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ASSESSMENT OF SOLID WASTES IN DIFFERENT AREAS OF KHANYAN, HOOGHLY, WEST BENGAL, INDIA

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ABSTRACT

The present study was aimed at the assessment of the stray waste available in different areas of Khanyan village highlighting the college campus. Observations of solid wastes in the three landmark areas station, roadside areas and college campus revealed the presence of at least 57 different types of wastes that varied in relative abundance and weight. Although linked to different origin and shape, the weight of the solid wastes varied to a considerable extent ranging from 0.06 to 209.3 g. The total solid wastes were divided into 6 major categories depending on their sources. The pollutants were again classified according to their origin. At present, no treatment is provided to these solid wastes in this village. More than 90% of the total wastes are directly disposed in an unsatisfactory manner without providing earth cover. This method of dumping can lead to soil as well as ground water pollution. The problem of pollution to some extent can be solved by awareness and with the help of the local people.

KEY WORDS: Solid waste, Rural waste management, Biodegradable waste, Non – biodegradable waste, Khanyan.

INTRODUCTION

Solid wastes had been produced since the beginning of civilization. During the earliest periods, solid wastes were unremarkably disposed of in large open land spaces, as the density of the population was low it was not a major problem. However today one of the consequences of global urbanization is the increased amount of solid wastes everywhere. The state of the economy influences waste generation (Petts and Edulijee, 1994). Usually, greater economic prosperity and a larger urban population result in a larger amount of solid waste generation (Hoornweg and Laura, 1999), which is a common feature in developing countries. This tremendous increase in the amount of solid wastes generated is due to changing lifestyles, food habits and living standards of the urban population (Talyan *et al.,* 2008). This scenario is applicable for rural India also. Man-made wastes are becoming great threat to mankind. Improper disposal of waste has huge social costs due to the spread of communicable diseases and increased treatment costs for pollutants are issues of increasing concern (Assmuth and Strandberg, 1993).

India is the second fastest growing economy and the second most populated country in the world. The population of India is expected to increase from 1029 million to 1400 million during the period from 2001 to 2026 (Talyan *et al.,* 2008). Until recently, environment was not an issue in a third world country like India and solid waste management was definitely not the prime concern of environmentalists and the government. But now this huge increase in population and economy causes increased amount of solid waste generation. In metropolitan cities like Kolkata (Chattopadhyay *et al.,* 2009; Hazra and Goel, 2009), Delhi (Talyan *et al.,* 2008) and others (Gupta *et al.,* 1998), various measurements are taken to clean the city. But in rural areas of India, the awareness about the solid waste disposal and post treatment is not worthy. Rural India lacks well formulated guidelines and policy structure regarding waste management services. Solid wastes have the potential to pollute all the vital components of living environment (i.e., air, land and water) at local and at global levels

(Gupta *et al.*, 1998).

Sometimes discarded solid wastes of different categories are managed in appropriate norms by the locals and government. But sometime it does not happen. Despite care and handling, management shortfalls and public ignorance results in the presence of solid wastes across unintended places in the concerned area. Often encountered as a nuisance with potential risk to pollute the environment, these unwanted wastes can be considered as stray wastes.

The present study was aimed at the assessment of the stray waste available in different areas of Khanyan highlighting the college campus. The results are expected to highlight the classified areas in the village based on the associated stray wastes so as to facilitate reframing of the existing solid waste management policy. However, after the study installation of dustbins in the station area as well as roadside areas was suggested. That could have been a good option for proper disposal of solid wastes. But installation of bins along the roadside areas faced the challenge "not in my backyard" (NIMBY)(Petts 1994).

MATERIALS AND METHODS

Study site

Khanyan of Hooghly district was the main model geographic area. The altitude 23.09° and longitude of the area is 88.3215°. The satellite image is given here (Fig. 1).

Materials required

Plastic gloves and polythene sampling bags were used for the collection of solid wastes. Pan balance, forceps were used for weighing the wastes.

