

DISSERTATION ON
“SOLID WASTE MANAGEMENT ON HALDIA MUNICIPALITY
A WARD LEVEL STUDY OF CITIZENS PERCEPTION”



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Date -

Pratima Tudu

Signature

ABSTRACT

Solid garbage is the unwanted, harmful, and wasted substance arising from day-to-day civic events. Management of the solid wastes can be described as the methodology of managing solid waste generation, storage, collection, transport, treatment and disposal. A country's growth status can be defined in several forms. As regards its effect on solid waste management, the growth status of this publication is classified according to the availability of economic capital and the degree of industrialization development. Economic growth status is more a function of the new economic environment than of the current economic situation (recession vs prosperity). The degree of industrialization is expressed in terms of the extent to which technical tools are mechanized and usable. The words "developed" and "industrialization" are often used interchangeably, justifiably or not. In so far as solid waste management is concerned, it is difficult to impose a specific structural definition due to regional shifts in the degree of growth within each region. For example, in a developed country, a large metropolitan population (typically the provincial capital and surrounding area) might be at a level of growth well above that of the rest of the nation. On the other hand, such groups are not absolutely resistant to the restrictions enforced by the nation's position. It is important to remember that while the material provided in this paper refers specifically to developing nations, some of it can even refer to a transforming country, or even to an advanced or developed world. The human-environmental relationships are a dynamic phenomenon. The ability of the Planet to sustain human beings is determined not only by the specific food needs, but also by our resource use rates, the volume of waste production, the technology employed in various applications. With the population growth and the growing trend of resource use, we have in effect exceeded the planet's carrying power.

LIST OF TABLES & PLATES

Table No.	Title	Page No.
2.1	Change of population of Haldia Municipality, 1971-2011	15
2.2	Percentage changes of area , population and density of Haldia Municipality,1971-2011	16
2.3	Gender composition	17
2.4	Child Sex ratio	18
2.5	Age Sex Composition	19
2.6	Dependency ratio	20
3.1	Literacy status	22
3.2	Caste composition	23
3.3	Poverty status	24
3.4	Level of education	24
3.5	Occupation pattern	26
3.6	Ownership of house	26
3.7	Monthly family income	27
4.1	Sources of waste	35
4.2	Types of waste	36
4.3	Segregation of waste	37
4.4	Disposal of waste	37
4.5	Duration of waste disposal	38
4.6	Alternatives of household waste	39
4.7	Level of satisfaction	41
4.8	Problems faced by people	42
4.9	Environmental issues	43
4.9.1	Improper waste disposal issues	44
4.9.2	Environmental pollution	45
4.9.3	Diseases caused by solid waste	47
Plate No.	Title	Page No
4.1	Types of waste	28
4.2	Solid waste management	31
4.3	Haldia municipality	32
4.4	Impact of solid waste on environment	33
4.5	Method of waste management	34
4.6	Environmental pollution caused by solid waste	46

LIST OF FIGURES

Fig.No.	Title	Page No.
1	Location map of the study area	10
2.1	Change of Urban population 1971-2011	15
2.2	Percentage change of density,1971-2011	16
2.3	Gender Composition	17
2.4	Child population	18
2.5	Age Sex Pyramid	19
3.1	Literacy Status	20
3.2	Caste Composition	22
3.3	Poverty Status	23
3.4	Level of education	24
3.5	Marital Status	24
3.6	Occupation pattern	25
3.7	Ownership of House	26
3.8	Monthly Family Income	27
4.1	Waste management hierarchy	30
4.2	Types of waste	35
4.3	Waste segregation	36
4.4	Waste disposal container	37
4.5	Duration of waste disposal	38
4.6	Alternatives of household waste	39
4.7	Collection of MSW	40
4.8	Level of satisfaction	41
4.9	Problems faced by people	42
4.9.1	Environmental issues	43
4.9.2	Improper waste disposal issues	44
4.9.3	Environmental pollution	45
4.9.4	Disease caused by solid waste	47

CONTENT

SUPERVISOR CERTIFICATE.....I
ACKNOWLEDGEMENT.....II
ABSTRACT.....III
LIST OF TABLES.....IV
LIST OF FIGURES.....V

Chapter no	Name	Page no.
1.1	Introduction	9
1.2	About haldia	10
1.3	Literatur review	11
1.4	Methods and methodology	12
1.5	Objectives of study	13
1.6	Limitation of the study	13
2.	Demographic background	
2.1	Demographic Profile	16
2.2	Trends of Population	17
2.3	Gender Composition	18
2.4	Child sex ratio	19
2.5	Age composition	20
2.6	Dependency Ratio	21
3	Socio-economic status	
3.1	Socio-economic profile	22
3.2	Literacy status	23
3.3	Caste composition	24
3.4	Poverty status	25
3.5	Level of education	26
3.6	Marital status	27
3.7	Occupation pattern:	28
3.8	Ownership of house	29

3.9	Monthly family income	30
4	SOLID WASTE MANAGEMENT	
4.1	Sources of waste Introduction	31
4.2	Types of waste Sources of waste	32
4.3	Types of waste	33
4.4	Amount of waste generation	34
4.5	Segregation of waste	35
4.6	Household waste disposal	36
4.7	Dispose of household waste	37
4.8	Alternatives of household waste	38
4.9	Collection of waste through municipality	39
4.9.1	Level of satisfaction	40
4.9.2	Problems faced by people due to MSW	41
4.9.3	Environmental issues	42
5.1	Major findings	48
5.2	Conclusion	49
5.3	Bibliography & websites	50-51

CHAPTER-I

Introduction

1.1.INTRODUCTION

In the eastern India state of West Bengal, lies the fast developing and industrial town of Haldia. Conveniently located at just 96kms south of Kolkata Haldia Town is one of the most industrialized towns in West Bengal. The uniqueness of this industrial town lies in the serene natural beauty it has to offer a perfect balance of development and natural beauty. Founded in 1959, this river town lies at the confluence of the Hooghly river and the Haldi river in the Purba Medinipur district of West Bengal. The township is a visual treat as it is surrounded by the Haldi river. The swak peek into the genesis of development of Haldia Port reveals that with the advent of freedom in 1947, increase and growth in the volume of trade and the accompanying industrialization, it was felt that a suitable location was required to augment the handling capacity of Calcutta Port. Hence, a new dock system at Haldia came into being to provide economies in cost as well as to increase capacity. The development of the port was accompanied by a steady increase in the number of companies setting up their units in the town. Today, the port town is home to factories of major Indian and multinational conglomerates. Some of the notable companies who have set shop in Haldia are South Asian Petrochemicals, Shaw Wallace, Tata Chemicals, Hindustan Unilever etc. In addition to these numerous factories Haldia is also a base of Indian Coast Guards.

1.2 About Haldia:

Haldia is an industrial port city in Purba Medinipur district in the Indian state of West Bengal. It has a major river port and industrial belt located approximately **124 km(77miles)** Southwest of Kolkata near the mouth of the Hooghly River, one of the distributaries of the Ganges. It is located at **22°03'N to 88°06'E**. It has an average elevation of **8 meters**. Haldia township is bordered by the Haldia River, an offshoot of the Ganges River. Haldia is a centre for many petrochemical businesses and is a major trade port for Kolkata.

As of 2011 census, Haldia had a population of **200,762** out of which **104,852** were males and **95,910** were females. The 0-6 years population was **21,122**. Effective literacy rate for the population was **89.06%**. As of 2001 India census, Haldia had a population of **170,695**. Males constitute **53%** of the population and female **47%**. In Haldia 13% of the population is under 6 years of age.

Haldia has a tropical savanna climate with winter temperature ranging from a low of around **7°C to a high of 22°C**. Summers can be very hot and humid. Usual summer temperatures in May, The hottest month, range from a low of **24°C to high around 39°C**. Although summers are hot and humid, Kalbaishakhis provide a relief to the people, albeit killing some in the process. Rainfall is heavy during monsoons, with an **average rainfall of 3650 mm** and the rainy months are between **May and October**.

Haldia is connected to Kolkata by bus of **South Bengal State Transport Corporation**. Recent efforts have been introduction of new air-conditioned buses which take less than three hours from station to station. Haldia is also connected to **Bnkura, Kharagpur, Tarakeswar, Burdawan, Asansol** by bus. Haldia railway station is the major railway station connecting the city of to Kolkata, Chennai And Delhi. For long distance trains, except one or two weekly for Delhi and Chennai you have to go either Mechada, Kolkata or Kharagpur. Haldia is also connected via the **1620km long inland waterway, National waterway 1**, that runs from Prayagraj across the Ganges, Bhagirathi and Hooghly river system to Haldia(Sagar). A catamaran service used to operate from Kolkata to Haldia but was withdrawn due to its high price and unpopularity among tourists. A government ferry service operates between Haldia and Nadigram.

