



P-ISSN: 2349-8528

E-ISSN: 2321-4902

IJCS 2019; 7(6): 513-518

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Received: 01-09-2019

Accepted: 03-10-2019

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Urban waste management: Socio-economic status and waste management practices

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Abstract

Solid waste has been produced since the beginning of civilization. Solid waste management is one of the most neglected aspects of India's environment. Municipal solid waste (management and handling) Rules 2000 have made it mandatory for the administrative authority of any area to undertake responsibility for all activities relating to municipal solid waste management. The present investigation had been conducted in Jalpaiguri Municipality of West Bengal. In Jalpaiguri Municipality there are altogether 25 wards, 10 respondents have been selected from each of 25 wards thus the total sample size was 250. The result had shown that municipal waste collection were two types i.e. domestic waste collection system, market waste collection system. Total 15 markets were there and 11000kg waste per day collected and 260 kg wastes per day were collected from 7 hotels. The study also reveals that total 710kg and average 2.84 kg wastes generated per day from households. The study also revealed that total 52510kg wastes per day generated from Jalpaiguri municipality out of which 29490 kg of wastes were bio-degradable and 23020kg of wastes were non-biodegradable.

Keywords: Municipal wastes management, recycling of wastes, solid waste management, waste management and environment

Introduction

Waste is a continually growing problem at global and regional as well as at local levels. Solid waste has been produced since the beginning of civilization. During the earliest periods, solid wastes were conveniently and unobtrusively disposed of in large open land spaces, as the Density of the population was low. However, today, one of the consequences of global urbanization is an increased amount of solid Waste. Solid waste management is one of the most neglected aspects of India's environment. Municipal solid waste (management and handling) Rules 2000 have made it mandatory for the administrative authority of any area to undertake responsibility for all activities relating to municipal solid waste management.

India is a developing country whose economy is currently growing at an extremely rapid annual growth rate of 8 to 9%. It is clear that a growing economy and population are likely to result in growth rates of 11 to 12% in MSW generation. Sudha Goel, 2008^[1] stated that major problem is that- underestimation of generation rates and therefore, underestimation of resource requirements, lack of technical and managerial inputs, and lack of reliable and updated information to the public are much higher than the current expert estimates of 1.3% for per capita MSW generation and 4.2% for total MSW generation. Present approach to MSW collection and transport results in insufficient utilization of resources. Modern technology and tools like remote sensing and mathematical optimization method and GIS can be used for more efficient allocation and utilization of resource. Chinyama *et al.* (2000)^[2] explained the solid waste which is collected by the city council contains a very high proportion of organic substances (about 90%) and less recycled materials. Kumar *et al.* (2009)^[3] examined in detail and an integrated solid waste management plan proposed based on the study results. At present, the total solid waste generated in Kharagpur municipality is 95 metric tons/day, but the waste collected by the municipality is about 50 metric tons/day, which implies that almost 45 metric tons/day of the solid waste generated remains uncollected. Behmanesh (2009)^[4] stated that the disposal of waste presents an increasing challenge to the administrative bodies of megacities. India has introduced source separation systems and onsite organic waste composting. The citizens concerned are looking for practical ways to treat their organic wastes and they have found city farming to be a viable solution.

The municipal waste regulations in are discussed. addition, the bottlenecks and potentials and the future of organic waste recycling and city farming in the region are explored. Fischer *et al.* (2011) [5] focused on different aspects of the waste management hierarchy, including waste reduction, reuse, recycling/composting and residual waste management. Pradhan *et al.* (2012) [6] described that in recent years municipal solid waste (MSW) management has been one of the most environmental concerns urban areas of India. This paper attempts to characterize the urban solid waste of the city as well as its energy potential for various uses. Results showed that the average generation the solid waste rate of MSW was 0.7 kg/capita/day. Jalpaiguri Municipality area that is 1 to 25 wards were selected for the study. In Jalpaiguri town Waste Management is a serious problem and strictly need governmental concern. In west Bengal approximately total 12552 MT wastes per day. In jalpaiguri town approximately 52520 kg wastes produced every day. Out of total waste generation, 29490 kg wastes are bio degradable in nature and 23020 kg of waste are non biodegradable in nature. The solid waste management system for jalpaiguri municipality has been prepared for improvement of the present solid waste management system of the town. Project has been developed and requires 12.2 acres of land. Jalpaiguri municipality already has 14 acres of land for this purpose. At present solid waste management programmer is going through ward committee of different wards with direct supervision of the sanitary department of jalpaiguri municipality. This scheme has implemented in 16 wards. Jalpaiguri municipality has introduced a system to collect accumulated solid waste from individual premises in two separate containers. Bio degradable wastes in green container and non bio degradable waste in yellow container. Collection waste is done through house to house collection and community bin collection. After collection waste is transferred to dumping ground. The function of entire system has been facing various problems such as non approval of vermi composting project, require number of vehicles, implements etc. Unhygienic open dumping also prevalent in town.