Methodology

In order to characterize the landmark areas in Khanyan, three different areas were selected namely area surrounding the station (zone 1), the roadside area from station to college (zone 2) and the college campus (zone 3). These landmark areas of the city were featured by different activities and assemblage of people with different purposes. In the vicinity of each area, survey of the streets was made for the presence of solid wastes originating from different sources. Following visual inspection, the stray wastes were collected randomly and brought to the laboratory. In the laboratory the stray wastes were segregated based on the origin and the numbers

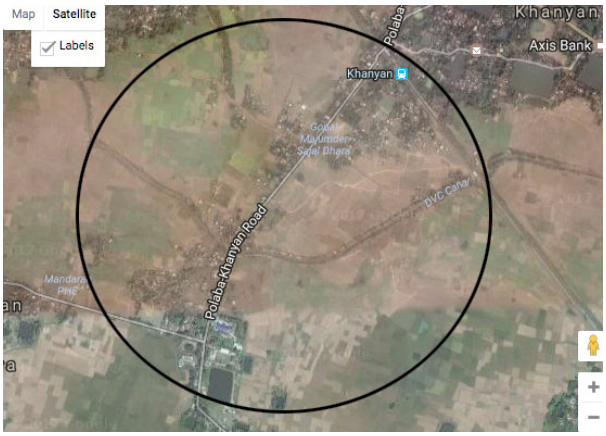

Fig. 1. The satellite image of the Khanyan area. (Picture courtesy Google map).

were recorded for each type against the area surveyed. The solid wastes were weighed in an electronic pan balance (Weighing India Corporation, model WIC-J) and recorded. At least three collections of wastes from each of the classified areas were made between September 2017 to January 2018.

Data analysis

The number of each pollutant was counted and their weight was taken in laboratory of college. The total biomass was calculated from raw data and their relative abundance was checked and compared among the three regions sampled. Microsoft Office Excel sheet was used for data calculation. The data were transformed to log value to make it uniform.

The data on the relative abundance of each waste type was used to characterize the classified landmarks of the village to highlight the differences in the solid waste composition and further management planning.

RESULTS

Observations of solid wastes in the three landmark areas revealed the presence of at least 57 different types of wastes that varied in relative abundance and weight. Although linked to different origin and shape, the weight of the solid wastes varied to a considerable extent ranging from 0.06 to 209.3g (Table 1, 2, 3).

The total solid wastes were divided into 6 major categories depending on their sources. Those were not categorized properly, were grouped as others. The main sources of pollutants were categorized as food, drinks, stationaries, tobacco, newsprint,

pharmaceuticals, and others. Among the three landmarks station zone was recorded as most polluted area of Khanyan. Whereas, the college campus was the least polluted area than the others. And roadside maintained the middle position in every case. Only the pollutants of newsprint sources showed opposite pattern. It showed highest abundance within and adjoining areas of college campus and least abundant near station zone (Fig. 2A, B).

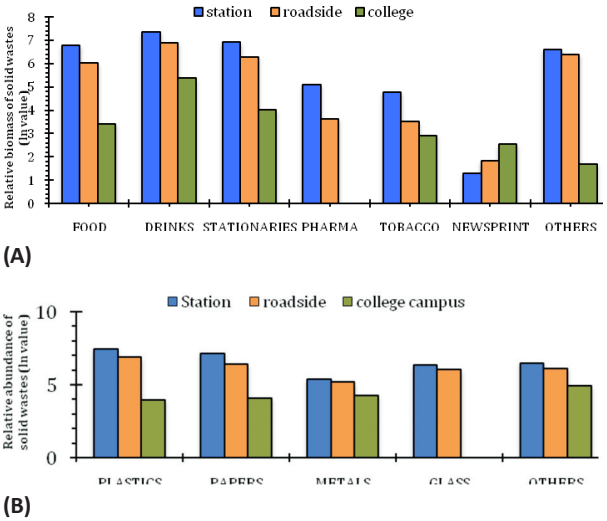

Fig. 2. The relative abundance of solid wastes among the three regions of sampled area. A. According to their sources, B. According to their origin.