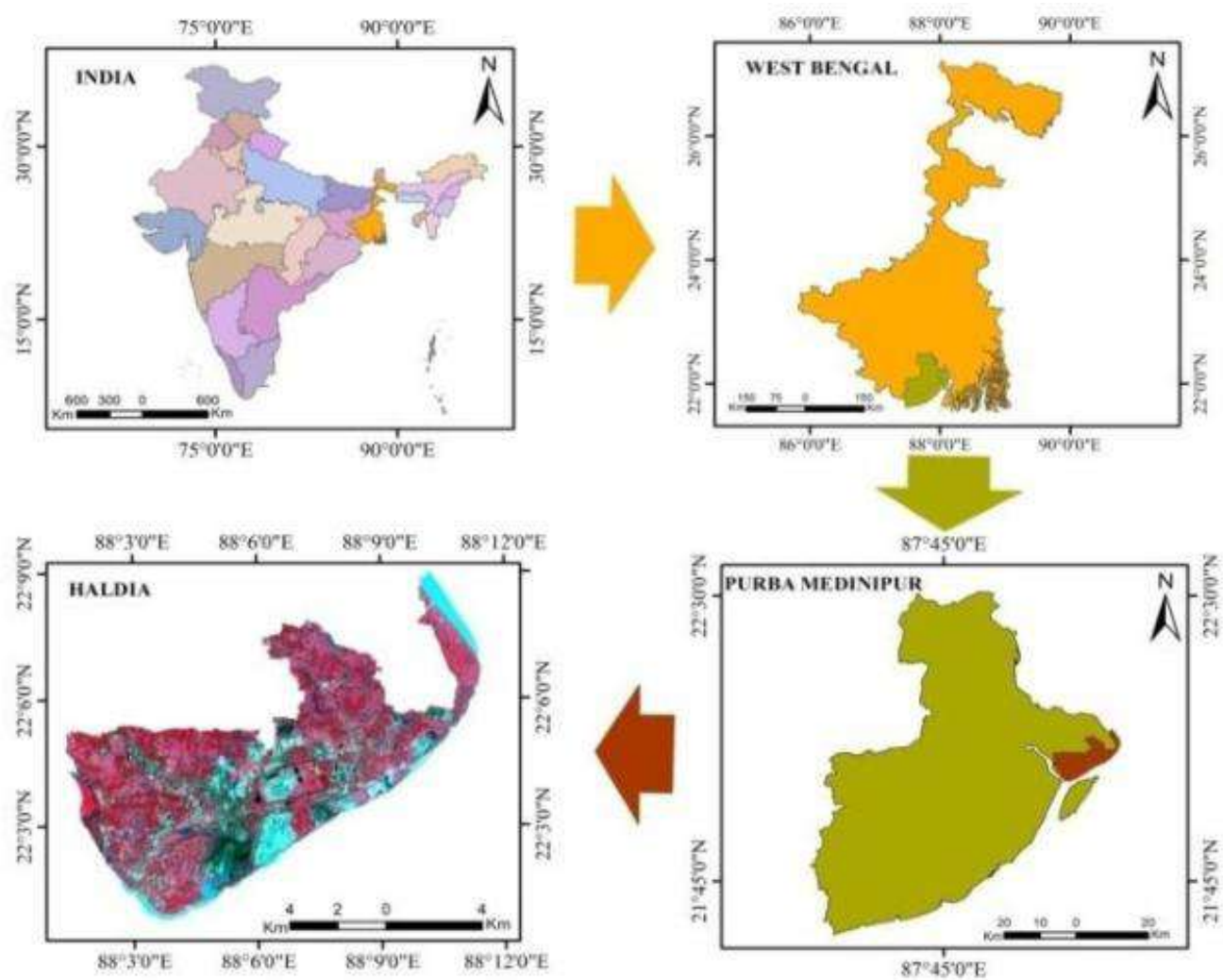


Fig No: 1 Location Map of Study Area

1.3 LITERATURE REVIEW

Some of the important research studies relating to the topic of the research are as follow:

A research paper on **“Solid and Liquid Waste Management”** summarizes the current environmental monitoring program and its major findings.. Researcher concluded that the public health movement later on spread rapidly to Europe and the United States, where the need for improvement was not as strong as in Europe. During the last two decades we have witnessed an unprecedented rapid growth in first concern and later action, which transformed the entire field of waste management (**S. Shayed, 2006**).

A research paper on **‘A Critical Analysis of Healthcare Waste Management in Developed and Developing Countries “** rise in the quantities of healthcare waste and its mishandling will continue unabated and may be of a big concern in future (**Goddu Vijaya Kumar, Davvuri Kavita and Bakki Vidya Kaumudini ,2007**).

A research paper on **“Rural Solid Waste Management”** discuss status of solid waste management in villages recommending appropriate system to handle the waste, The quantity of waste generated in each village is not sufficient to be managed separately thus a regional solid, waste management must be defined to include adjacent village (**M. A. Abduli , Samieifard, and Jalili Ghazi Zade. , 2008**).

A research paper on **‘A Web Based Solution Framework for E-Waste Management E-waste Management Forms An Integral Part of Sustenance And Growth For Business Across The World,’** argue that the e-waste is going to become a great challenge for environmentalists and technologists at the rate of growth is much higher than rate it is needed for improvement, operation plan, implementing a protective protocol for improvement, operation plan, implementing a protective protocol for the workers working in e- waste disposal and educating public about this emerging issue posing a threat to the environment as well as public health (**Joshi Yudhishtir and Purshottam Sunita ,2011**).

A research paper on **‘Sustainable Solid Waste Management in Rural Areas,’** study discusses this present study the qualities of both solid and liquid wastes are disposed of in an uncontrolled manner these adverse impact on public health and environment. In this study main aim of the study is to generate source of income for women of rural areas using vermin composting for solid waste management (**Rashmi Shah and Abhay Tiwari,2012**)

1.4 SOURCES AND METHODOLOGY

The data base is one of the most important tools for any study. For collection of any data base, primary and secondary data sources have been needed. The study based on different primary and secondary data.

- **Secondary Sources:**

- ❖ Physical background of the study area has been studied from different articles and web pages
- ❖ To understand the demographic background of the study area secondary data have been collected from Primary Census Abstract, 2011 and District Census Handbook, 2011.

- **Primary Data Source:**

- ❖ Intensive door to door survey has been carried out covering total 60 household at ward no. 21,22 & 18 of Haldia municipality, Purba Medinipur
- ❖ Market ,industrial and local areas have been surveyed through structure questionnaire

- **The methods of data collection :**

- a. Primary data collection through questionnaire.
- b. Secondary data collection from census handbook.
- c. Cartographic and statistical methods

1.5 OBJECTIVES OF STUDY

The overall objectives of the waste management assessment are summarised below:

- I. To assess the activities involved for the proposed and determine the type,nature and estimated volumes of waste to be generated.
- II. To identify any potential environmental impacts from the generation of waste at the site.
- III. To determine the perspective of people in industrial,market and local area.

1.6 LIMITATION OF THE STUDY

- I. During the study one of the main problems faced by the researcher is the lack of time to do a more through analysis.
- II. Another constraints of the study is that there was a lack of participation of municipal members during data collection.
- III. Lack of data resouces creates barrier in case of research .

CHAPTER-II

Demographic Background

2.1. Demographic Profile:

Demography is the statistical study of populations, especially humans. It examines and measures the aspects and dynamics of populations; it can cover entire societies or groups defined by criteria such as education, nationality, religion, and ethnicity. Educational institutions usually treat demography as a field of sociology, though there are a number of independent demography departments. These methods have primarily been developed to study human populations, but are extended to a variety of areas where researchers want to know how populations of social actors can change across time through processes of birth, death, and migration. In the context of human biological populations, demographic analysis uses administrative records to develop an independent estimate of the population.

As a rule, in the same country and at the same period, the size of an urban community is much larger than that of a rural community. In other words, urbanity and size of a community are positively correlated. Density of population in urban areas is greater. Urbanity and density are positively correlated. So far as urban community is concerned, greater importance is attached to the individual than to the family. Nuclear families are more popular in urban areas

2.2. Trends of Population:

Changes of population are always temporal and related with economic processes of the region. The change of population characteristics of Haldia from 1971 to 2011 shows a very quick and inconsistent pattern. From 1981 to 1991 with a difference in growth rate was 26.32 percent (11.09% in 1981 and 37.71% in 1991). This period was the first phase of the construction of large scale industries in this area which attract large number of people mainly labour class for construction and shifting works. It was the period of high concentration of population when inter-district and local level migration of population was maximum.

At the end of 1991 the major constructional work was completed and most of the labour class people have returned to their original place which causes the decrease in growth rate of population. The decrease of population was about 30 per cent from 1991 to 2001 (Table-). From 2001 to 2011, the percentage of growth has decreased up to 1.70 but rate of growth has increased to some extent. The growth of area and population of the urban area is an indicator of urbanization, but another indicator is the degree of urbanization, i.e. percentage sharing of urban population to the total population of the region.

Here, Haldia sub-division is considered as a region and the percentage increase of urban population of Haldia town is compared with the total population of Haldia sub-division. In

comparison with the total population of the region, the degrees of urbanization and percentage change of urban population have shown in the table 1 and figure 2.

