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STATUS OF HOUSEHOLD SOLID WASTE GENERATION IN VIDHATA NAGAR, BATHINDI, JAMMU

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ABSTRACT

India is still considered to be a so called developing country and an enormous gap exists between the rich elite and the poor masses. It is the second largest nation in the world, with a population of 1.21 billion, accounting for nearly 18% of world's human population, but it does not have enough resources or adequate systems in place to treat its solid wastes. Its urban population grew at a rate of 31.8% during the last decade to 377 million, which is greater than the entire population of US, the third largest country in the world according to population. India is facing a sharp contrast between its increasing urban population and available services and resources. Solid waste management (SWM) is one such service where India has an enormous gap to fill. Proper municipal solid waste (MSW) disposal systems to address the burgeoning amount of wastes are absent. The present study area Vidhata Nagar, Jammu, is facing some serious problems regarding Solid Waste Generation disposal due to lack of communication at Authority level and Public level and due to some other reasons. The paper seeks to identifies the total amount of Solid Waste Generated per k.g per household and thus provides immense and some valuable recommendations both at Authority level and Public level to overcome the hazards faced by it.

KEYWORDS *:Population, Solid wastes, Urban, Resources, Municipal Solid Waste, Solid Waste Management.*

DEFINITION OF SOLID WASTE

In general, the term 'waste' implies to substance which has no longer an economic value. Merriam-Webster defines waste as "refuse from place of human habitation or animal habitation." The World Book dictionary defines waste as "useless or worthless material, stuff to be thrown away". In the process of obtaining food and energy, large amount of solid, liquid and gaseous waste have been produced. Solid waste often called the third pollution after air and water pollution is those materials which arise from various human activities and which are normally discarded as useless (Rana, 2007). Mukherjee, (2010) defines Solid Waste as any solid or semi solid or slurry with high consistency, that arises from different anthropogenic activities and which is considered to be useless, unwanted or

throw able. It is discarded mass of heterogeneous compound of commercial, agricultural and industrial activities.

** Puri et al.,(2008) defines solid waste as the material that no longer has value to person who is responsible to it and is intended to be discharged through pipe. It does not normally include human excreta. It is generated by domestic, commercial, industrial, agricultural and mining activities and accumulates in streets and public places.

Present Status of Solid Waste Generation

The principle source of solid wastes is domestic, commercial industrial and agricultural activities. Many times domestic and commercial water are considered together and called as urban wastes. The main constituents of urban waste are similar throughout the world, but weight generated, the density and the proportion of constituents vary widely from country to country, and from town to town within a country according the level of economic development, geographical location, weather and social conditions. In general, it has been found that as the personal income rises, kitchen declines but the paper, metal and glass wastes increase, the total weight generated rises but the density of wastes declines (Rana, 2007).

Scenario of Jammu and Kashmir

The scenario of Jammu and Kashmir in general and Jammu in particular can be charted out from the report issued by CPCB and NEERI in 2004-05. Ministry of Urban Development and Central Pollution Control Board has kept Jammu in class-I cities as population is greater than one lakh. It has waste generation rate of 0.58 kg/capita/day. As far as waste characterization is concerned, waste of Jammu has 51.5 percent compostable waste. The C/N ratio is 26.79 and moisture is about 40 percent (CPCB.2005).

As far as management of solid waste in Jammu is concerned, 25 percent coverage is done by NGO's in Jammu and Srinagar by house to house collection there is one landfill site one each in Jammu and one in Srinagar having a life span of 10 years and area of about 30.40 ha. Presently community bin system for collection of municipal solid waste is being adopted in Jammu and Kashmir. The waste is either disposed in community bins or at open place from where it is put into community bins by Safai-Karamcharis. Due to shortage of community bins, there are a number of places throughout where people disposed solid waste on open ground. In spite of having 71 municipality in Jammu and Kashmir, the state has no compositing or vermi composite plant, which otherwise is practical scientific and eco friendly method of waste disposal (CPCB, 2005).