The pollutants were again classified according to their origin. The origins were chiefly categorized as plastics, papers, glass, metals, and those which were not properly categorized under the above-mentioned categories were treated as others. The total biomasses of plastic origin pollutants were largest, and metal pollutants were the least in amount in this village area. The plastic originated pollutants were highest in amount (1680.45g) in station zone, 966.34g in roadside areas and 53.6g within the college premises. Whereas the metal pollutants were found 219.3g in station zone, 177.5g in roadside, 72.11g in college campus. According to the origin papers also showed the similar trends 1259.8 g in station zone, 595.45 g in roadside areas, and 61.59 in college campus. The other pollutants also show the similar trends (Table 4). From the above data we can conclude that the college campus is lowest polluted area than the other areas of Khanyan.

DISCUSSION

The above results showed that the station zone is the highest polluted area of Khanyan and the college campus is the bottommost polluted area of that region. The most plausible explanation is that human interference is maximum at the station surrounding zone. Various activity of man creates a large amount of solid wastes and improper dumping of solid wastes on the ground is the main cause of pollution. Proper solid waste disposal and post treatment procedure is not satisfactory in the station zone and roadside areas. Proper segregation of waste into different components and scientific disposal of those can definitely minimize the solid wastes at that area. The biodegradable matter could be disposed of either by aerobic composting, anaerobic digestion, vermicomposting (Kaviraj and Sharma, 2003) or sanitary land filling (Assmuth and Strandberg, 1993). Depending upon land availability and financial resources either of these disposal

A B C D

Fig. 3. The abundance of pollutants in various areas, A and B. Station zone, C and D. Roadside area from Khanyan station to College.

Table 1. Area surrounding to Station (Zone 1)

Serial No.	Type of material	Number	Source	Weight (gm)
1	Advertisement paper	266	Newsprint.	3.62
2	Biscuit packet	474	Food	45.05
3	Bidi packet	1993	Tobacco	13.46
4	Broken toys	15	Others	28.25
5	Plastic bottle	133	Drinks	6.89
6	Glass bottle	36	Drinks	557.14
7	Tin Can	16	Drinks	39.2
8	Cake packet	775	Food	22
9	Chocolate packet	583	Food	10.84
10	Cigarette packet	550	Tobacco	93.48
11	Cold drinks Plastic bottle	78	Drinks	213.56
12	Cold drinks bottle Tin can	3	Drinks	37.01
13	Cold drinks paper pouch	3	Drinks	58.04
14	Cloth Pieces	156	Others	11.02
15	Cloth pieces packet	80	others	158.31
16	Cycle tyre	56	Others	5.54
17	Other cycle parts	31	Others	11.29
18	Cement Packet	20	Others	423.16
19	Computer parts Broken	164	Stationaries	40.48
20	Cassetrill	107	Stationaries	-
21	Dhoop packet	3	Stationaries	101.48
22	Egg tray	321	Food	446.92
23	Electrical goods broken	513	Stationaries	44.4
24	Fuchka plate	89	Food	16.36
25	Gum tube	3979	Stationaries	17.45
26	Icecream packet	21	Food	20.59
27	Icecream cup	272	Food	23.51
28	Khoinee packet	618	Tobacco	11.97
29	Logenge packet	1041	Food	70116
30	Lottery packet	1379	Others	81.72
31	Matches Box	1071	Stationaries	39.91
32	Medicine paper packet	165	Medicine	161.44
33	Medicine plastic packet	1111	Medicine	-
34	Milk packet	95	Food	158.42
35	Mosquito vaporizer packet	37	Stationaries	33.28
36	Mobile recharge card	171	Stationaries	5.83
37	Panmasala packet	733	Tobacco	-
38	Rubber Band	49	Stationaries	3.55
39	Straw	75	Drinks	5.565
40	Snacks Packet	959	Food	59.63
41	Soap packet	88	Stationaries	73.45
42	Sim card cover	35	Stationaries	24.3
43	Sim card	34	Stationaries	2.33
44	Syringe	53	Medicine	-
45	Shalpata	394	Food	-
46	Sponges Piece	9	Stationaries	2.87
47	Shoes Packet	115	Stationaries	-
48	Sweet Packet	241	Food	7.08
49	Thermocol piece	85	Stationaries	84.11
50	Thonga (Paper packet)	1264	Food	4.39
51	Tea Plastic cup	1639	Drinks	12.97
52	Tea paper cup	432	Drinks	22.68