Table no2.1: Change of population of Haldia Municipality, 1971-2011

Year	Population of Haldia municipality	Population of Haldia sub-division	% of urban to total population	% change of urban population	Degree of urbanization	Rate of change
1971	9968	639831	1.56	0.0	Low	-
1981	21122	719688	2.93	1.38	Low	Low positivde
1991	100347	799545	12.55	9.62	Moderate	High positive
2001	171673	820149	20.93	8.38	High	Positive
2011	200827	959934	20.92	-0.01	High	Negative

Source: Primary Census Abstract of Purba Medinipur, 2001-2011

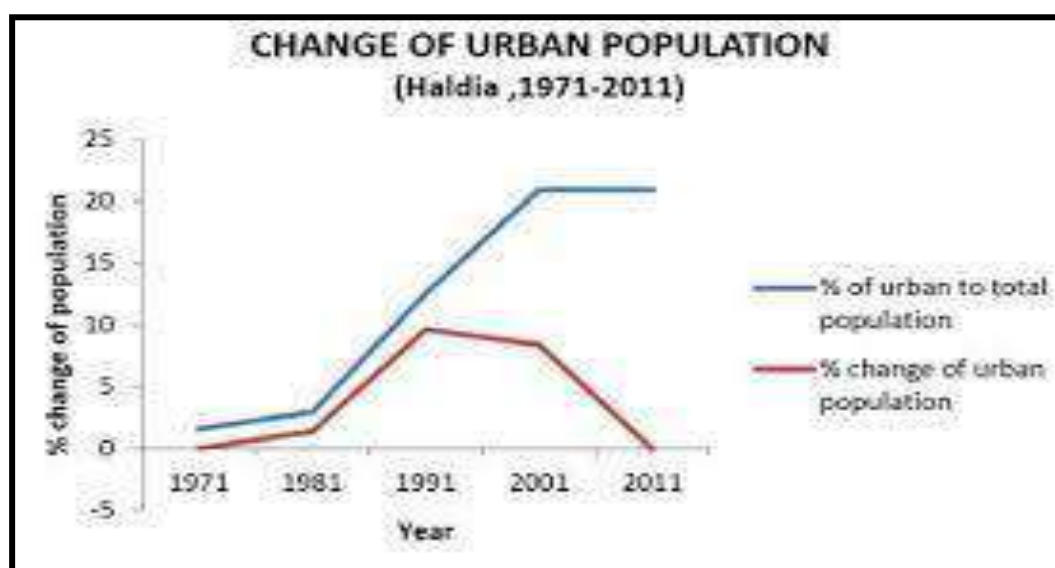


Fig.2.1: Change of Urban population 1971-2011

Table 2.2: Percentage changes of area, population and density of Haldia Municipality, 1971-2011

Year	Area(sq.km)	Population	Density/sq.km	%Chang of population	%Change of density
1971	21.6	9968	461.48		
1981	16.2	21122	1303.83	11.19	18.25
1991	69.1	100347	1452.2	37.51	1.14
2001	104.9	171673	1636.54	7.11	1.27
2011	109.89	200827	1827.53	1.70	1.17

Source: Primary Census Abstract of Purba Medinipur, 2001-2011

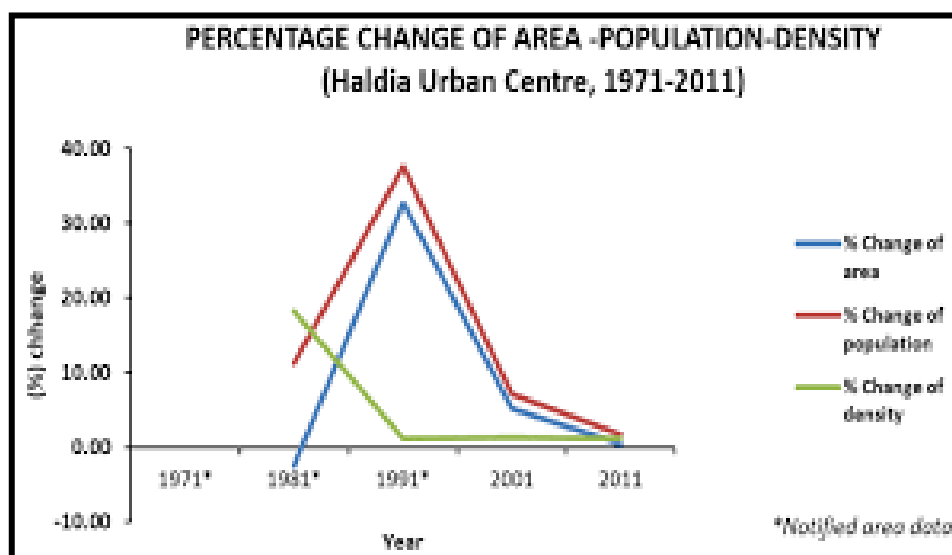


Fig.2.2:Percentage change of density,1971-2011

2.3 Gender Composition

The composition of population by gender is one of the primary demographic characteristics of human population around which meaningful analysis is woven. Gender composition reflects natality, mortality and migration character of a given population. Distribution pattern of male and female in a population affects relative roles and economic relationships. According to the census year 2011, in the study area (ward no 21, 22 & 28) the gender composition is shown below:

Table No2. 3: Gender Composition

Ward No.	Total population	Male population	Male ratio	Female population	Female ratio	Gender composition
21	5956	3160	53	2796	47	885
22	7042	3632	52	3410	48	939
28	8292	4223	51	4069	49	96
Source: Field survey, 2023						

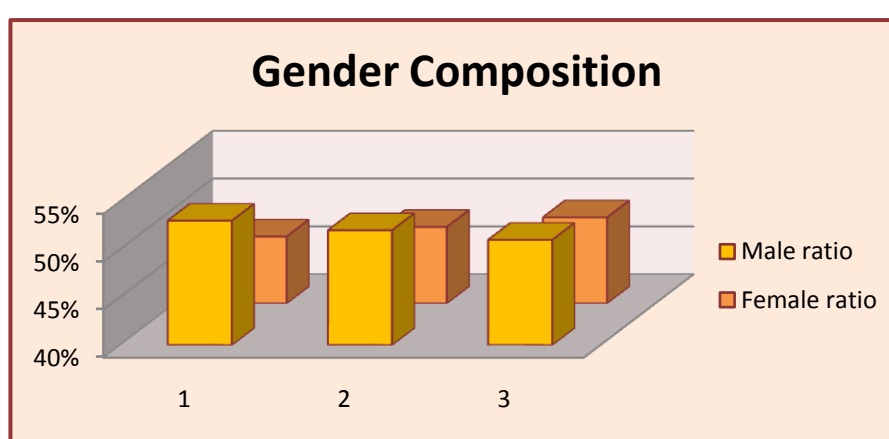


Fig No 2.3 :Gender Composition

2.4. Child sex ratio

In India, the child sex ratio is defined as the number of females per thousand males in the age groups 0-6 years in a human population. According to the census year 2011, in the study area total child population is 21,945 including male child population is 11,194 and female child population is 10,751. So the child sex ratio is 960.

Table No.2.4: Child population

Child population	Total child population	Male	Female	Child sex ratio
No of child population	21,945	11,194	10,751	960.
Source: Field survey ,2023				

Fig No. 2.4: Child population

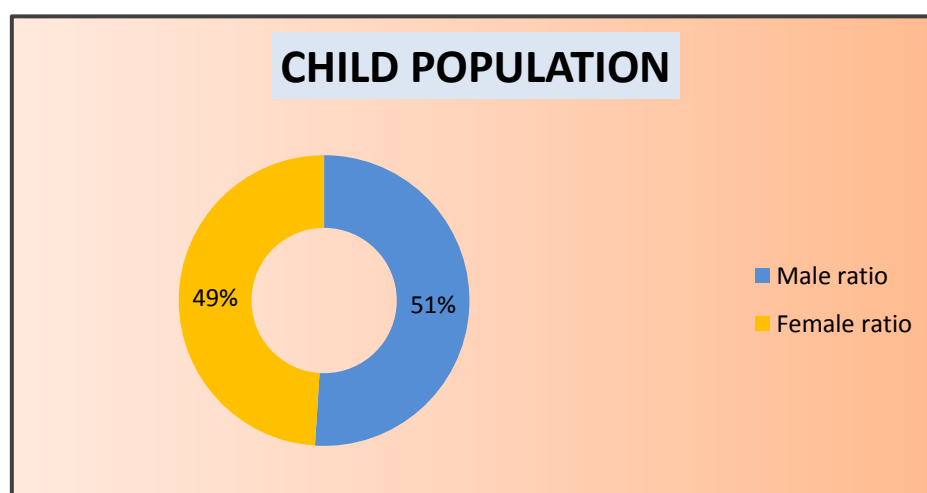


Fig No. 2.4: Child population

2.5.Age composition

In population studies , age distribution (also known as age composition)refers to the proportionate numbers of people in various age groups in a population.It is common in demography to split the population into four broad category,0-14; 15-24; 25-60 and above 60 years.The household survey data on age reveals that 10%of the population ranges between 0-14years; 29% of the population ranges between 15-24years ;54% of the population ranges between 25-60years and 7% of the population ranges between above 60years.

