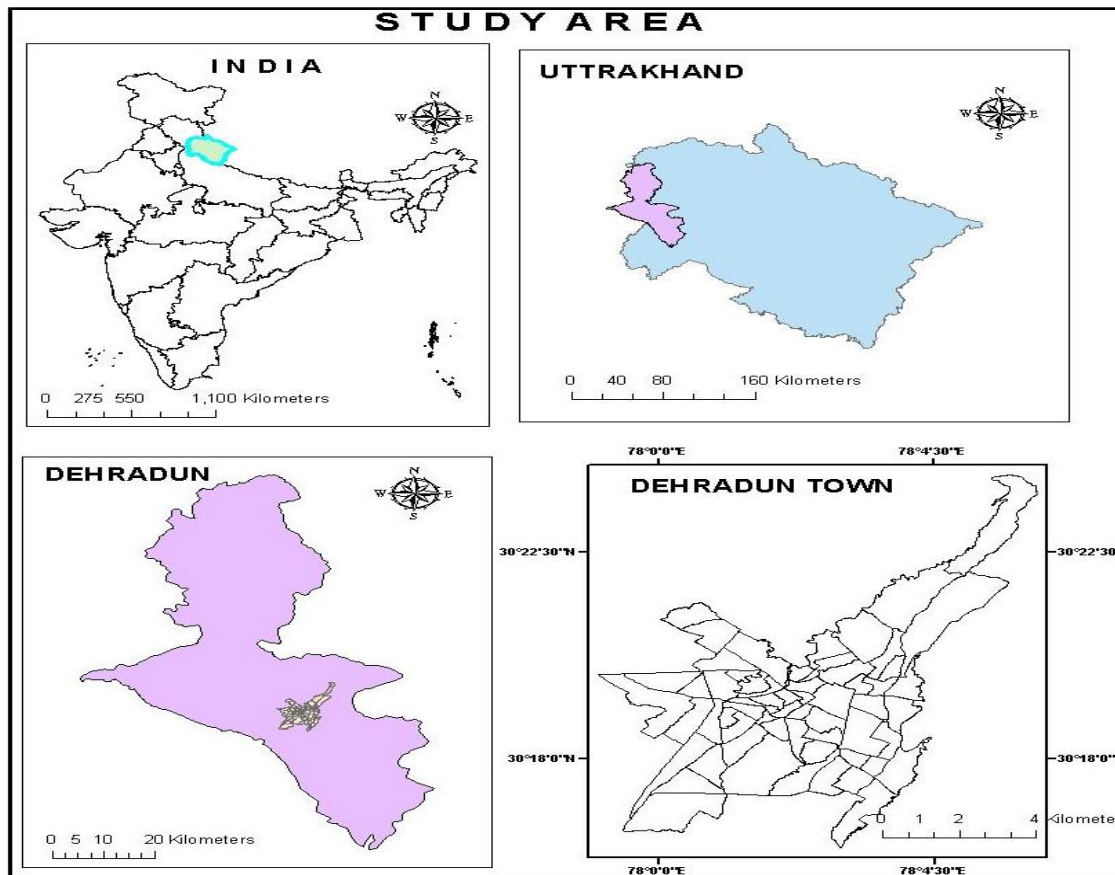


Fig. 1- Location Map of Dehradun City

## Objective

1. To investigate the present status of Municipal Solid Waste Management in Dehradun city.

## Methodology

The study was mainly concentrated to investigate the present status of Municipal Solid Waste Management in Dehradun city. In order to carry out the study a detailed survey was carried out on existing facilities of Solid Waste Management (SWM) such as manpower resources and management systems. A detailed study comprising the methods of practices associated with generated quantity of waste, collection, transportation, treatment and disposal (MSW). The relevant data was obtained from Dehradun Municipal Corporation, other reliable sources and individual field visits, studied and correlated with the present investigation.

