

## Generate solid waste is a major issue of environmental degradation: A case study

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### Abstract

The term 'Solid Waste Management' is the scene of total system covering all process from the collection to disposal stage for all types of refuse. It involves managing activities associated with generation, storage, collection, transfer and transport processing and finally disposal in an environmentally compatible form by adopting principle of economy aesthetics energy and conservation (Karnad, 2006). It can not to speak of resource which is not in vogue in municipalities nor does it find a place in legislation or executive order relating to sanitation. Narnaul town generates 26 tones of solid waste per day and the municipal committee is able to collect only about 77% of the generated waste, 23% dispose of and 10% remained. It indicates that generation of waste is much higher than collection and disposal of the waste materials. This looks like a burning issue for detail analysis, observation and strategic approach to lessen up to some extent for which Narnaul town has been selected as case study.

**Keywords:** management, activities, waste materials

### Introduction

Waste is generated owing to human activities which is influenced human population.

It is technically defined as waste is a refuse in a solid form produced by human, activities. It is generated from residential, commercial, education institutions, hospital, construction, demolition process and municipal service (Singh, 2001) [7, 8]. Waste materials may be classified into four categories i.e. (i) combustible materials, (ii) non-combustible materials, (iii) biodegradable materials and (iv) non-biodegradable materials which provide scientific information on the possible intrinsic values of particular solid waste for recycling. Though the rag paper pickers picked daily recyclable materials such as plastic, rubber, polythen, metal and glass etc.; even after that a huge quantity of poly then etc. is left out, this poses serious problems to the administrator and the planner. The quantity of collection of solid waste has increased over time, but at the same time the rate of increase of solid waste has not been consistent. This is indeed a matter of serious concern. It is due to the entire developing world is witness to an unprecedented shift of people to the cities. While India's population remains substantially rural, she is emerging as one of the fastest urbanizing countries in the world. The pace and volume of urbanization have swiftly and irreversibly altered the landscape of the Indian cities. It is evident, looking at the past five decades of India, and the empirical evidence around the world, that the future of India is inescapably urban. It is estimated that decidedly by the middle of this century or probably earlier, she would reach at the beginning of this century - of becoming more urban and urban.

The effects and responses to these urban phenomena have been varied in many cities but with certain commonalities. For example, most of the mega and big cities have problems with the provision of urban services, such as, water supply, drainage, sewerage, solid waste disposal, transportation,

healthcare, etc. all of which make the city life very frustrating. Urban environment has been under particular threat as populations in cities have multiplied and commerce and industries have added the generation of waste and the non-ecological use of resources. Thus it is generally considered to be unwanted materials of the houses, shops, construction sites etc. which does not come under the proper management system.

With growth in urban population, increase in per capita income, commerce and industry, there has been a rapid expansion in the quantity and the composition of the solid waste generated in Indian cities. This increase is set to continue for the foreseeable future. The proper disposal of urban waste is not only necessary for the prevention and improvement of public health but it has an immense potential for resource recovery and urban environment management. The different process of waste recycling unfolds a wide range of products, which are transformed from different kind of waste. They reduce the volume of garbage which has to be disposed off by the municipal body and enable local small factory to save manufacturing cost, since production from recovered material uses less energy than production from the virgin material. This strengthens city's economy.

The management of solid wastes is one of the essential services and it is obligatory of municipal bodies to arrange for daily cleaning, collecting, transportation processing and disposal of wastes. Proper discharge of this service is essential to public health, a clean environment and good healthy living. Delhi mismanagement hospital waste has also been highlighted by Singh (2001) [7, 8]. Due to lack of adequate efforts by local authorities and apathy on the part of the citizens, solid waste management has become a tenacious problem and this notwithstanding the fact that the largest part of municipal expenditure is allotted to it. It is crucial for the department that discharges this function to ensure that this

vital civic service is carried out efficiently and adequately since it reflects the performance capability of the municipal body (Panitkar, Modi and Chavan, 2006) [5]. Improper solid waste management gives rise to problem of health, sanitation and environmental degradation which can affect the very sustainability of life.