Table No.2.5: Age sex composition

Age groups(years)	Male		Female	
	Number	%	Number	%
0-14	11	9%	13	11%
15-24	37	31%	32	26%
25-60	64	54%	66	54%
>60	6	5%	11	9%

Source :Field Survey ,2023

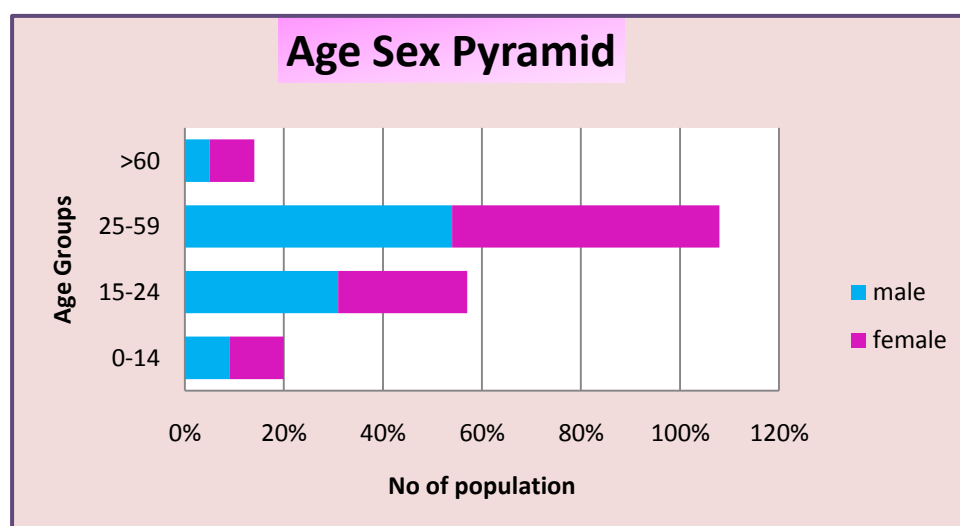


Fig No.2.5:Age Sex Pyramid

2.6. Dependency Ratio

The **dependency ratio** is an age-population ratio of those typically not in the labour force (the dependent part ages 0 to 14 and 65+) and those typically in the labour force (the productive part ages 15 to 64). It is used to measure the pressure on the productive population. Consideration of the dependency ratio is essential for governments, economists, bankers, business, industry, universities and all other major economic segments which can benefit from understanding the impacts of changes in population structure. According to the survey data the maximum population in middle age groups or working age groups ,i. e.,15-59 years which is about 82.92% ;the dependent population is about 17.08% which is further classify into two groups i.e. young age groups(10%) and old age groups (7.08%).So the dependency ratio of the study area is about 20.60%.That indicates 21 non –working population depend on 100 working population.

Table No.2.6: Dependency ratio

Age groups(years)	No of population	Dependent population	Independent population	Dependent Ratio(%)
0-14	24	41	199	20.60
15-59	199			
>59	17			
Source :Field survey ,2023				

CHAPTER-III

Socio-economic status

3.1. Socio-economic profile:

Socioeconomic status (SES) is an economic and sociological combined total measure of a person's work experience and of an individual's or family's economic access to resources and social position in relation to others. When analyzing a family's SES, the household income, earners' education, and occupation are examined, as well as combined income, whereas for an individual's SES only their own attributes are assessed. Recently, research has revealed a lesser recognized attribute of SES as perceived financial stress, as it defines the "balance between income and necessary expenses". Perceived financial stress can be tested by deciphering whether a person at the end of each month has more than enough, just enough, or not enough money or resources. However, SES is more commonly used to depict an economic difference in society as a whole

Socioeconomic status is typically broken into three levels (high, middle, and low) to describe the three places a family or an individual may fall into. When placing a family or individual into one of these categories, any or all of the three variables (income, education, and occupation) can be assessed.

Education in higher socioeconomic families is typically stressed as much more important, both within the household as well as the local community. In poorer areas, where food, shelter and safety are a priority, education is typically regarded as less important.

Additionally, low income and education have been shown to be strong predictors of a range of physical and mental health problems, including respiratory viruses, arthritis, coronary disease, and schizophrenia. These problems may be due to environmental conditions in their workplace, or, in the case of disabilities or mental illnesses, may be the entire cause of that person's social predicament to begin with.

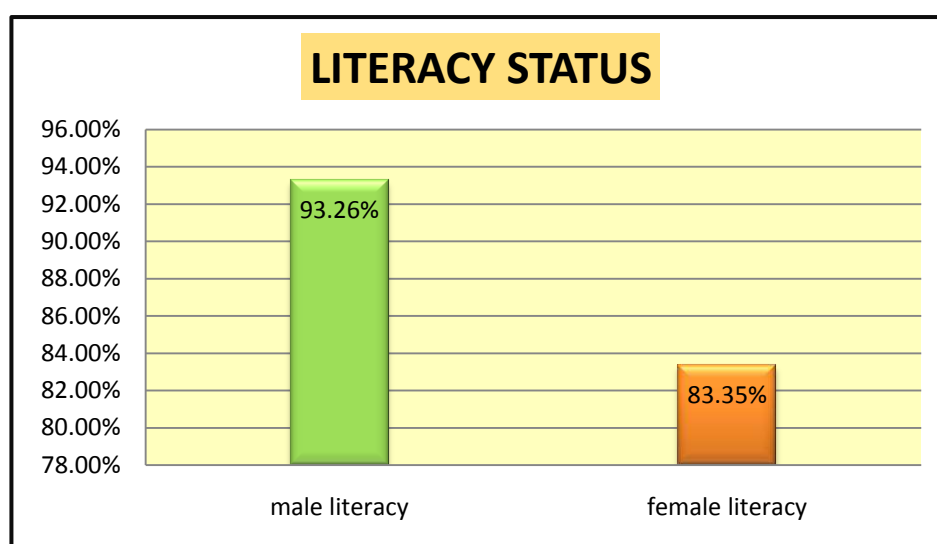
3.2. Literacy status:

According to the 2011 Census, any person aged seven and above and has the ability to read and write is considered literate. According to the 2011 the Literacy rate of Haldia city is 88.54 % higher than state average of 76.26 %. The average literacy rate of the study area is 88.54 percent for male and female of the study area stood at 93.26 % and 83.35 % respectively. The total literate persons in the study area were 158,380 Out of which males were 87,334 and remaining 71,046 were females. The study area has literacy gender gap is 9.91.

Table No.3.1: Literacy Status

Gender	Literate persons	Literacy rate(%)	Literacy gap(gender gap)
Male	87334	93.26 %	9.91
Female	71,046	83.35 %	

Source : Field survey ,2023

**Fig No 3.1: Literacy Status**

3.3. Caste composition:

Caste systems are a form of social and economic governance that is based on principles and customary rules. It involves the division of people into social groups (castes) where assignments of rights are fixed by birth, often includes an occupation and are hereditary. According to the field survey the overall population has been divided into schedule caste, schedule tribe, and OBC. It shows that majority of the population belongs to UR category which is around 61%, SC population is about 18%, ST population holds 10% and OBC population holds 12%.

Table No.3.2: Caste Composition

Categories	No	(%)
Unreserved	37	61%
SC	11	18%
ST	6	10%
OBC	7	12%
Source: Field survey ,2023		

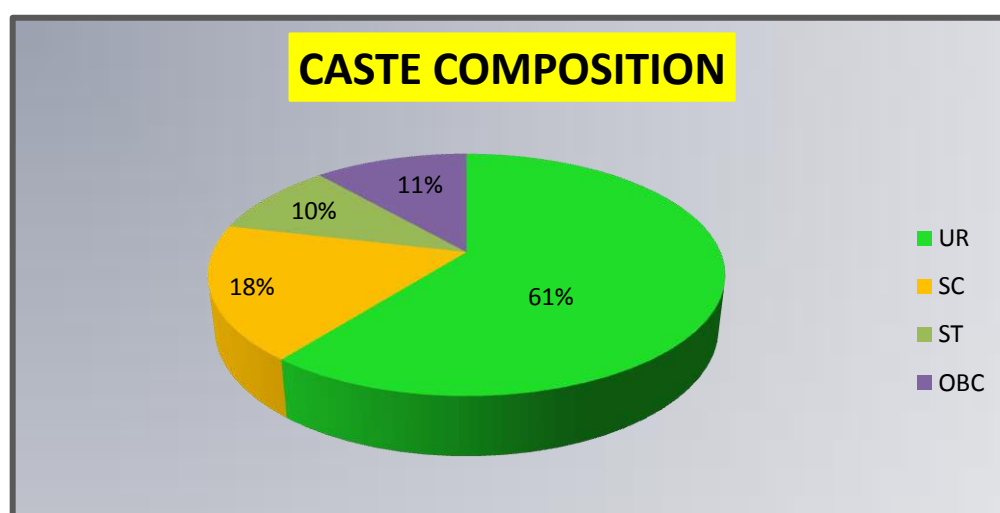


Fig No. 3.2:Caste Composition

3.4.Poverty status:

Poverty is a state or condition in which a person or community lacks the financial resources and essentials for a minimum standard of living. Poverty means that the income level from employment is so low that basic human needs can't be met.

According to the field survey, out of the 60 households in the study area, 72% APL households and 28% BPL Households belong in this area.