## Present Status of Solid Waste Management in Dehradun City

Urbanization directly contributes to waste generation, and unscientific waste handling causes health hazards and urban environment degradation. Municipal Solid Waste (MSW) is defined to include refuse from the households, non-hazardous solid waste discarded by the industrial, commercial and institutional establishments, market waste, yard waste and street sweepings which are collected by the municipal authorities for disposal<sup>2</sup>. As the result of rapid increase in production and consumption, urban society rejects and generates solid material regularly which leads to considerable increase in the volume of waste generated from several sources such as, domestic wastes, commercial wastes, institutional wastes and industrial wastes.

Wastes that arise from a typical urban society comprises of garbage, rubbish (package materials), construction and demolition wastes, leaf litter, hazardous wastes, etc.<sup>3</sup> MSW is only a relatively small fraction of all the solid waste that is generated in an advanced urban economy.

**1. Waste generation** – Dehradun city has in all 60 wards (at present time 100 wards). These wards are divided in five zones. Each zone consisting approximately 12 wards. The existing solid waste management in Dehradun city is scheduled zone wise. Dehradun city generates mostly mixed waste. Mixed waste can refer to any combination of waste types with different properties. Typically commercial and municipal wastes are mixtures of plastics, metals, glass, biodegradable waste including paper and textiles along with other nondescript junk. Dehradun city generates 350 MT of waste per day, out of which 52.86 % waste is compostable, 27.14% is recyclable in nature and rest inert materials.

**Table 1: Quantities of Waste Generation<sup>4</sup>**

Year	2011	2019
Population	905409	--
Total waste from residential areas/day in MT/day (calculated from waste generated from households )	185.61	195
Commercial waste in MT/day	58.86	100
Street Sweepings	48.13	55
Total waste generation per day in MT	292.6	350

Source: Dehradun Municipal Corporation, 2019

**Table 2: Category Wise Quantities of Waste Generated Per Day**

Items/Year	2019 Waste in MT/day	Percentage
Biodegradable waste	185	52.86
Recyclables	95	27.14
Inert materials	58	16.58
Construction waste	12	3.42