### Objective

- Trace out the waste generated sources, assessment of quantity, and the status.
- Assessments amount of collection, disposed off and the remaining amount of solid waste.
- Recycling of non bio - degradable waste
- Role of Municipal committee.
- Strategic approach for dispose off solid waste.

### Methodology

Primary data, regarding solid waste generation, collection, problems of dispose off the solid waste, and management with the help of a set of questionnaires through sample survey, has been applied. The secondary data also used to correlate the facts and figures at ward level. The field data was collected from the solid waste management sector by using a variety of sample techniques. District census handbook, statistical abstracts of district Mahendergarh; records of Narnaul municipal committee have also consulted. We have attempted to analyse the comprehensive data through observations, informal discussions and interactions with municipal officials and stake holders in waste management for detail study.

### Study Area

Narnaul town extends from 28°2'29" North latitude and 76°6'25" East longitude in the southwestern part of Haryana state. It is one of the sub division and district headquarters of Mahendergarh district. The town is connected by road from Delhi at a distance of 161km, 43 km from Khetri, 125 km from Rohtak city and 23 km south of Mahendergarh town. It is almost plain area on an elevation of 100 feet (30.5 meters) above mean sea level (figure 1). It has population of 62 091 persons inhabited in 10 599 - households, spread over an area of 9.67 sq. km. The literacy rate and the sex ratio recorded 78.56% and 878 respectively (Census, 2001).

### Data analysis

#### Sources of solid waste generation

Table 1 shows two sources of solid waste generation in Narnaul town, 2008, viz. (i) domestic and (ii) non-domestic.

#### (i) Domestic waste

It includes waste material generate from the Kitchen, waste paper, plastic, glass, metal, rag paper, leather, ash etc It generates large quantity i.e., 8 tones (31 %) per day from the domestic activities.

#### (ii) Non Domestic Waste

It includes waste material generates from building debris; trade and commerce; hospital and clinical labs; and community areas such as street, park, and play ground etc. An amount of 18 tones (69%) waste is generated from non-

domestic sources like building waste, industrial waste and the market waste.

#### Building waste materials

During the construction of houses, shopping centers, waste materials remained inthe premises or on the road near the constructions sites. It is amounted about 5 tones (19%). The owner does not bother to get it removed (Table 1).

#### Industrial Waste

There is no large or medium scale industry in the town and the small-scale industries do not generate any un-hygienic waste?

#### Market waste

Market area of the town is the second largest source of generation of solid waste after the domestic waste. About 7 tones (26.93%) solid waste generates in the forms of degradable fruits, vegetables, chicken and meat shops; the cloth shops generate paper, poly then and the wooden materials etc. that poses great threat to the local administrator.

#### Generation of waste at ward level

Table 2 and figure 1 shows generation, collection and the disposal of solid waste in Narnaul town, 2010. There are 26 tones of solid waste generated in which 20 tones (77%) collected and 6 tones (23%) remained at the collected points/containers. Out of which 18 tones (90%) disposed off and only 2 tones (10%) remained intact. Table 3 shows source wise distribution of generation of solid waste in Narnaul town, 2010. It reveals that maximum amount of domestic solid waste generated from the residential houses in wards 11, 12, 13, 15 & 21 dominated by economically weaker section of the society and the Scheduled caste population, followed by other wards 4, 8, 10, 14, 15, 16, 18, 19, 20, and 23 in which solid waste generates from non domestic works like market waste, commercial activities etc. The lowest quantity of waste generates from the hospital.

#### Distribution of Solid waste generation

Table 4 show the distribution of solid waste materials generation, collection, disposal and the remaining at ward level, Narnaul town, 2010. The amount of solid waste generation of the wards has been divided into three groups, i.e., (i) the area of highest amount of solid waste generation (1 tone), (ii) the area of medium amount of solid waste generation (0.05- 1 tone) and (iii) the area of low amount of solid waste generation «0.05 tone).