Table No.3.3: Poverty status

Poverty status	Number	Percentage(%)
APL	44	72%
BPL	17	28%
Source : Field survey ,2023		

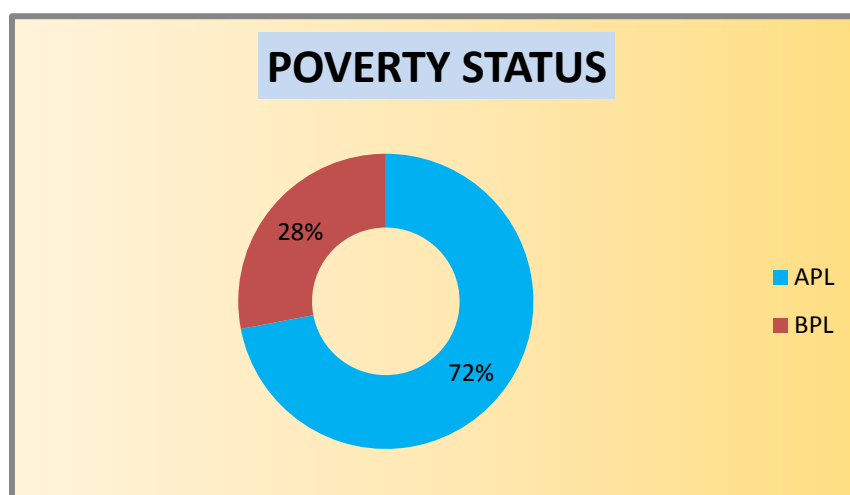


Fig No.3.3:Poverty Status

3.5. Level of education:

Institute of Education, Haldia is one of the institutions under the aegis of Indian Centre for Advancement of Research and Education. Born 2004-2005, it is yet to grow out of its toddling infancy although, academically speaking, it has already acquired the excellence, alacrity and flamboyance of youth. Haldia is affiliated to Vidyasagar University and recognized by the National Council for Teacher Education. According to the survey data most of the people are educated upto higher secondary level(31.3%).25% people are graduate degree holder.and 18.4 % people hold post graduate degree.

Table No.3.4: Level of education		
Level of education	Number	Percentage(%)
Primary	17	7.4%
Secondary	29	13%
Higher Secondary	72	31.3%
Graduate	57	25%
Post Graduate	42	18.3%
Other	13	6%
Source: Field survey , 2023		

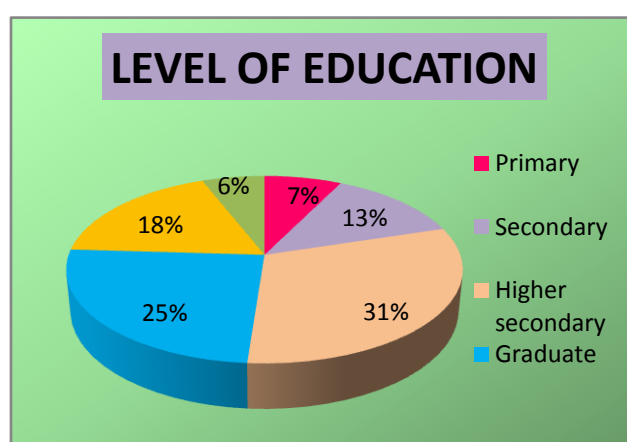


Fig No.3.4: Level of education

3.6. Marital status:

Civil status, or **marital status**, are the distinct options that describe a person's relationship with a significant other married single, divorced and widowed are examples of civil status. According to the field survey most of the people is married (52.5%) followed by the unmarried people is 41% and widow people are 6.25%.

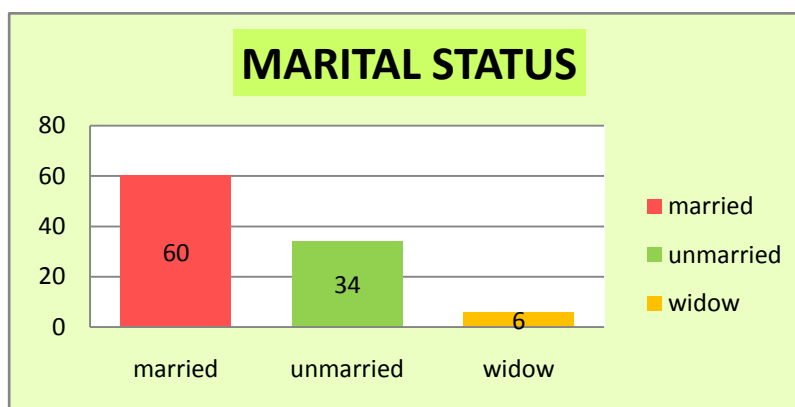


Fig No.3.5: Marital Status

3.7.Occupation pattern:

The occupational structure is another important indicator of the demographic status of any area. Depending on the plenty of resources and occupational opportunities number of people are concentrated in the coastal areas. In this study, the diversified occupational structures have been observed in the different service sectors. The most diversified occupational structure is found in the Haldia urban centre due to its variety of economic activities related to the port, industries, and urban activities along with the agricultural activities. A large number of the people involved in the port-industry based activities, transport sector and real estate business. According to the survey data most of the people are engaged in government job (42%), and moderate number of people are engaged in private sector (31%) and some people are involved in trade and business (16%). people are involved in trade and business .

Table No.3.5: Occupation pattern

Occupation pattern	No	Percentage
Skilled wage workers	6	6%
Unskilled wage workers	4	4%
Salaried employment in government	42	42%
Salaried employment in private sector	31	31%
Trade and business	16	16%
Source : Field Survey , 2023		

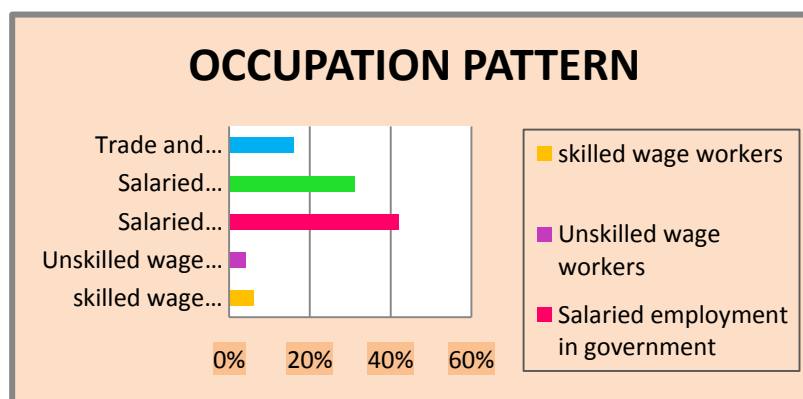


Fig No.3.6: Occupation pattern

3.8. OWNERSHIP OF HOUSE:

The pattern of house ownership in India varies significantly in urban areas. According to the field survey 56% of the total households in study area has their own houses, most of the people do not have their own houses and the percentages of them are 44%.

Table No.3.6: Ownership of House

Owner of house	Number	Percentage(%)
Rental	27	44%
Own	34	56%

Sourcr:Field Survey , 2023

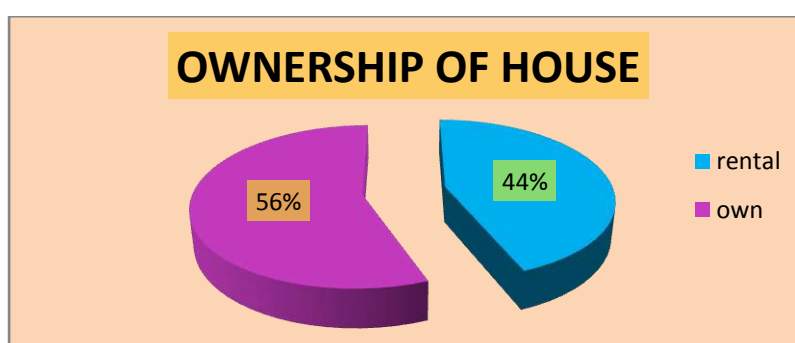


Fig No.3.7: Ownership of House

3.9. Monthly family income:

According to field survey , in the study area most of the people spend their life in a luxurious way and they belonged from a higher income cohorts(High-Middle and Rich).Only 7% families have an income of less than Rs20,000 per month i.e belong to a lowest income cohort.

Table No.3.7: Monthly Family income

Monthly family income(in rupees)	Number	Percentage(%)
<5000	-	-
5000-10000	4	7%
10000-20000	8	13%
20000-30000	20	33%
>30000	29	48%

Source: Field survey ,2023

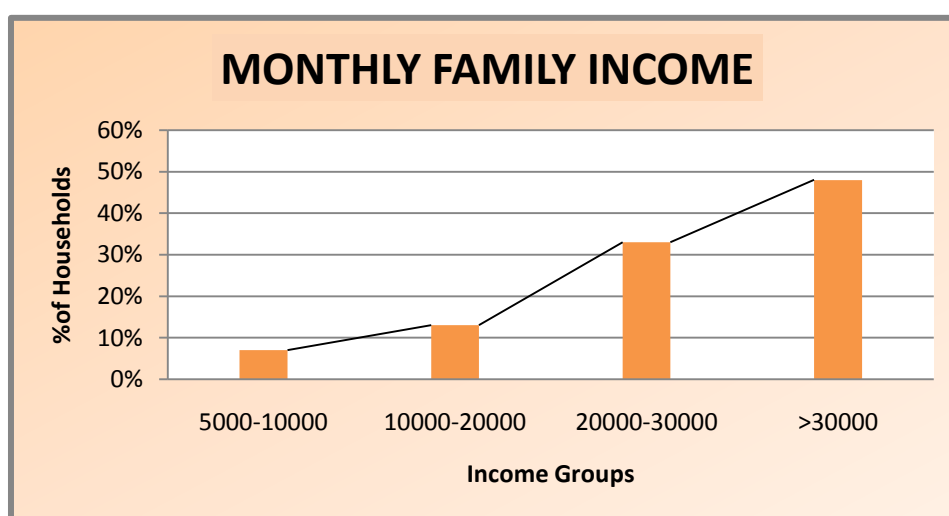


Fig No.3.8:Monthly Family Income

CHAPTER-IV

SOLID WASTE MANAGEMENT

4.1.Introduction:

Land-filling is perhaps the oldest method in coordinated waste management. Until the 1970s, land-filling was practiced as an unceremonious waste disposal in any convenient location without taking into account health, welfare, environmental conservation or cost efficiency. Yet now the situation has shifted not because of the understanding and value of the handling of waste, but also other matters. Availability of landfill capacity in urban environments is getting frightening and a very bad problem. The problem causes political incentive to redirect waste to many other methods for treatment. Currently, the trend of sophisticated waste management schemes of countries is to reduce waste that ends up in landfills. In Hong Kong, for example, the initiative's driving force was the lack of landfill capacity, instead of resource use.