Source: Dehradun Municipal Corporation, 2019

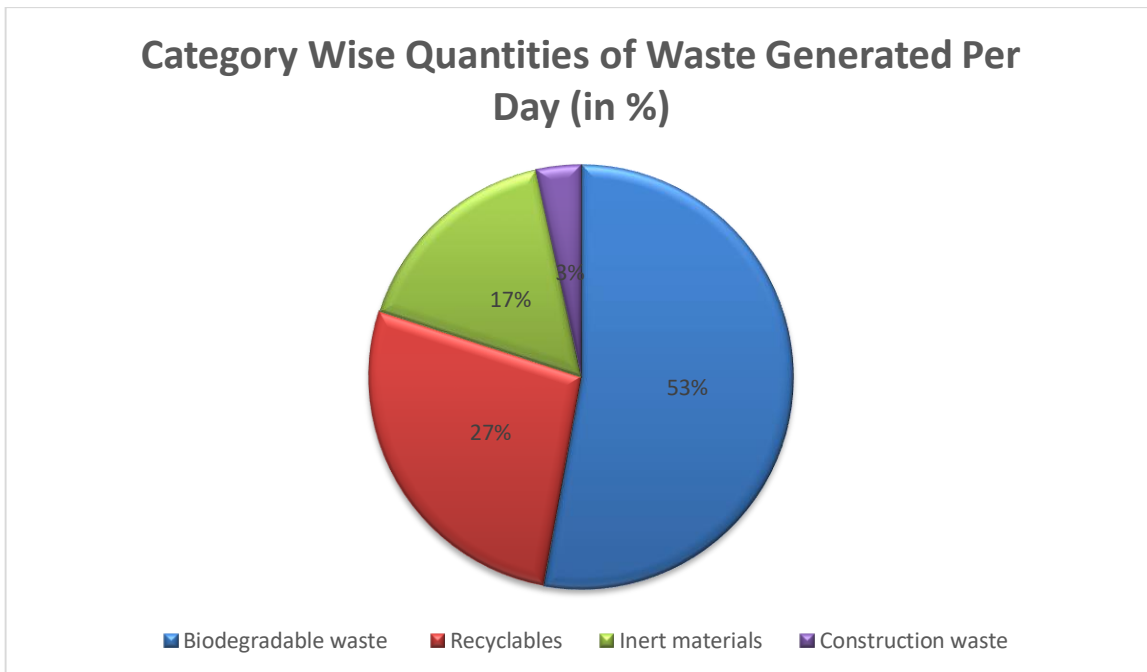


Fig.2

**2. Waste Collection** – As mentioned above, Dehradun city generates mostly mixed waste. Since the city is generating mixed waste therefore, it is not possible to segregate the waste (no segregation of waste is performed). According to author, for not segregating the waste, the residents of the city, as well as municipality both are equally responsible because people instead of keeping waste into separate dustbins like biodegradable or non-biodegradable, they put both the waste into same dustbin. And all the dustbins full of mixed waste, are emptied into the collection trucks by Dehradun Municipal Corporation. City waste is collected through door to door collection, community bins, street sweeping, market waste, etc. A sweeper who sweeps the roads manually is allotted a specific area. The sweepers put the road wastes into a wheelbarrow and then transfer the waste to dustbins or collection points. Very poor storage and collection practice was seen in the city. It was seen that sweepers are not doing their road sweeping duties regularly and sincerely also people of Dehradun were also found less aware to through the waste into the bins. The mixed waste was seen inside & outside the bins states that segregation of waste is not being done seriously. The stray animals were also seen around the bins as the waste was not also throwing inside the bins. The daily estimated generation of municipal solid waste in Dehradun city is about 350 MT/Day, which is collected through street sweepings and from communal waste storage sites. The quantity of waste generally collected and transported to the waste processing site is only about 280 MT/Day, which is about 80% of the waste generated in the city. Remaining 20% solid waste not being transported is the main concern of all visible solid waste pollution in Dehradun city. It causes the environmental problem and affects human society in many ways.



**Table 3: Number of Bins in the City**

<b>Bins</b>	<b>No. of Bins</b>	<b>Capacity (m3)</b>
Dumper Placer Bin	44	8.1
Compactor Bin	86	1.1
Under Ground Bin	80	3.5
		2.5
		1.5
<b>Total Bins</b>	<b>210</b>	<b>16.7</b>

Source: Dehradun Municipal Corporation 2019

**3. Vehicle and Transportation** - Transportation of waste is done through a variety of vehicles such as Tata Ace, tractors and trucks. The transport vehicles are loaded manually and these are used for two-three shifts in a day. Inadequate number of transport vehicles is a major problem. The transportation system also does not synchronize with the system of primary collection and bulk waste storage facilities. Multiple manual handling of waste becomes necessary. During the study period, it was observed that vehicles transporting waste were not covered with the tarpaulin/plastic sheets. The waste is collected daily. First, the waste is collected through door to door collection with the smaller vehicles (Tata Ace) and sent to transfer station which is located at Kargi Chowk. As soon as the trucks laden with waste reach at Kargi Chowk, rag pickers jump in and start scrounging for waste materials, plastic bottle, wraps and so on. At Kargi Chowk where refuse from many collection vehicles is combined into a larger vehicle, such as a dumper. The waste is then transported, usually over long distances, to a processing or disposal site at Shishambara. Most of these vehicles carry the waste in open manner creating nuisance of odour and smell. Transportation is not scientifically designed. Municipal corporation has introduced containers and dumper machines but in most of the cases the waste is manually loaded in the containers/tractors/trucks due to lack of synchronization. Besides, several open waste storage sites and masonry sites are attended by loader machine in a very unhygienic manner. The transportation work is unscientific and causes nuisance and unsightly appearance. The transportation work is carried out on all the days of the year. Municipal Corporation is not in a position to transport the entire quantity of waste generated in the city on a day to day basis on account of inadequacy of fleet of vehicles and inappropriate management for transportation of waste.