#### (i) Area of highest amount of solid waste generation

There are 7 wards viz., 1,5, 14, 15, 16, 17, and 21 generate an amount of 1.525,2.074, .934,1.197,1.366, 1.196 and .797 (total 9.083 tone) from the domestic as well as non domestic works which contributes 34% of the total waste material per day.

#### (ii) Area of medium amount of solid waste generation

This area includes 13 wards viz., 2, 3,4,6,8,9,11,12,13,18,19 and 20 from where an amount of 1.320, 2.806, .997, 1.726, 1.910, 1.789, .674, .637, .673, .985, 1.184, 3.190 and 807(total 14.09 tone) waste materials generates from the domestic works and the nondomestic centers which contributes 56% of

the total waste materials.

### (iii) Area of low amount of solid waste generation

There are 3 wards viz., 7, 10 and 22 from where an amount of 1.299, .821, and .722 (total 2.824 tone) solid waste generates from domestic work non-domestic which contributes 10% of the total waste materials. This proves that highest quantity of solid waste generated from domestic by the people of weaker sections, Scheduled caste; and the market area. Opposite results can be noted in the case of III area where little quantity of solid waste generated 2.824 tones (10%) through non-domestic activities where highly educated, socially high status people like officers, and administrator inhabited.

### The solid waste collection

Table 3 reveals that high amount of solid waste collection is done in the wards 1, 3, 14, 15, 17 and 21 and the low amount collected in the wards 5, 6, 7, 8, 9, 10, 11, 12, 13, 18, 22 and 23 It is done weekly in the wards (1, 2, 3, 5, 7, 9, 17, and 22) where officers, highly educated, and economically sound people inhabited. Where as in the wards 11, 12, and 13 it is done after a gap of four week or irregular occupied by economically week persons and the Scheduled Caste (table 3). It should be collected daily otherwise it will be unhygienic for dwellers.

### Solid Waste Disposal

Table 3 also shows the solid waste disposal is high in five wards, viz., 1,3,5, 14 and 17 and the lowest amount in 14 wards viz., 4, 5, 6, 7, 8, 9,10, 11, 12, 13, 18,20,22, and 23.

### Solid Waste Remaining

Table 3 shows solid waste remains in Narnaul town, 2010. It reveals that there are 6 wards viz., 1, 5, 14, 16, 17 and 19 where high amount of solid waste remained for disposal every day in the area under study. It reflects that Municipality is not in a position to dispose off total collected solid waste every day. The remaining waste / garbage accumulated and produced various types of diseases in the town.

### Functions of Municipal committee

#### First Phase (Pre-1950)

Prior to 1950, female sweepers were main employees of the Municipal committee. They used to sweep the road with the help of brooms. Then they collect garbage in trays and used to dump in the local disposal sites. Male sweepers were also used "broom sticks" to sweep streets and they used camel carts to transport garbage to dispose at the sites of low laying area.

#### Second Phase (1950)

Narnaul municipal committee was established in 1950. Since then administrator looked after the affairs of municipality. The municipal committee covers an area 6.48 km<sup>2</sup> served a population of 31,890 persons (1971).

#### Third Phase (2001)

Narnaul municipal committee accommodates 10, 588 households. They look after the affairs of the water supply, cleaning of the roads and the streets, collection of the solid waste materials, supply of dustbins and the disposed off the

same at designated places by appointing employees, supply of essential materials, equipments, and the transport.

### Employment

The municipality has sanctioned post 171 and employed 107 sweepers. They have engaged in cleaning, sweeping, collecting and disposed off the solid waste in the town in 2007. To assess the requirement of the employees and their optimum use, and the available limited infrastructure and resources, the municipal committee is divided into two wings (i) private contractor and (ii) the municipality committee (Figure3.>.The private contractor controlled two regions, viz., II and III including 5 wards viz., 13, 17, 18, 19as well as 8 wards viz., 8, 9, 10, 11, 12, 14, 15, 16 respectively while the municipal committee controlled the region- I and IV which took care of 5 wards viz., 1,20,21,22,23 and four wards viz., 2,3, 5, 6 respectively. Presently, there are 107 sweepers' posted in the Municipality. The private contractor has controlled 38 (44%) sweepers to take care of region-II and III and the Municipal committee has engaged 69 (56%) sweepers to see the affairs of cleaning of the road and the street of the region I and IV. It indicates uneven distribution and the paucity of the employees.