In relation to recycling, the growing waste-to-energy systems and advances in technologies and emissions reduction tools further decreased the volumes entering landfills primarily in Europe, while in the future it may be a model for other nations. It refers in particular to those regions where seeking suitable landfill capacity is a problem and those regions where these solutions are still not completely applied. This should also be anticipated that in the near future, better and environmentally efficient product design will be possible and will transform the face of energy harvesting systems. Given risks, land-filling is unavoidable and the final inert fraction always has to be buried. The construction, maintenance and management of landfills is being constantly investigated and new methods are being implemented to reduce air and water emissions.

The accumulation of landfill gas offers room for green-house gas (GHG) reduction. Yet the economics of extracting waste and recycling electricity remain to be convincingly illustrated. Since, due to partial oxidation in the landfill, the average methane content of landfill gas is around fifty percentage and most of the gas produced in landfills is lost to the environment, even with an efficient gas collection system. This low methane level in the landfill gas necessitates vital upgrade activities that jeopardize the advantages of collecting landfill gas.

Solid waste management is a term that refers to the storage and disposal process for solid wastes. This also provides recycled options for things that don't belong to trash or waste. As long as humans have lived in villages and rural areas, the problem has been trash or solid waste. The solid waste management used in solid, liquid, and gaseous waste disposal. It is known as a realistic method of disposal of certain toxic waste products (such as medical organic waste). Incineration is a controversial waste disposal process, owing to concerns including gaseous pollutant pollution. The most significant justification for recycling waste is

to protect the environment and the public health. Garbage and waste can pollute the air and water. It is also recognized that decaying garbage releases poisonous gases that interact with the atmospheric air and can cause respiratory issues in people.

Categorization and comparison of solid industrial waste based on the thermo-chemical properties. Municipal solid waste (MSW) has usually been divided into six categories: food residues, wood waste, pulp, textiles, plastics, and rubber. Products may be further divided into subgroups within each grouping. Properly regulated waste will support the society economically and socially through recycling and, where possible, reusing waste. Solid waste treatment main elements include on-site managing, processing and storing; garbage collection; waste management transfer and transport, reduction and final disposal. Solid waste involves trash, building rubble, industrial refuse, sewage or waste disposal sludge or air quality control plants, among the other recycled items.



Domestic waste



Industrial waste



Agricultural waste



E-waste

Plate No.:4.1: Types of waste

The practices related to urban solid waste management from the point of generation before final disposal can be divided into the six functional components.

- **Generation of waste**
- **Storage of waste**
- **Collection of waste**
- **Transportation of waste**
- **Process of segregation**
- **Disposal of waste**

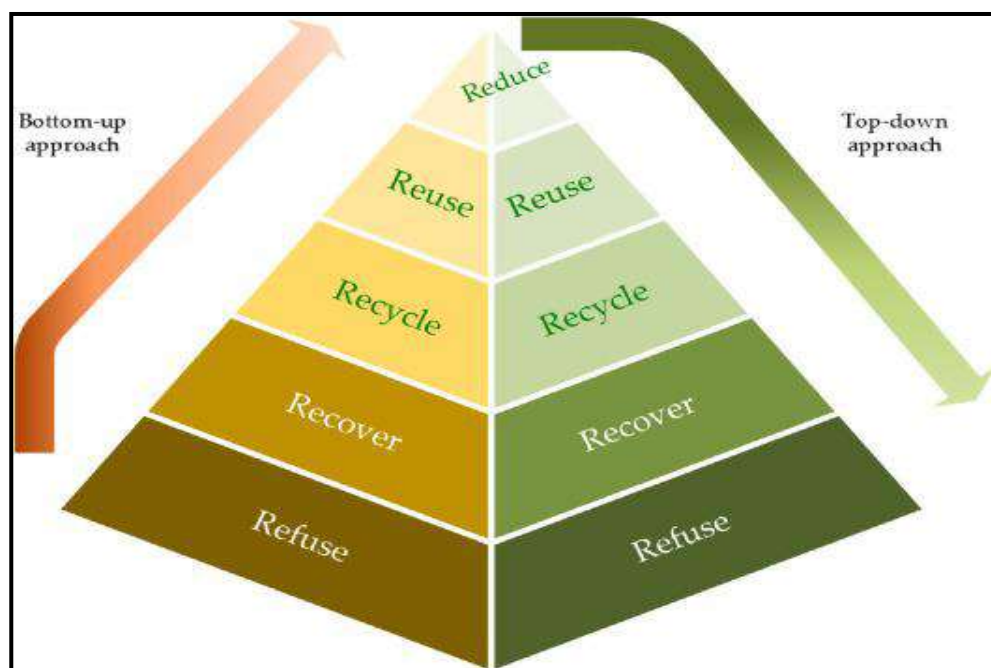


Fig No.4.1: Waste Management Hierarchy



Waste generation



Waste storage



Waste collection



Waste segregation



Waste disposal

Plate No.:4.2:Solid waste management

4.2. Waste management in India

Solid waste policy in our country conveys the responsibilities and duties for hygienic waste management system for cities and citizen of our country. This policy formulated in 2000 September. Based on the March 1999 Report (1) of the solid waste management committee in class 1 cities of India to the Supreme Court, which urged statutory bodies to comply with reports suggestions and recommendations. There also serve as a guide on how to comply with the municipal solid waste rules. At present, India is one of the tops places in the world where most garbage is disposed. Indian soil and land contain poisons and dangerous materials, like chemicals and plastics. These report and the rules and regulations, based on the principle that the best to keep cities clean and neat not to dirty them at all. So normally towns with street waste bins will generally become clean and neat. Authorities recommend daily doorstep wet waste collection especially food waste for composting it, which consider as a good method for India.

4.3. Status of Waste Management System in Haldia:

Supreme court of India verdict that in India all the local government should prepare proper facilities for managing waste generated within their limits if population strength of over ten lakh. And by December 31, 2003 Supreme court also conveyed that waste management to be in placed in municipalities.

Regarding the waste management only few state in the country have taken some measures to address this issue. Presently Bio-medical wastes(BMW) are generated from health cativities and have the potential to spread diseases. The Government of India regulates BMW as per the provisions of the Bio-medical wastes management rules, 2016 and its amendment 2018 which includes storage, treatment and disposal of BMWs (segregated into incinerable and autoclavable) from their member HCEs and transport the waste to their treatment and disposal facilities.



Plate No.4.3: Haldia Municipality

4.4.Negative Impact of Waste Management

The failure to adopt proper method of waste management process creates lot of problem Like:

- **Environmental:** Ground water contamination will take place due to poorly maintained land.
- **Public health:** If wastes are not properly managed it will lead to continuous outbreaks of communication diseases such malaria, dengue fever, chickungunia etc. Even labour productivity and economy gets affected with continuous outbreaks of communication diseases
- **Economic effect:** It will negatively affect tourism industry.
In Indian cities normally waste is thrown in nearby vacant area, street etc. Because of it street environment becomes ugly and unhygienic. Even in case of regular cleaning municipal / Panchayat or city cannot be keep clean for 2-3 hours. If there is open drains or large drains passing a cross the city, people have a tendency to throw waste and through that way there drains is reduced because of continuous dumping



Plate No.4.4: Impact of waste on environment

4.5.Method of existing Waste Management :

● **Landfill:** It is engineered method to dispose hazardous and solid waste. In this process soils waste will place in the landfill. Then the waste will be covered every day with a layer of compacted soil

Incineration: This process is a controlled combustion of waste and then it becomes combustible matter like ash, waste gas, and heat. The generated waste gases are then treated and released.

Waste compaction: Cans and plastic bottles like waste items are compacted into blocks and sent for recycling. This method prevents the oxidation of metals and reduces air space need, thus making transportation and positioning easy.

Bio-gas: Bio degradable waste, like food waste, animal waste, and waste from food packing units etc. are sent to plants. With the help of bacteria, fungi, and other biological means they are converted to biogas by degradation in bio degradation plants.



Landfill



Incineration



Bio-gass



Waste compaction

Plate No.4.5:Methods of waste management

4.2.Sources of waste:

Waste is generated basically from every aspect, ranging from households, industries, healthcare facilities, markets, schools, abattoirs and naturally by the environment (e g volcanic ash) etc. These are known as the sources of waste. Sources of waste can be broadly classified into four types: Industrial, Commercial, Domestic, and Agricultural. According to the survey data two major types source of waste are found i.e. commercial waste which is about 36.1% and domestic or household waste which is about 64% .