Medicinal wastes require recycling facility. Recycling facility, incineration facility is not available in town. Immediate recycling facility should be implemented immediately. Adequate fund is also required to run the solid waste management programmer under Jalpaiguri Municipality as the system is a continuous process. Presently municipal authority has decided to engage private agency, NGO, and institution as recognized by the government to run the project of solid waste management. The main Objective of the study was to identify the socio economic status of the respondents and to understand the methods of waste management by the municipality.

Materials and Methods

The present investigation had been conducted in Jalpaiguri Municipality of West Bengal. In Jalpaiguri Municipality there are altogether 25 wards, 10 respondents had been selected from each of 25 wards thus the total sample size were 250. For conducting the study the state, district, block, municipality were selected purposively and respondents were selected randomly. The statistical tools were used: frequency, percentage, means, and standard deviation.

Results and Discussions

To identify the socio economic status of the respondents with socio economic variables

1. Age: The attribute age has categorized in three distinctive category viz. Old age (mean + 1/2 s.d), Middle age (mean \pm 1/2 s.d) and Young age (mean - 1/2s.d) i.e. greater than or equal 68 is said to be Old age, 58 to 67 is said to be Middle age and less than or equal 57 is said to be Young age. The majority percentage of the respondent is 58 to 67aged i.e. middle age categories (50.4%), then Old age categories (greater than or equal 68) i.e. (38.4%) and last is Younger categories i.e. (less than or equal 57) is (11.2%).

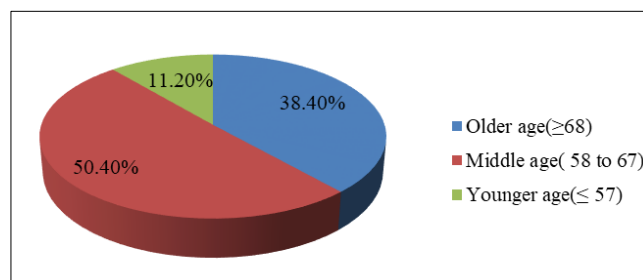


Fig 1: Distribution of respondents according to age

2. Education: The education level of the respondent has been classified into three categories i.e. Secondary education, higher secondary education and Graduate and above. The result shows that 47.2% of the respondent had an education up to secondary level, 30.8% of the respondent had achieved higher secondary level and 22% of the respondent had achieved graduate and post graduate.

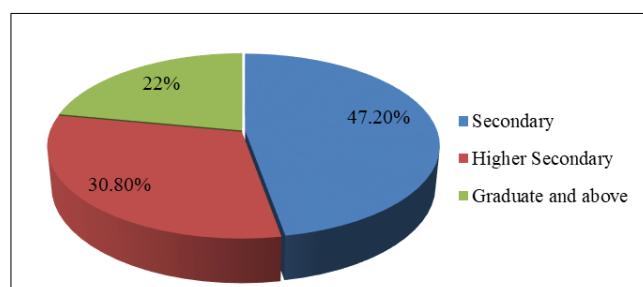


Fig 2: Distribution of respondents according to Education

3. Occupation: The attribute occupation has been classified into three categories viz. pensioner, business and service. The result shows that 53.6% of the respondent earn their income from pension, 27.6% of the respondent engaged in service and 18.8% of the respondent are engaged with business.

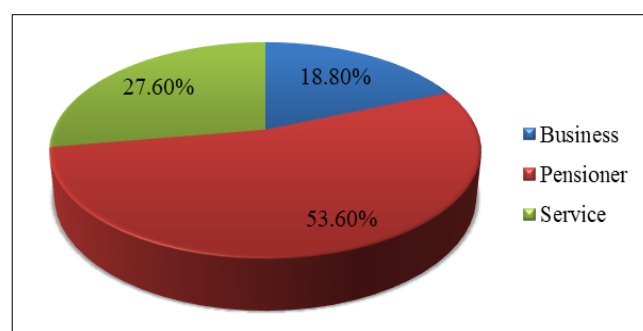


Fig 3: Distribution of respondents according to occupation

4. Family Type: The attribute Family Type has two distinct categories viz. Nuclear Family and Joint Family. The result shows that in the selected area the majority of the family is Joint Family (54.4%). The percentage of the Nuclear Family is 45.6%.