Table 1. *Continued ...*

Serial No.	Type of material	Number	Source	Weight (gm)
53	Tea Mud cup	578	Drinks	613.99
54	Thermocol Plates/Dishes	2391	Food	8.91
55	Toothpaste Packet	32	Stationaries	76.79
56	Vegetable Wastage	67	Food	-
57	Watch's broken parts	9	Others	18.67

Table 2. The roadside area from Station to College (Zone 2)

Serial No.	Type of material	Number	Source	Weight(gm)
1	Advertisement paper	380	Newsprint.	6.16
2	Biscuit packet	389	Food	23.63
3	Bidi packet	756	Tobacco	5.33
4	Broken toys	37	Others	6.33
5	Plastic Bottle	24	Drinks	22.56
6	Glass Bottle	5	Drinks	409.6
7	Tin Can	247	Drinks	27.65
8	Cake packet	201	Food	10.78
9	Chocolate packet	167	Food	5.85
10	Cigarette packet	28	Tobacco	22.58
11	Cold drinks Plastic bottle	11	Drinks	50.62
12	Cold drinks Tin can	5	Drinks	33.16
13	Cold drinks paper pouch	99	Drinks	30.55
14	Cloth Pieces	63	Others	22.2
15	Cloth pieces packet	13	Others	123.77
16	Cycle tyre	13	Others	46.32
17	Other cycle parts	29	Others	67.13
18	Cement Packet	22	Others	317.79
19	Computer parts Broken	9	Stationaries	25.32
20	Cassetrill	15	Stationaries	0.34
21	Dhoop packet	36	Stationaries	46.31
22	Egg tray	35	Food	221.48
23	Electrical goods broken	23	Stationaries	10.79
24	Fuchka packet	2219	Food	11.48
25	Gum tube	11	Stationaries	7.53
26	Icecream packet	104	Food	10.80
27	Icecream packet	134	Food	15.43
28	Khoinee packet	460	Tobacco	5.679
29	Logenge packet	896	Food	2.942
30	Lottery packet	757	Others	9.59
31	Matches Box	49	Stationaries	19.49
32	Medicine paper packet	310	Medicine	37.83
34	Milk packet	16	Drinks	52.04
35	Mosquito vaporizer packet	8	Stationaries	9.8
36	Mobile recharge card	34	Stationaries	3.86
37	Panmasala packet	335	Food	-
38	Rubber Band	24	Stationaries	2.46
39	Straw	21	Drinks	0.62
40	Snacks Packet	498	Food	15.73
41	Soap packet	29	Stationaries	247.17
42	Sim card cover	10	Stationaries	12.05

Table 2. *Continued ...*

S. No.	Type of material	Number	Source	Weight(gm)
43	Sim card	2	Stationaries	-
44	Syringe	14	Medicine	-
45	Shalpata	43	Food	-
46	Sponges Piece	9	Stationaries	0.06
47	Shoes Packet	15	Stationaries	-
48	Sweet Packet	27	Food	62.11
49	Thermocol piece	24	Stationaries	22.6
50	Thonga (Paper packet)	448	Food	7.98
51	Tea Plastic cup	560	Drinks	9.92
52	Tea paper cup	130	Drinks	10.49
53	Tea cup Mud cup	529	Drinks	395.54
54	Thermocol Plates/Dishes	347	Food	4.67
55	Toothpaste Packet	15	Stationaries	37.02
56	Vegetable Wastage	25	Food	-
57	Watch's broken parts	14	Others	6.84

Table 3. Area within the college premises (Zone 3)