Table No.4.1: Sources of waste

Source of waste	No	Percentage
Household Waste	39	64%
Commercial Waste	22	36.1%

Source: Field survey,2023

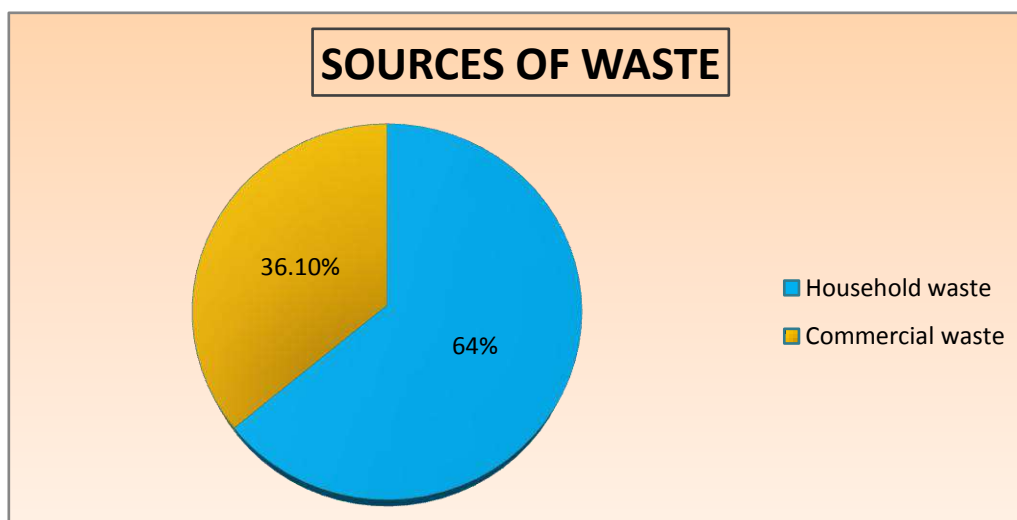


Fig No. 4.2: Sources of waste

4.3. Types of waste:

It is important to understand how much and what types of waste are generated – and where. This can help governments create more effective waste management policies and plans for the local context. According to the survey data, the highest amount of waste which is found is food waste which is about 26.13% followed by plastics 22.1% and paper waste which is about 21.62%. Small amount of boxes(9%), glass(4.5%) and electronics waste (4.5%) are also found.

Table No.4.2: Types of waste

Types	No	Percentages(%)
Boxes	20	9%
Plastics	49	22.1%
Paper	48	21.62%
Glass	27	12.16%
Tins	10	4.5%
Electronics	10	4.5%
Food	58	26.13%

Source: Field survey, 2023

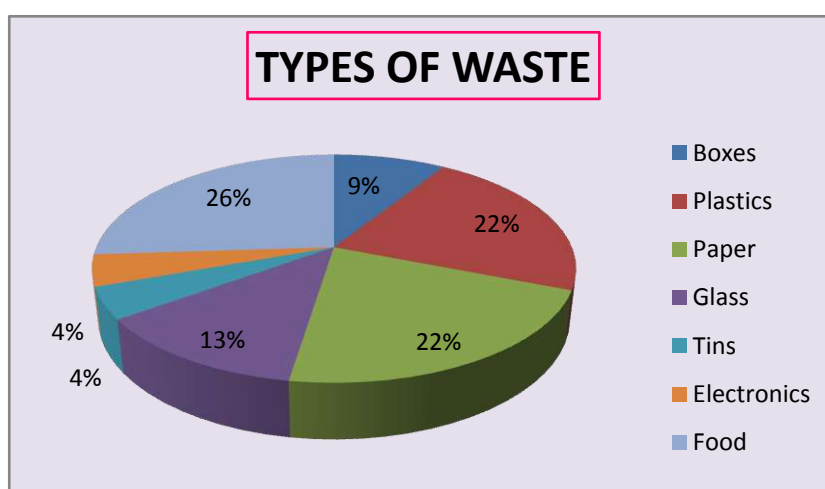


Fig No.4.3: Types of waste

4.5. Segregation of waste:

Waste segregation facilitates the process of reuse, recycling, and recovery of waste. Segregating waste can improve the recycling process. According to the survey data waste segregation has done in categories i.e. Bio-Degradable and Non-Biodegradable. The amount of bio-degradable waste is 56.84% % and the amount of non-biodegradable waste is 43.15% .

Table No.4.3:Segregation of waste		
Waste segregation	No	Percentage(%)
Bio-Degradable	54	56.84%
Non-biodegradable	41	43.15%
Source: Field survey ,2023		

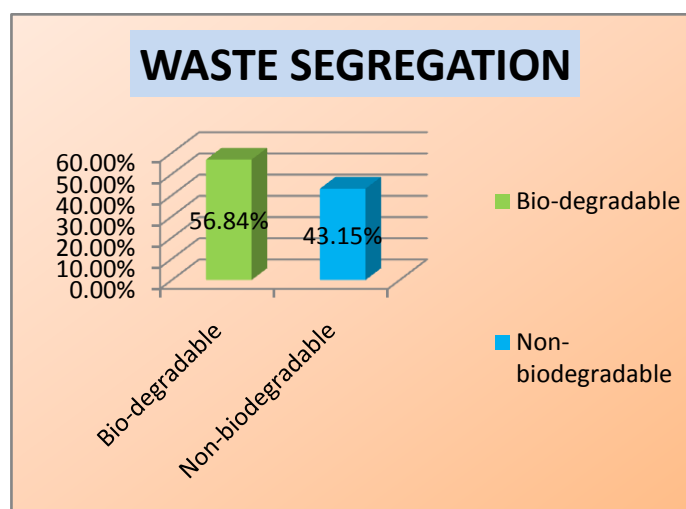


Fig No 4.4: Waste segregation

4.6. Household waste disposal

A waste container, also known as a dustbin, garbage can, and trash can is a type of container that is usually made out of metal or plastic. According to the field survey people of the study area have used various of containers to dispose off their household waste. Maximum number of people(47.62%) uses rubbish bins to dispose solid waste.

Table No.4.4:Disposal of waste		
Waste container	No	Percentage(%)
Plastic bag	11	17.46%
Cardboard	13	20.63%
Rubbish bins	30	47.62%
No storage	5	7.94%
Direct dispose to dump	4	6.35%
Source:Field Survey,2023		

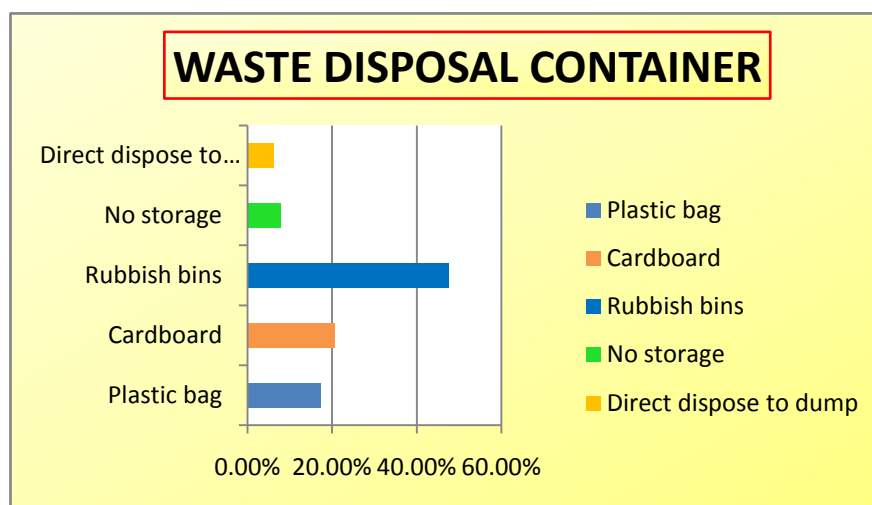


Fig No.4.5: Waste disposal container

4.7. Dispose of household waste:

Duration of household waste disposal is an important factors which helps to identify the consciousness of people about waste management and on the basis of which the government or municipality can take the further steps. According to the survey data, about 87% of household dispose off their waste on daily bases .On the other hand some people are also there who are not aware about the situation and the percentage of it is 10 % and 8.3%. The majority of the people dispose the wastes daily. If the wastes are not disposing daily the management of it will become difficult. It is better to dispose a small quantity of waste daily than the large quantity of waste disposal monthly or occasionally

Table No.4.5:Duration of waste disposal

Duration	No	Percentage
Everyday	49	87%
ONCE EVERY THREE DAYS	6	10%
ONCE EVERY TWO DAYS	5	8.3%