Study Area

Jammu and Kashmir, the north western state of India is located in between 32°17' to 37°06' N Latitudes and 73°26' to 80°30' E longitude. Major portion of Jammu and Kashmir lies within Himalayas. The Jammu region has ten districts viz. Jammu, Samba, Kathua, Udhampur, Reasi, Doda, Kishtwar, Ramban, Poonch and Rajouri. The Jammu city has an area of 54.97 sq. km with population of approximately 8 lakh. The present area of investigation (Vidhata Nagar, Bhatindi,) is situated at distance of 4km from Jammu University Campus. The area doesn't come under municipal limit of Jammu city. There are approximately 85 houses having five hundred individuals. A minimum of 50 houses were randomly selected for the purpose of study.

OBJECTIVE

Although a lot of work has been done on various aspects of solid waste in Jammu such as composition generation and management of domestic wastes, but no attempt has been made on this aspect from Vidhata Nagar, Bhatindi, Jammu.

The main objective of present study is: -

- To estimate the amount of solid waste generated in Vidhata Nagar, Bhatindi, Jammu and its characterization.
- To add more knowledge to existing data base of solid waste generation and management already attempted from different parts of Jammu City.
- To adopt proper waste management techniques in the area, thereby protecting the common mass from possible hazards.

METHODOLOGY

The data regarding solid waste generation was collected into two phases in the month of January 2015. Phase I involved the measurement of pre- exposure level of knowledge of the respondents with the help of a structured questionnaire. During this phase knowledge regarding the nature of waste minimization techniques was imported to the individuals. Phase II involves the collection of data after the post exposure levels of knowledge from the respective families. The appropriate statistical tool i.e., average, percentage score were applied to the meaningful inference. The data were collected with the help of a questionnaire and field experiment where solid waste generated per house during 24 hours were collected, segregated into biodegradable waste (kitchen, textile and paper), non- biodegradable waste (plastic, glass and metal waste) and inert material and weighed with the help of Spring Balance.

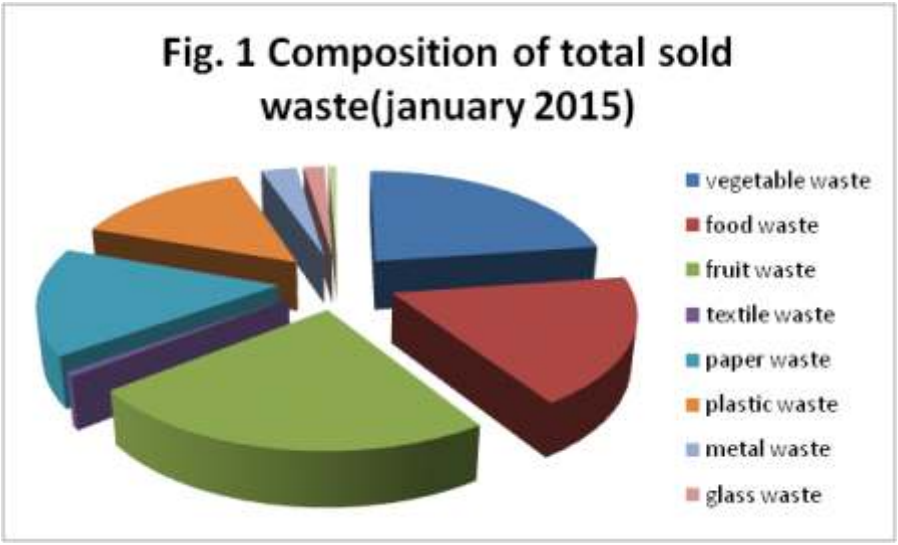
SOLID WASTE CHARACTERIZATION

The physical composition of waste is changing over the year with the economic development of country, increased habitations, density of population, changing food habit, social and cultural habits and effect of globalization etc. During the study period the biodegradable component constitute the maximum percentage by weight followed by non biodegradable and inert component (table.1).

Detailed account of solid waste generation during the study period for 7 days (table no. 1) shows that biodegradable waste was 47.76 kg per house per month which accounts for 80.42 percent of total waste followed by non-biodegradable which was 11.24 kg per house per month which accounts for 18.94 percent of total waste and inert material was 0.388 kg which account only 0.65 percent of total waste generated per month.

Table No. 1 Overall composition of solid waste (kg) generated during the Study period for 7 days.