**Table 4: Total Number of Vehicles**

<b>S. No.</b>	<b>Vehicle Name</b>	<b>No. of vehicles</b>
1	Tata Ace	45
2	Refuse Compactor	2
3	Hyva Compactor	2
4	Bobcat	1
5	JCB	4
6	Dumper Placer	10

7	Dumper	12
8	Rickshaw	39
9	Trolley	6
10	Tata Ace for E-waste	1
	Total	122

Source: Dehradun Municipal Corporation 2019

**4. Disposal** - Once collected, municipal solid waste may be treated in order to reduce the total volume and weight of material that requires final disposal. Treatment changes the form of the waste and makes it easier to handle. It can also serve to recover certain materials, as well as heat energy, for recycling or reuse. The waste is disposed daily to the landfill site located at Shishambara. The operations at the plant include composting, recycling, Refuse Derived Fuel (RDF) as well as sanitary land fill. The landfill sites are not well maintained, which create the threat of groundwater contamination due to leachate percolation. Open dumped garbage serves as breeding ground for disease vector such as flies, mosquitoes, cockroaches, and rats affects the other pests. The waste sometimes is taken by local farmers as fertilizer. Most of the waste remains laying down in open causing pollution with the odour and smell unless degrades naturally. A treatment plant of anaerobic digestion is in progress to extract energy from organic waste generating the biogas.

**5. Solid Waste Treatment Plant** – The treatment plant is located at Shishambara, 21.8 Kms away from the city. It was planned in the state capital under the Jawaharlal Nehru National Urban Renewal mission (JNNURAM) Scheme of the central government with an aim to achieve scientific collection, disposal and processing of around 350 metric ton of waste produced in the city every day. The plant begun functioning on December 1, 2017. Vermicompost production is not practiced here because the amount of salt is high in the waste received by the plant (according to the DMC). As the waste received is only about 280MT/day in that, after screening of the waste is being used for Refuse Derived Fuel (RDF), compost production and recyclable production. The received waste contains polythene, rubber, stones, iron, sand, cloth, wood, foam, leather and vegetables. The windrow technology is being used for the compost manufacturing. Water spraying on the waste is done for three times a week. To compost the waste first it is segregated properly and moisture is to be maintained. After this the segregated waste for the compost is being fed to 75mm, 4 mm trommel machine respectively, and the reject of these machine is sent to landfill area. The Dehradun Municipal Corporation intends to earn revenue by selling the compost, generated by the treatment plant, to private companies. The operations at the plant include composting, recycling, Refuse Derived Fuel (RDF) as well as sanitary land fill. Shishambara solid waste management plant on 8.3 hectares and is being implemented on the Public Private Partnership (PPP) mode<sup>4</sup>.

**6. Solid Waste Management Department** –The solid waste management Department is looked after by health department headed by the municipal health officer. Sanitary officer, inspectors and supervisors work under the Health Officer. There are ten sanitary inspectors work under the five zonal sanitary officers. Every ward has a supervisor who has twenty sanitary workers (ten workers from DMC and ten workers from out sources)

under him. The total strength of workers are 600 out of which 75 are Tata Ace Driver (door to door collection vehicle). There is a group of workers, having 120 persons, has been engaged on a special project called Nala Gang. The total strength of sanitary staff is 1472. The deployment of manpower at the ward level is planned by sanitary inspectors and the ward supervisors are deployed by the corporation as per local needs.

**Table 5: Total manpower involved in solid waste management**

S.No.	Name	Total	
1	Chief Health Officer	1	
2	Health Officer	1	
3	Zonal sanitary officer	5	
4	Sanitary Inspector	10	
5	Sanitary Supervisor	60	
6	workers	Permanent	600
		Out Source	600
7	Nala Gang	120	
8	Night Sweeping	75	
Total		1472	

Source: Dehradun Municipal Corporation 2019

**7. Total process of solid waste summary of 15 months** – Progress report of solid waste management has been given in the following table 6. Data has been taken from Health Department, Dehradun Municipal Corporation. DMC received 114231.56 /MT of solid waste from December, 2017 to February, 2019. After processing this solid waste in solid waste treatment plant, 59118.84 /MT of Refused Derived Fuel (RDF) was produced. Further production of compost 4938.39/MT and recyclable production 2800.57 were also done. Rest of the inert production 14456.35 /MT was sent to landfill area.