### Facility

At present Narnaul Municipal Committee has 22 containers, 263 dustbin and waste storage installed at identified points. Table 5 shows uneven distribution of containers and dustbin in the municipality. There are 4 tractors and two tempo trolleys in the municipality which took three rounds in a week or two for collecting and transporting garbage. In some cases they took round in four week or very irregular in the wards 11, 12 and 13 (Table 6). The municipal committee had been transporting waste through open tractor trolley and tempo, which were being aided manually. The system of manual loading of waste is unhygienic, time consuming and injurious of the health. There is no treatment plant established in the town for proper utilization of solid waste till date.

### SolidWaste Management (SWM)

In order to dispose off the garbage, municipal committee of Narnaul at present have five land-fill sites, namely, Taliya Wali Johad near Telephone exchange, Near Ravidas Mandir, Mohalia Bas Ka Johad, Near Stadium, and Sobha Sager tank. These sites were originally pond, low lying area and swampy areas which are getting reclaimed and fill up through continuous dumping of town waste. These dumping areas are not fenced and very poorly maintained. If these maintained properly, the content of waste (largely biodegradable matter) through which fertilizers may be generated that contribute to a larger source of income to the municipal committee. But now the waste has a large proportion of plastic. It cannot be useful if it is not used properly. Table 6 shows the generation of solid waste and its disposal management in Narnaul town, 2010. An amount of 26 tones solid waste including 8 tones (30.77%) from domestic area and 18 tones (69.23%) from non-domestic area generates per day from many sources. Out of which 20 tones (77%) waste collected and 18 tones disposed off and the remaining waste left out at the collected sites, which create environmental pollution. The municipality collected 6 tones

(30%) from domestic area and 14 tones (70%) from non-domestic area. Out of total 20 tones collected waste materials, only 5 tones (28%) wastes are disposed off from domestic area and 13 tones (72%) from non-domestic area. There are some places where dustbins are installed but they are not use properly where as some places are badly required but they are not installed. Hence, the usual way of disposing the waste wrapped in colored poly bags by the people used to throw their waste from long distance toward the dustbins. This had led to gathering of waste around the bins. As the lifting of waste is irregular, it keeps accumulating, and keeping one away from utilizing the dustbins. However, it is observed that garbage is scattered everywhere other than the dustbins. There is no regular maintenance of dustbins in terms of lifting of garbage and cleaning the surrounding area. Due to weak financial position, the committee is not in a position to provide sufficient number of dustbins to store at all localities that is why people throw solid waste on the street. Sweepers clean the allotted beats one time a day and dispose the waste in the municipal containers. The overflowing dustbins invite stray cattle's leading to more messing up of the waste.

### Waste Recycling

The waste recycle is not popular in this area. The extent of waste recycling indicated by the values of such constituents at the source and at the waste disposal sites which should be promoted through establishing formal and informal waste collection and processing in the city. It ranges some large organized setups to several hundreds of small scale recycling operations. It is not possible to estimate to any satisfactory degree of accuracy of data, the number of waste units or the actual number of people involved in wide range of informal waste recycling activities in Narnaul town. It is also very difficult to establish accurately the total quantum of waste recovery taking place in this manner. There have been few studies but the estimates vary considerably. Bhide (1990) estimates that about six to seven per cent of the total waste generated in the city is recover in this manner. However, a study carried out in Bangalore (D'souza, 1991) found this figure to be 15 per cent. An estimates given by Kotnis (1992) for Mumbai city, the informal waste recycling sector comes about 12 to 15 per cent of the city solid waste. There is a unique program launched by AAI's social wing- Kalyanmayee- started the organization first paper recycling unit in Delhi and will launch two more in Mumbai and Chennai respectively by March, 2010 The recycling unit - locate at Nangal Devat in Vasant kunj - would be churning out 3000 sheets of recycle paper, about 1.5 tones each day. "The A1 size sheets will be converted to files, folders, visiting cards, etc, and then sold back to AAI. Printing will be also done at the unit itself by those employed there." He said at present about 16-17 people, all belonging to the economically weaker sections, have been trained and employed at the unit (Mehta, 2009). It shows that at the different processes of waste recycling unfolds a wide range of products, which are transformed from different kind of waste. It is strengthen the