Waste Category	Total Waste generated per house per month (kg)	% Composition
A. BIODEGRADABLE		.
Vegetable Waste	13.48	22.70
Food Waste	10.80	18.19
Fruit Waste	14.00	23.57
Textile Waste	0.38	00.64
Paper Waste	9.01	15.33
Total	47.76	80.42
B. NON-BIODEGRADABLE		
Plastic Waste	8.52	14.34
Metal Waste	1.07	02.87
Glass Waste	1.2	01.71
Total	11.24	18.94
C. INERT MATERIAL		
Stone, dust, hair, wax	0.388	0.65



Solid Waste Generation

Table no. 2. Depicts the daily solid waste generation in the study area in the month of January. Quantitatively, the waste comprises of biodegradable fraction viz. Vegetables, food, fruit, textile and paper and non-biodegradable fraction viz, plastic, metal, glass waste and inert material. The total daily domestic solid waste generated was 57.054kg and biodegradable was 39.80 kg (80.42%) , non-biodegrade was 16.93 kg (18.94%) and inert material 0.324 k.g (0.65%) . On contrary Ram Pal and

Sharma (2003) reported 114.67 kg daily solid waste generation at Bagh-e-Bahu, Jammu. The variation is due to religious and commercial importance of the area.

Waste generation per household per day was reported to be 1.9588 k.g viz. Biodegradable waste 1.572 k.g , non-biodegradable waste 0.374 k.g and inert material 0.128 k.g. Olurefemi and Odita (1998) while making similar studies at Ilorin , Nigeria reported 120 k.g waste generation per household, the more quantity of waste generation in comparison to present study may be attributed to low socio-economic status of people of Ilorin as the house holder lack the refrigeration facilities.

The waste generated per capita per day was 0.418 kg, viz .biodegradable waste was 0.338 kg, non biodegradable waste was 0.078 kg and inert material was 0.002 kg. The total monthly solid waste generated was 1486.36 k.g viz. biodegradable waste 1196,3 k.g, non-biodegradable waste 281.34 k.g and inert material as 9.72 k.g.

Table No. 2 Cumulative solid waste generated for different categories of domestic solid waste in the month of January.

Waste category	Total domestic waste generated (kg)	Waste generated per house(kg)	Waste generated per capita per day (kg)	Total monthly solid waste generated(kg)	Total waste generated per house per month(kg)
A.BIODEGRADABLE					
Vegetable waste	11.24	00.44	0.096	337.2	13.48
Food waste	9.0	00.63	0.076	270.42	10.80
Fruit waste	11.66	00.46	0.10	350.04	14.00
Textile waste	0.324	0.013	0.002	9.74	00.38
Paper waste	7.58	00.30	0.064	227.90	09.1
Total	39.80	1.572	0.338	1196.3	47.76
B.NON-BIODEGRADABLE					
Plastic waste	7.01	0.284	0.060	213.04	08.52
Metal waste	1.42	0.056	0.012	042.80	01.7
Glass waste	08.05	0.034	0.006	025.50	01.02
Total	16.93	0.374	0.078	281.34	11.24
C.INERT MATERIAL					
Total	0.324	0.0128	0.002	009.72	0.288

AWARENESS LEVEL AMONG THE RESPONDENTS

50 Individuals were interviewed with the help of questionnaire. Maximum number of respondents (60 percent) belongs to the age group of 20-30 age group. Maximum of the respondents (64 percent) belongs to the low education status and 36 percent belongs to high education status. Majority of the respondents had service and sole profession and only (15 percent) had independent profession. Majority of the respondents (83%) belong to nuclear family system consisting of 3 to 4

family members. Table no.3 depicts the awareness level among the respondents. It was found that about 48% of the respondents preferred to throw waste in open space, 32% in the drain and 20% in the dust bin in order to reduce their daily solid waste generation, 24% respondents preferred to reuse the throw away items, 56% preferred to sell them to waste purchaser while the rest of the respondent simply throw away the waste items in the dust bins or in the open dumping site. The result of qualitative and quantitative analysis of domestic waste generation in Vidhata Nagar, Bathindi, Jammu has been shown in table no. 3