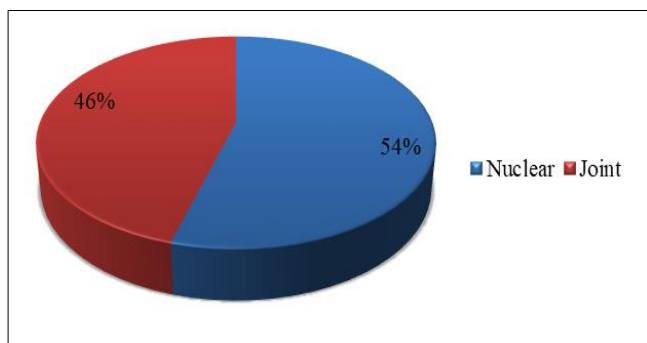


Fig 4: Distribution of respondents according to Family Type

5. Family Size: The attribute Family Size has classified into two distinct categories viz. up to 5 members and above 5 members. In the selected area the majority percentage of the respondent is up to 5 members (65.2%) and above 5 members (34.8%).

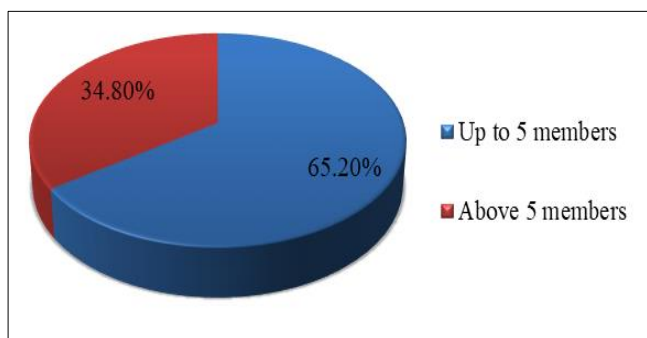


Fig 5: Distribution of respondents according to Family size

6. Income: The attribute Income has categorized in three distinctive category viz. High(mean + 1/2 s.d), Medium(mean \pm 1/2 s.d) and Low(mean - 1/2 s.d) i.e. greater than or equal 33,273 is said to be high, 17431 to 33,272 is said to be medium and less than or equal 17430 is said to be low. The majority percentage of the respondent earn their income belongs to Low categories (49.6%), then high categories (greater than or equal 33,273) i.e. (31.6%) and last is medium categories i.e. (17,431 to 33,272) is (18.8%).

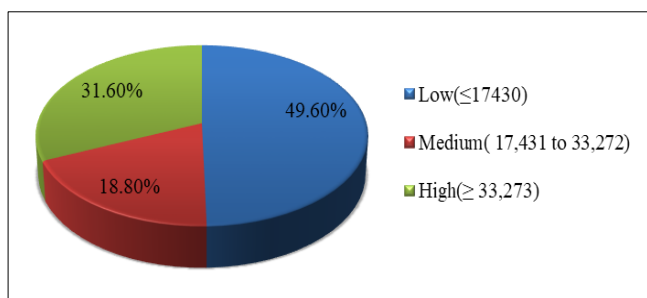


Fig 6: Distribution of respondents according to Income

7. Number of Rooms per Household: The attribute number of rooms per household has classified into three categories viz. Double rooms, Triple rooms and More than triple rooms. The result of the study area shows that majority of the

respondent has Triple rooms in their house (54%). 37.2% of the total respondent has Double rooms in their house and 8.8% of the respondent has more than Triple rooms in their house.

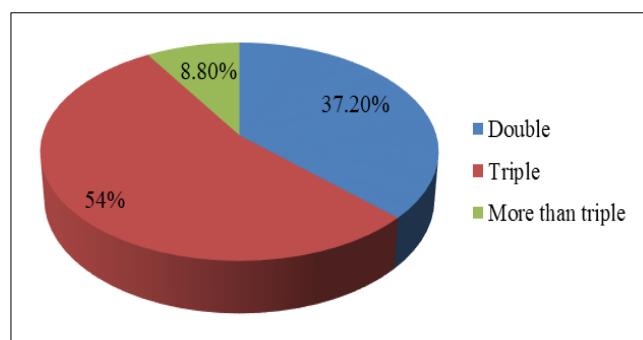


Fig 7: Distribution of respondents according to number of rooms per household

8. Number of Latrines per Household: The attribute number of Latrines per household has classified into three categories viz. 1 Latrine, 2 Latrines and More than 2 Latrines. The result of the study area shows that majority of the respondent has 2 Latrines in their house (89.6%). 6.4% of the total respondent has 1 Latrine in their house and 4% of the respondent has more than 2 Latrines in their house.