city's economy. They reduce the volume of garbage which has to be disposed off by the municipal body and enable local small factory to save manufacturing cost, since production from recovered material uses less energy than production from the vergin material. The recycling process does not require if the entire states of our country completely imposed restriction, on the production of plastic materials like *thalleys* (small packets, etc.) *as done by the Himachal Pradesh Government, Oct. 4, 2009. The state Government has not only restricted use of plastic thalleys by people but they can also imposed charge minimum Rs. 10001 and maximum Rs.250001 if the public do not follow the restriction (Dainik Bhaskar, Oct. 4, 2009).* The municipal committee suffers from an acute resource crunch i.e. human technical and financial to carry out its activities in the interest of the town. A gross amount of Rs. 19, 70,000/- has been sanctioned by the central government to install the solid waste management plant in the municipal area, which is seen as a hope to minimize the garbage situation.

### Suggestions

Municipal Committee should have a comprehensive plan for solid waste management. It should be well equipped to collect waste, transport at disposal points on regular basis. - It is observed that present tractor trolley vehicles are used for collecting and transporting of waste from various bins. The dumper container can also be used for collection of waste. This would reduce cost of collection and faster's transportation of waste besides reducing environment hazards. - To maintain the environment hygiene around the waste collection bins, container and disposal sites should be maintained by using modem methods of disposal; such as sanitary land filling, preparation of compost pulverization etc. - There should be proper maintenance and supervision of landfills sites. - There is an urgent need for encouraging NGOs, local representative and private participants to educate the people of various aspects of health diseases from solid waste. However, sufficient care should also be exercised in identifying and awarding the contract to genuine NGOs / Contractors. - The waste recycle is not popular in this area. A recycling sector in the city can be very well functioned from the starting point - door to door waste collector, rag pickers and middlemen - to the manufacturers of the consumer products and citizen without much support from the Municipal body or the State Government. It should be promoted through establishing formal and informal waste collection and processing sectors in the city.

### Conclusion

The above analysis demonstrates that the municipality generates 26 tones of solid waste per day and is able to collect only about 20 tones (77%) of the generated waste. It indicates that generation of waste is much higher than the disposed off the waste materials. The quantity of collected solid waste has increased over time, but at the same time the rate of increase of solid waste has not been consistent.

**Table 1:** Sources wise generation, collection, and disposal off solid waste, Kurukshetra, 2010

Source of Waste	Waste generated	W collected/Remained	Waste off/Remained
Domestic	8* (30.77%)	6* (75.00%)/2(25%)	5* (28.00%)/1(16.66%)
None-Domestic	18* (69.23%)	14* (77.77%)/4(22.22%)	13* (72.00%)/1(07.14%)
Total	26* (100%)	20* (76.96%)/4(23.04%)	18* (1.00%)/2(10%)

Source: Municipal Committee, Narnaul, 2010. Star\* indicates tones.

**Table 2:** Sources wise production of solid waste materials, Kurukshetra town, 2010.

S. No	Source	Quantity (In Tones( %)	Degree	Cumulative Frequency
1	House Hold Waste	8 30.77	110.77	111
2	Market Waste (M)	7 26.93	96.93	208
3	Construction Waste	5 19.23	69.22	277
4	Hospital Waste	2 7.69	27.69	305
5	Others (O)	4 15.38	55.39	360
	Total	26 100.00	360	

Source: Compiled by authors, 2010.