Questionnaire used in the study are given below-

Q1. Do you have knowledge about solid waste?
Q2. What type of solid waste you come across daily?
Q3. Do you have knowledge about solid waste management?
Q4. Do you know some domestic waste are recycled or reused?
Q5. Do you separate solid waste?
Q6. If yes, why do you separate solid waste?
Q7. If no, why don't separate solid waste?
Q8. Where do you through waste?
Q9. What do you do to reduce waste?
Q10. Which fraction of wage is generated more in your house?
Q11. How many polythene bags are used daily in your house?
Q12. What would you prefer to use -polythene or jute bags?
Q13. How many times in a week you collect your waste?
Q14. Do you have knowledge about the harmful aspects of open dumping of waste?
Q15. Do you have knowledge about vermin-compositing of kitchen waste?
Q16. Do you have harmful aspects of polythene bags?
Q17. Do you have knowledge about the energy recovery from plastic waste?
Q18. Do you know use of polythene bags are banned by Govt.?
Q19. What is your opinion about solid waste disposal and management?

Table No. 3 Awareness level of the respondents regarding solid waste management in the study area

Q. No.	Response of individuals		n=50
1.	Yes – 96%	No – 4%	
2.	Kitchen – 88%	Plastic waste – 8%	Paper – 4%
3.	Yes – 52%	No – 48%	
4.	Yes – 84%	No – 16%	
5.	Yes – 24%	No – 76%	
6.	It is useful – 24%		
7.	It is useful – 32%	Nobody do – 20%	I don't have time – 24%

8.	Open space – 48%	Dustbin – 20%	Drain – 32%
9.	Reuse – 20%	Sell to purchase – 56%	Throw away – 24%
10.	Yes – 4%	No – 96%	
11.	Less than 5 – 64%	Equal to 5 – 20%	More than 5 – 16%
12.	Polybags – 68%	Jute – 32%	
13.	Daily – 72%	After 2 day – 20%	Once in week – 8%
14.	Yes – 84%	No – 16%	
15.	Yes – 28%	No – 72%	
16.	Yes – 72%	No – 28%	
17.	Yes – 32%	No – 68%	
18.	Yes – 92%	No – 8%	
19.	Yes – 96%	No – 4%	

Table No. 4 A comparative account of present study with other studies

S.No.	Biodegradable waste (%)	Non-biodegradable waste (%)	Inert material (%)	Study area	Reference
1.	70.00	11.7	10.3	Ilorin, Nigeria	Olurefemi and Odita (1998)
3	58.06	39.9	1.5	Rehari, Jammu	Bhawana (2001)
2.	54.73	32.2	12.98	Gandhi Nagar	Slathia (1999)
3.	70.09	29.91	---	Bagh-e-Bahu, Jammu	Rampal & Sharma (2002)
4.	91.26	6.47	2.27	Small plot area, Gandhi Nagar	Dubey (2006)
5.	81.65	0.15	4.36	Rajpura, Jammu	Verma (2005)
6.	79.88	0.15	---	Dhaka city, Bangladesh	Yousuf Rehman (2007)
7.	80.42	18.94	0.65	Vidhata Nagar,Jammu	Present study

Table No. 4 depicts comparative account of the present study with the similar study performed at various areas. The trends of solid waste generation more or less remains the same because in all studies there is maximum generation biodegradable followed by non biodegradable waste and inert material

Solid waste Management in Study Area (Vidhata Nagar, Jammu)

Solid waste disposal in Vidhata Nagar, Bhatindi is not done in a systematic way. People store and collect solid waste in small bins or polythene bags and throw the same into the open plots, road sites, and streets or in nearby drain. There is no segregation of waste at source of generation .The waste generated at individual house is removed by the owner or its employee. Due to lack of community bins, people disposed solid waste on open ground and burn it. Rag pickers collect solid waste from door to door and also from streets and disposal sites.

The basic steps and functional elements of solid waste management in the study area consist of storage, collection, transportation and disposal.

1.STORAGE: Storage means holding of solid waste for a period of time until it is collected for final disposal. Different methods are used for the storage of solid waste in Jammu City such as different type community bins provided by Jammu Municipal Corporation (JMC). But in the study area there are no community bins. Residents store solid waste in polythene bags, domestic dustbins or plastic buckets and leave e the same in front of their home or throw inn open space.

2.COLLECTION: It refers to the gathering of the solid waste from places such as residences, commercial, industrial establishment etc. In study area, solid waste is collected in polythene bags or small dust bins by the owner or his employees and then thrown in open plots, drains or burning site. Kabariwalas collect the recyclable solid waste from door to door. These Kabariwalas segregate the plastic, paper, polythene and metal which are then sold to Kabariwala's shop located in Malik market.