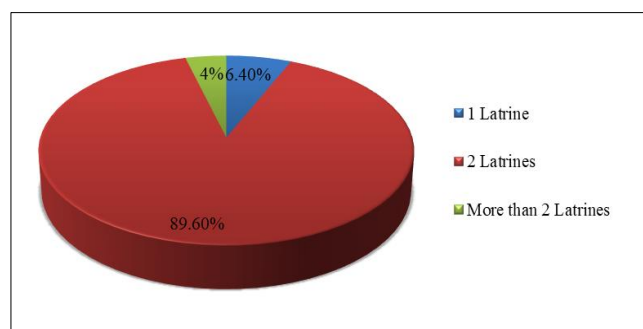


Fig 8: Distribution of respondents according to number of latrines per household

To understand the methods of waste management by the municipality

Method of collection, Quantity and Types of Waste
Present Municipal collection system categories in to two parts-

Domestic waste collection system

House to House collection: In this process waste collector knocks on each door or rings doorbell and waits for waste to be brought out by resident.

Advantage: It is Convenient for resident. Little amount waste can be seen on street.

Disadvantage: Residents must be available to hand waste over. Not suitable for apartment buildings because of the amount of walking required.

Community Bin collection: Users bring their garbage to community bins that are placed at fixed points in a neighborhood or locality. Municipal solid waste is picked up by the municipality or it's designate according to a set schedule.

Advantage: Low capital cost is required in case of community bin collection system.

Disadvantage: Loading the waste in to trucks is slow and unhygienic. Waste is scattered around the collection point. Adjacent residents and shopkeepers protest about the smell and appearance.

Commercial/Market waste collection system

Door to Door collection: Most common method for collecting market waste id door to door collection. Here waste collector knocks on each door or ring bells and wait for waste to be brought out by resident. After the collection, the truck arrives at the designated point at a specified time and place. The waste is transported to the disposal site by means of a large capacity tipper truck, and in a few wards by a small capacity tripper truck or dumper placer. The truck is covered with a mesh and a polythene sheet to prevent scattering.

Types of Wastes

Market Wastes: This result reveals that there are total 15 markets present in jalpaiguri town. Ward no 1 have one market with 750 kg wastes generation, ward no 3 have one market with 700 kg wastes generation, ward no 4 have one market with 750 kg wastes generation, ward no 7 have one market with 700 kg wastes generation, ward no 9 have one market with 750 kg wastes generation. Ward no 11 have one market with 700 kg wastes generation, ward no 12 have one market with 800 kg wastes generation, ward no 13 have one market with 700 kg wastes generation, ward no 16 have one market with 700 kg of wastes generation, ward no 18 have one market with 750 kg wastes generation, ward no21 have two markets with 1500 kg wastes generation, ward no 22 have one market with 700 kg of wastes generation, ward no 24 have one market with 800 kg of wastes generation, and ward no 25 have a single market with 700 kg of wastes generation. It is found that total 11000 kg wastes had generated from all market.

