

## 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 Eduljee, 1994). Usually, greater economic prosperity and a larger urban population result in a larger amount of solid waste generation (Hoorweg 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

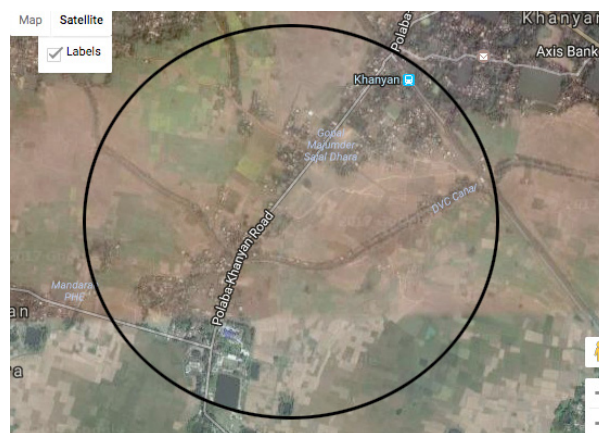


Fig. 1. The satellite image of the Khanyan area. (Picture courtesy Google map).

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).

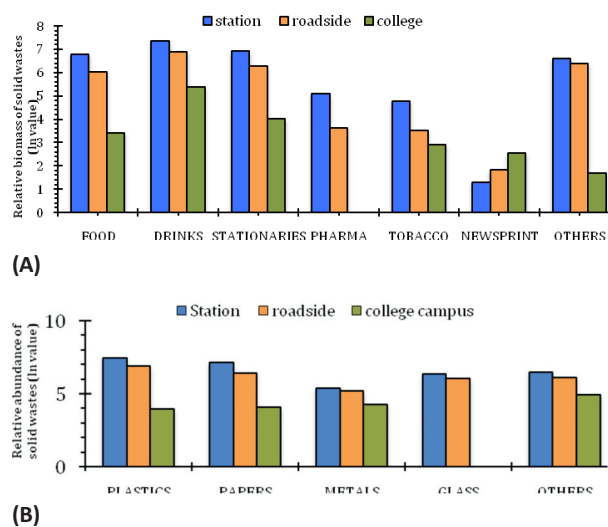


Fig. 2. The relative abundance of solid wastes among the three regions of sampled area. A. According to their sources, B. According to their origin.

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



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.

| 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 collection 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 – biodegradable solid wastes within the college campus.

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