Serial No.	Type of material	Number	Source	Weight(gm)
1	Advertisement paper	1774	Newsprint.	12.56
2	Biscuit packet	87	Food	6.15
3	Bidi packet	114	Tobacco	2.3
4	Broken toys	0	Others	
5	Plastic bottles	0	Drinks	2.14
6	Glassbottles	86	Drinks	
7	Tin Can	14	Drinks	
8	Cake packet	0	Food	5.97
9	Chocolate packet	74	Food	6.1
10	Cigarette packet	144	Tobacco	15.15
11	Cold drinks Plastic bottles	16	Drinks	
12	Cold drinks Glass bottles	4	Drinks	
13	Cold drinks paper pouch	2	Drinks	5.58
14	Cloth Pieces	4	Others	
15	Cloth pieces packet	23	Others	
16	Cycle tyre	4	Others	
17	Other cycle parts	0	Others	
18	Cement Packet	0	Others	
19	Computer parts Broken	0	Others	15.97
20	Cassetrill	1	Stationaries	
21	Dhoop packet	14	Stationaries	
22	Egg tray	2	Food	
23	Electrical goods broken	0	Stationaries	17.03
24	Fuchka packet	0	Food	
25	Gum tube	26	Stationaries	5.27
26	Icecream packet	1	Food	2.58
27	Icecream packet	15	Food	5.39
28	Khoinee packet	6	Tobacco	0.93
29	Logenge packet	11	Food	2.41
30	Lottery packet	154	Others	2.37
31	Matches Box	278	Stationaries	8.69
32	Medicinal paper packet	2	Medicine	
33	Medicine plastic packet	6	Medicine	

Table 3. *Continued ...*

Serial No.	Type of material	Number	Source	Weight(gm)
34	Milk packet	16	Drinks	-
35	Mosquito vaporizer packet	4	Stationaries	-
36	Mobile recharge card	3	Stationaries	-
37	Panmashala packet	0	Food	-
38	Rubber Band	12	Stationaries	0.69
39	Straw	121	Drinks	-
40	Snacks Packet	0	Food	10.61
41	Soap packet	0	Stationaries	-
42	Sim card cover	137	Stationaries	-
43	Sim card	0	Stationaries	-
44	Syringe	0	Medicine	-
45	Shalpata	0	Food	-
46	Sponges Piece	0	Stationaries	-
47	Shoes Packet	0	Stationaries	-
48	Sweet Packet	3	Food	-
49	Thermocol piece	0	Stationaries	12
50	Thonga (Paper packet)	1	Food	0.58
51	Tea Plastic cup	4	Drinks	3.75
52	Tea paper cup	155	Drinks	16.66
53	Tea Mud cup	179	Drinks	138.96
54	Thermocol Plates/Dishes	309	Food	0.34
55	Toothpaste Packet	6	Stationaries	-
56	Vegetable Wastage	50	Food	-
57	Watch's broken parts	0	Others	3.11

Table 4. The total biomass of pollutants in the three different zones according to their A. Sources and B. Origins.
A.

Sources	Station zone	Roadside	College campus
Food	876.201	416.802	30.74
Drinks	1561.48	992.85	216.92
Stationaries	1008.59	526.75	55.21
Pharma	161.44	37.83	–
Tobacco	118.91	33.589	18.38
Newsprint	3.62	6.16	12.56
Others	737.96	599.97	5.48

B.

Origins	Station zone	Roadside	College campus
Plastics	1680.449	966.341	53.6
Papers	1259.8	595.45	61.59
Metals	219.3	177.56	72.11
Glass	557.14	409.6	–
Others	658.49	460.29	139.65

methods could be adopted. The non-biodegradable ones can be recycled and reused (Al-Salem *et al.*, 2009).

At present, no treatment is provided for collected solid waste. More than 90% of the total wastes are directly disposed in an unsatisfactory manner without providing earth cover. This method of dumping can lead to soil as well as ground water pollution (Hazra and Goel, 2009). The problem of pollution can be solved with the help of the local people. The options and opportunities are many, it is upto the panchayet, who can select and adopt the suitable most ones to them. Constituting a nodal body at the level of local committee, which can be

involved in colletion and disposing the wastes could come a long way involving the issue, which in turn would pay certain amount to the collectors, thereby adding to their income.

A large number of students are visiting the college campus regularly but the proper dumping of solid wastes into the dustbins minimizes the pollution within the premises. As well as one dedicated area is there within the campus for degradation of solid wastes nearer to the boundary, where the solid wastes are dumped in a regular basis, which solved the problem and kept the campus pollution free.

CONCLUSION

From the above study it can be concluded that proper dumping and scientific separation of solid wastes according to their sources and origin can be helpful to reduce the pollution of any area, be it urban or rural. As the rural areas are totally devoid of any kind of awareness, improper dumping of wastes causes pollution. In the study site - Khanyan, only college campus shows lowest pollution as it provides proper management of biodegradable and non – biodegrạdable solid wastes within the college campus.

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