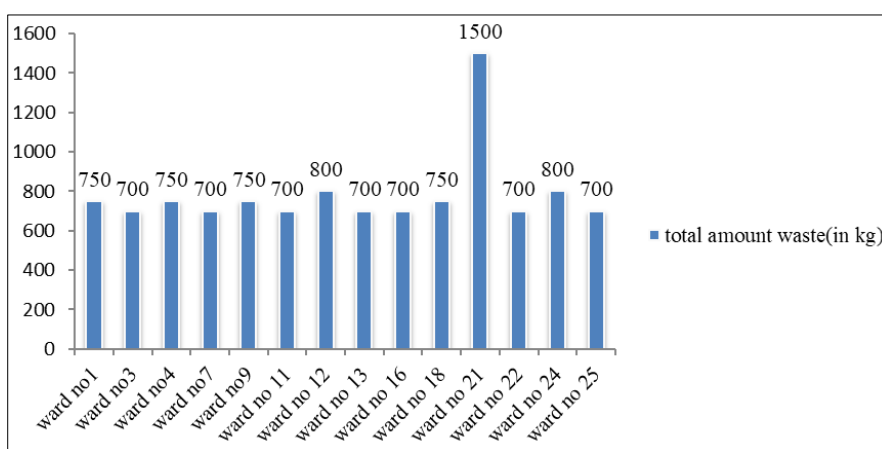


Fig 9: Total amount of Market Wastes

Hotel wastes: This result shows that total 7 big hotels present in town. Ward no 2 have one hotel with 35 kg wastes generation, ward no 5 have one hotel with 40 kg wastes generation, ward no 8 have one hotel with 35 kg wastes generation, ward no 21 have two hotels with 80 kg wastes

generation, ward no 22 have one hotels with 40 kg wastes generation and ward no 24 have one hotel with 30 kg wastes generation. Total 260 kg wastes generate from all hotels per day.

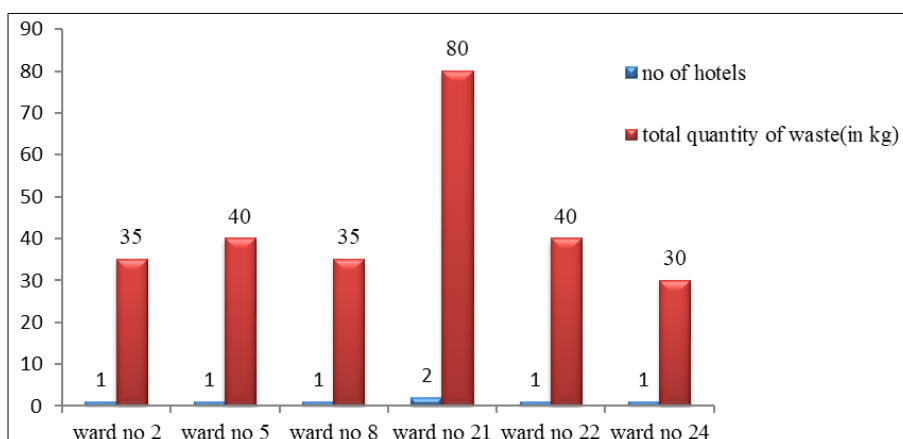


Fig 10: Total amount of Hotel Wastes

Households Wastes: This result reveals that total 710 kg and average 2.84 kg wastes generate per day from households. Average 35 kg wastes generates form ward no 1, from ward no 2 25 kg wastes generates per day from ward no 3 average 35 kg wastes generates per day, from ward no 4 30 kg wastes generates per day, from ward no 5 20 kg of wastes generates

per day, from ward no 6 total 30 kg of wastes generates per day, from ward no 7 average 25 kg wastes generates per day, from ward no 8 and ward no 9 average 35 kg of wastes generates per day, from ward no 10 25 kg of wastes generates per day, from ward no 11 30 kg of wastes generates per day from ward no 12 average 35 kg of wastes generates per day,

from ward no 13, 14, 17, 19, 20, 23 and 25 average 25 kg wastes generates per day. From ward no 15, 18, 21, and 22 average 30 kg of wastes generates per day. From ward no 16

average 35 kg wastes generates per day and from ward no 24 average 20 kg of wastes generates per day.