**Table 6: Production Abstract of Month Wise**

Months	MSW Received Waste (in MT)	Production detail				
		RDF(in MT)	Compost production (in MT)	Recyclable's production(in MT)	Inert (not payable) as it is no processed waste product. (in MT)	total
Dec 2017	7443.63	0.00	0.00	0.00	0.00	0.00
Jan 2018	6598.79	2534	17.89	0.00	64.23	2616.12
Feb 2018	6453.3	5643.47	196.5	50.96	255.08	6145.91
Mar 2018	7027.95	3390.30	365.27	1551.7	4596.67	9903.94
Apr 2018	6915.09	3698.66	545.05	647.85	1213.87	6105.43
May 2018	6001.37	3378.79	614.86	538.65	1731.55	6263.85
June 2018	7447.59	4015.18	530.34	0.00	1239.1	5784.62
July 2018	7527.49	4368.48	547.16	0.00	1113.65	6227.29



Aug 2018	11609.84	6307.15	461.61	0.00	966.81	7735.57
Sept 2018	7992.14	4392.01	231.04	11.41	486.89	5121.35
Oct 2018	7535.51	4293.53	426.76	0.00	864.32	5584.61
Nov 2018	7397.63	4126.59	371.03	0.00	730.87	5228.49
Dec 2018	7824.43	4011.27	363.13	0.00	533.9	4908.30
Jan 2019	8660.14	4579.16	189.87	0.00	203.32	4972.35
Feb 2019	7796.66	4380.35	77.88	0.00	258.09	4716.32
Total Quantity	114231.56	59118.84	4938.39	2800.57	14456.35	81314.15
Total production (in %)		51.75	4.64	2.45	13.58	72.43

## CONCLUSION

The municipal corporation is using open vehicles to transport garbage, because of which the entire area is filled with a stench. Besides this the plant is unable to treat the quantity of waste that is brought here. As a result, the waste remains dumped and foul smell emanates from it. Dehradun is one of the leading urban centers in Uttarakhand. The management and disposal of solid waste is not scientific and it creates serious environmental problems. In-sanitary method of waste disposal is also a serious health concern, particularly in rainy season. Leachate and high humid conditions increases the risk of health problems. The combined effects of uncollected wastes, poor handling and inadequate disposal safeguards for municipal wastes have always implications for public health leading to the chances of transmission of diseases, the spread of epidemics and loss of healthy urban and amenable environment.

### 1. Problems

- There is a lack of segregation of waste at the source that creates problem of mixing the hazardous waste in the municipal waste.
- The bins at many places of the city area were very dirty, overflowing and broken. People, often threw the garbage outside the bins. The nuisance of huge garbage on roads and sorting by the rag pickers or moving stray animals on the streets, present very ugly scene. Irregular, ineffective and inefficient primary collection system. A significant part of the waste is left uncollected.
- A part of the solid waste generated is disposed into open lands, streets, surface drains etc. and sometimes burnt in open causing health hazards, public nuisance and degradation of environment and aesthetics.
- Most of the vehicles carry the waste in open manner creating nuisance of odour and smell.
- E-waste is a serious problem for the Dehradun Municipal Corporation in present, as well as in future.

## 2. Recommendations

- Segregation of waste should be promoted at the waste generation source itself.
- Residents of the city should be made aware that put the waste in the dustbins or door to door collection vehicles provided by Municipal Corporation instead of throwing the waste in the open space.
- To stop and prevent open burning of tree leaves and other waste by sweepers on the roadside and direct them to take all the waste to the communal waste storage bins/sites only.
- To spread mass awareness through messages like “Clean Dun, Green Dun” or “Keep your waste unmixed” etc. and cartoons related to MSW management can be painted on the DMC vehicles, Public buses or private buses for public awareness<sup>8</sup>.

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