**Table 3:** Sources wise distribution of solid waste generation, Kurukshetra town, 2010.

S. No	Domestic	Non-Domestic	Ward	Total
1	1.83(23.55%)	2.634(14.66%)	1,13,17,18,23	4.527 (17.41%)
2	.450(18.03%)	7.900(43.98%)	22,20,21,19	9.530(36.65%)
3	3.700(44.15%)	3.840(21.37%).	11,2,7,9,4,8,5,15,16	7.540(29.00%)
4	1.215(15.11%)	3.223(17.94%)	10,3,6,14,12	4.438(17.07%)
Total	8.038(30.91%)	18(69.09%)	23	26(100%)

Source: Computed by authors-2010.

**Table 4:** Distribution of the Solid Waste Generations at ward level, Kurukshetra Town, 2010

Ward No.	Density of Population	Generalization per day(in tones)		Percentage		Total
	Person	Domestic	Non-Domestic	Domestic	Non-Domestic	
1	494	.325	1.200	4.04	3.32.	7.36
2	540	.570	.750	7.09	4.17	11.26
3	802	.310	2.496	3.85	13.89	11.26
4	808	0.357	.640	6.68	3.56	10.24
5	2583	.331	1.743	4.12	9.70	13.82
6	1505	.221	.300	2.75	1.67	4.43
7	1080	.213	.180	2.72	1.00	3.72
8	1586	.324	.225	4.03	1.25	5.28
9	1562	.227	.150	2.83	0.83	3.66
10	532	.249	.165	3.09	0.92	4.01
11	581	.299	.150	3.72	0.83	4.55
12	312	.322	.126	4.00	0.70	4.7
13	604	.267	.150	3.32	0.83	4.15
14	726	.327	1.125	4.07	6.27	10.34
15	821	.513	.598	6.38	3.33	9.71
16	777	.522	.800	6.49	4.46	10.95
17	222	.530	4.550	6.59	25.39	31.98
18	580	.403	.250	5.01	1.39	6.4
19	722	.459	.700	5.71	3.89	9.6
20	1653	.357	.464	4.44	2.58	7.02
21	515	.287	.600	3.57	3.34	6.91
22	414	.312	.120	3.88	6.68	10.56
23	465	.321	.250	3.99	1.39	5.28
Total	19884	8.038(30.91)	17.962(69.09%)	100.00	100.00	100.00

Source: Primary survey, 2010.

**Table 5:** Solid Waste Management in Kurukshetra Town, 2010

Ward	Frequency	Transport	Dispose off
1	One Week	Tractor Trolley	Land Filling
2	One Week	Tractor Trolley	Land Filling
3	One Week	Tractor Trolley	Land Filling
4	One Week	Tractor Trolley	Land Filling
5	One Week	Tractor Trolley	Land Filling
6	One Week	Tractor Trolley	Land Filling
7	One Week	Tractor Trolley	Land Filling
8	One Week	Tractor Trolley	Land Filling
9	One Week	Tractor Trolley	Land Filling
10	One Week	Tractor Trolley	Land Filling
11	One Week	Tractor Trolley	Land Filling
12	One Week	Tractor Trolley	Land Filling
13	One Week	Tractor Trolley	Land Filling
14	One Week	Tractor Trolley	Land Filling
15	One Week	Tractor Trolley	Land Filling
16	One Week	Tractor Trolley	Land Filling
17	One Week	Tractor Trolley	Land Filling
18	One Week	Tractor Trolley	Land Filling
19	One Week	Tractor Trolley	Land Filling
20	One Week	Tractor Trolley	Land Filling
21	One Week	Tractor Trolley	Land Filling
22	One Week	Tractor Trolley	Land Filling
23	One Week	Tractor Trolley	Land Filling

**Source:** Office of Municipal Committee, 2010.

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