3.TRANSPORTATION: Different methods of transportation in Jammu city include head load, bicycle, tricycle, open truck, mechanized vehicles, closed trucks, trolleys, etc. But in study area, the solid waste is collected and carried by owner or its employees to the nearby open space or drain for disposal or burning as there are no sweepers and transportation facilities available in the study area except bicycle and hand cart pullers who collect only recyclable material from door to door and finally sell to Kabariwalas for recycling.

4.DISPOSAL: It refers to placing of solid waste to its ultimate destination. There is no particular dumping site in the study area. Most of solid wastes dispose off by burning by the waste generators or its employee in the nearby open space or left unborn in the nearby open plot. Waste are often scattered by human scavengers searching for recyclable, as well as dogs, goats and cows searching for food. These activities present health risks to the animals and human health. The cow feeding from the garbage sometimes eat plastic items, eventually killing them and waste picker's daily contact with garbage increases their risks of health hazards.

Such inadequate disposal practices lead to problems that will impair human and animal health and result environmental and biological losses. Main reason for mismanagement of solid waste in study area are- lack of community bins for collection of solid waste, lack of manpower, lack of transportation facilities, lack of proper disposal sites, lack of awareness among the residents and lack of finance with local bodies etc. Based on the observation made during the present study, the following recommendations have been suggested for the study area: - Recommendations at Authority Level

1.There is no community bin in the study area as a result of which residents have to dump the waste in the open space, therefore it should be provided with community bins for proper collection and storage

of solid waste.
2.There are no transportation facilities in the study area for transportation of waste to proper disposal site so it should be provided with transportation facilities.
3.Area should be provided with sweepers for door to door collection of waste.
4.Adequate man power, equipment and finance should be provided by Jammu municipal corporation (JMC).
5.Collection of recyclable waste such as polythene plastic, glass, metals by NGO's should be motivated. So that these can be recycled and waste can be reduced.
6.Workers and sweepers should be educated from time to time in workshops organized by Municipal Corporation to educate them about the methods of collection, separation and final disposal of solid waste.

Recommendations at Public Level

1.Efforts at individual level should be promoted for disposal and management of waste.
2.Residents should be made aware about the segregation of solid waste at source of generation.
3.People should be made aware about the reuse and recycling of waste material.
4.People's participation in the implementation of laws and rules should be increased by making them aware about their duties through legal literacy camps.
5.People should be made aware about the harmful aspect of open dumping of solid waste by arranging awareness camps.
6.People should also be made aware about the harmful aspect of polythene bags.
7.People should use jute bag and avoid polythene bags.
8.Residents should approach to JMC to highlight sanitation problems.

CONCLUSION

Domestic solid waste is a specific component of Municipal Solid Waste. It originates from normal daily activities in municipal residences. Household's solid waste is quite heterogeneous commodity that comprises biodegradable, non-biodegradable as well as inert material in various proportions and states of mixtures. The current work examined the generation, characterization and management of domestic solid waste in Vidhata Nagar, Bhatindi, Jammu. Solid waste generation, characterization and management in study area were studied during the month of January, 2015. 50 houses were randomly selected for the purpose of study. The data were collected with the help of questionnaire and field experiment where solid waste generated per house during 24 hours was collected, segregated into biodegradable waste, and non-biodegradable waste and inert material and weighed with the help of spring balance and digital balance.

There is no segregation of waste at source; the waste generated at individual house is removed by the owner or its employees. Due to lack of community bins, people deposit solid waste in open ground and burn it. Rag pickers collect waste from street and deposit sites. Hand driven cart pullers collect and segregate recyclable waste material from door to door and then sell to Kabariwalas.

Main reason for mismanagement of solid waste in study area is that the study area doesn't fall in the municipal limit of Jammu Municipal Corporation (JMC) that is why there is no community bins for collection of solid waste, lack of manpower, lack of transportation facilities, lack of proper disposal sites, lack of awareness among the residents and lack of finance with local bodies.

As an immediate solution to the problems, area of study should be included in JMC limit and should be provided with community bin for proper collection and storage of solid waste. Adequate

transportation facilities and number of sweepers should be appointed for proper collection and transportation of solid waste to proper disposal site.

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