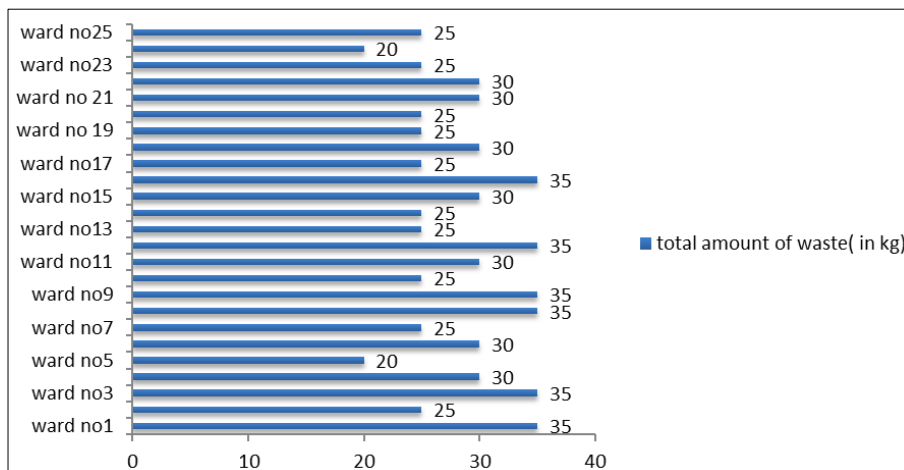


Fig 11: Total amount of Household Wastes

Municipality waste generation kg per day: This result shows the estimation of total waste generation in jalpaiguri town. It is found that 35200 kg domestic wastes generate per day (66%) out of which 21130 kg bio degradable in nature and 14080 kg non bio degradable in nature. 12100 kg market wastes generate per day (23%) out of which 7250 kg bio degradable in nature and 4840 kg non bio degradable in nature. 260 kg hotel wastes generate per day (0.377%) out of which 130kg bio degradable in nature and 130 kg non bio degradable in nature. 1000 kg agricultural wastes generates

per day (2%) out of which 980 kg bio degradable in nature and 20 kg non bio degradable in nature. 3000kg wastes generates from trade sector (6%) out of which total 3000kg non bio degradable in nature. 50 kg wastes generates from railway station (0.944%) out of which 50 kg non bio degradable in nature. From bus stand 100 kg wastes generates per day out of which 100 kg non bio degradable in nature. From street sweeping 100 kg wastes generates per day out of which 500kg non bio degradable in nature and from cess pool 200 kg wastes generate out of which 200kg bio degradable.

Table 1: Total amount of municipal waste generation per day (in kg)

| | Types of waste | Total(kg) | Quantity of waste(kg/day) | |
|-------------------------------|-----------------|-----------|---------------------------|-------------------|
| | | | Waste Type | |
| | | | Bio-Degradable | Non-biodegradable |
| Municipality waste Generation | Domestic | 35200 | 21130 | 14080 |
| | Market | 12100 | 7250 | 4840 |
| | Hotels | 260 | 130 | 130 |
| | Agriculture | 1000 | 980 | 20 |
| | Trade | 3000 | 0 | 3000 |
| | Railway Station | 50 | 0 | 50 |
| | Bus Stand | 100 | | 100 |
| | Street Sweeping | 100 | 0 | 100 |
| | Drain Cleaning | 500 | 0 | 500 |
| | Industry | 0 | 0 | 0 |
| | Cess pool | 200 | | 200 |
| | Total | 52510 | 29490 | 23020 |

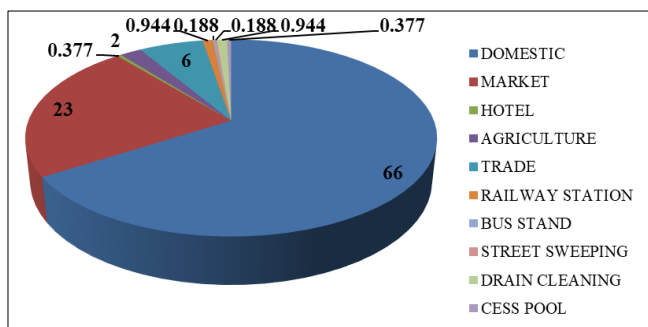


Fig 12: Distribution of municipal wastes

Types of municipality wastes- From result it is also found that out of total waste generation per day 56% of wastes are bio

degradable in nature and 44% are non bio degradable in nature.

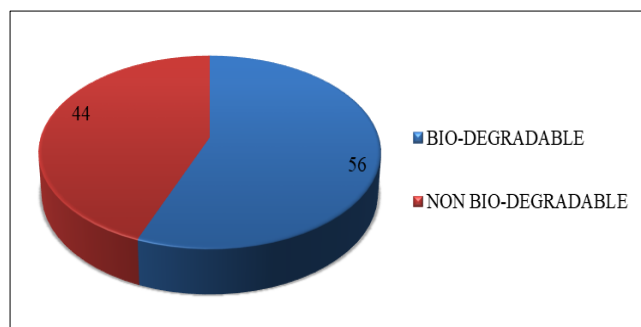


Fig 13: Distribution of bio- degradable and non bio- degradable wastes

Conclusion

It is evident from the findings that peoples are not fully satisfied with the waste management mechanism by the jalpaiguri municipality. Though within the limited resources they are trying hard to maintain the regular services of waste management from house to house collection, collection from market yard, different institution even road side sweeping. It has been expressed by the people the door to door collection was irregular. Even in some cases the open dumping is also being noticed by the household in the nearby areas, causing pollution in the life and living of the people of the town.

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