Source:Field survey,2023

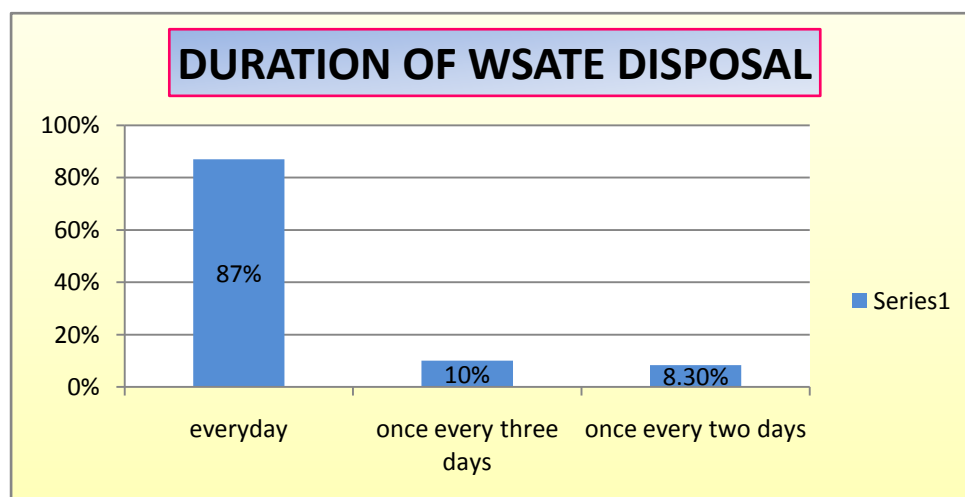


Fig No.4.6:Duration of waste disposal

4.8. Alternatives of household waste

we are generating more garbage and we don't know what to do with it. Ineffective or irresponsible disposal of this waste can pollute the environment and pose a public health risk. We are running out of space in existing landfills. Citizens are discovering that there is no easy way to get rid of the garbage they once assumed could be buried or burned and forgotten.. Most industrial, commercial, and household waste is now being placed in landfills or surface impoundments. Waste treated in this manner may contaminate groundwater, rivers, and streams. When waste is burned, it releases hazardous gases into the air and leaves toxic residues in the form of ash. According to the survey data , four types of alternatives have been found where collection of waste contribute highest amount(42%), animal waste and reuse of waste is seen in moderate amount i.e.35.5% and 12.90% and compost of waste shows 9.7%

Table No.4.6: alternatives of household waste

Alternatives	No	Percentage
Collection	13	42%
Animal waste	11	35.5%
Reuse	4	12.90%
Compost	3	9.7%

Source: Field Survey ,2023

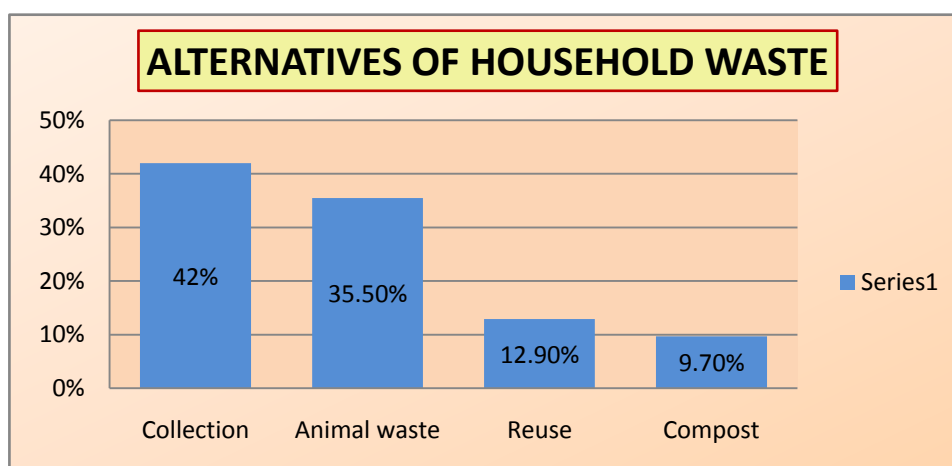


Fig No.4.7: Alternatives of household waste

4.9. Collection of waste through municipality

Collection of waste by Municipality plays an important role in waste management. It shows the systematic approach of corporation. According to the survey data, it is found that municipality facility is given to all the wards of Haldia and there is a 100% achievement in everyday waste collection.



Fig No.4.8: Collection of MSW

4.9.1. Level of satisfaction

In case of MSW management measurement of level of satisfaction is highly required for the further development of waste management. According to the survey data, level of satisfaction are majorly categorized into four parts. The data shows that level of satisfaction is about 50%, moderate level of satisfaction is 24.2%, below moderate level of satisfaction is 14.5% and 11.3% people are not satisfied.

Table No.4.7: Level of satisfaction

Level of satisfaction	No	Percentage(%)
Very good	15	24.2%
Good	31	50%
Ok	7	11.3%
Not satisfy	9	14.5%

Source: Field survey, 2023

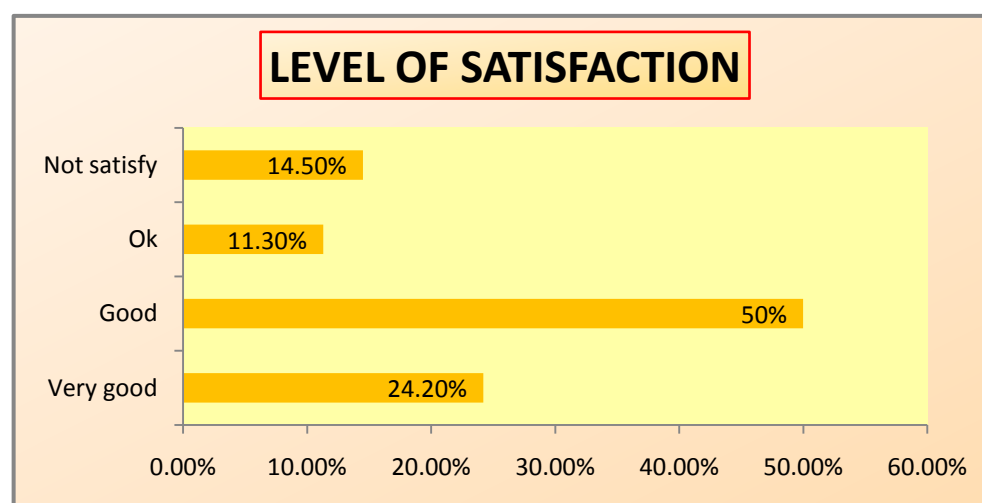


Fig No.4.9: Level of satisfaction

4.9.2. Problems faced by people due to MSW

There may be varieties of problems related to waste management which people have to face in their daily lives. This issues can sometimes makes our life quite difficult. According to the survey data, the people of study area faces some issues which is needed to be resolved. Here lots of people give response about The problem which is caused by soild waste is dustbin area smells badly which effect the environment as well as their health.

Table No.4.8:Problems faced by people		
Problems	No	Percentage(%)
NO DUSTBIN IN THE AREA	9	14.3%
DUSTBIN IS FAR AWAY	12	19.04%
DUSTBIN IS NOT AT RIGHT PLACE	8	12.69%
IT IS SMELLY NEAR DUSTBINS	34	53.96%
Source: Field Survey ,2023		

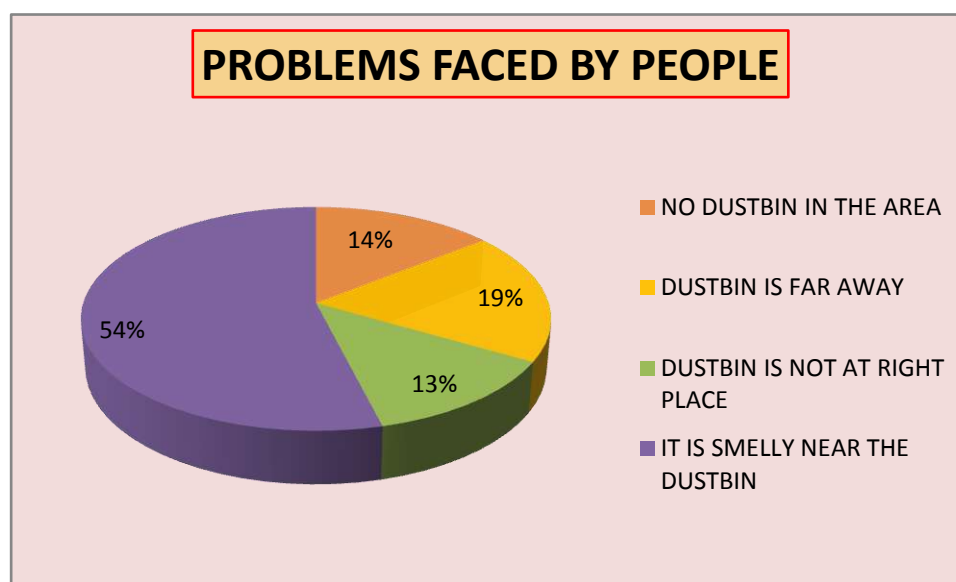


Fig No.4.9.1:Problems faced by people

4.9.3. Environmental issues

All together, the amount of waste generated affects the environment in multiple ways: its contribution to the worsening climate crisis, its negative impact on wildlife and the natural environment, and its detriment to our very own public health. According to the survey data, it is found that solid waste has a high impact on human health(26.81%).and besides it also affect on environment and hamper its natural beauty.

Tabele No.4.9:Environmental issues caused by solid waste

Issues	No	Percentages(%)
Create nausea	48	26.81%
Waste are left around dustbins	34	18.99%
Waste on drains	28	15.64%
Waste left on road	28	15.64%
Blocking drain	26	14.52%
Blocking line	15	8.37%

Source:Field survey ,2023

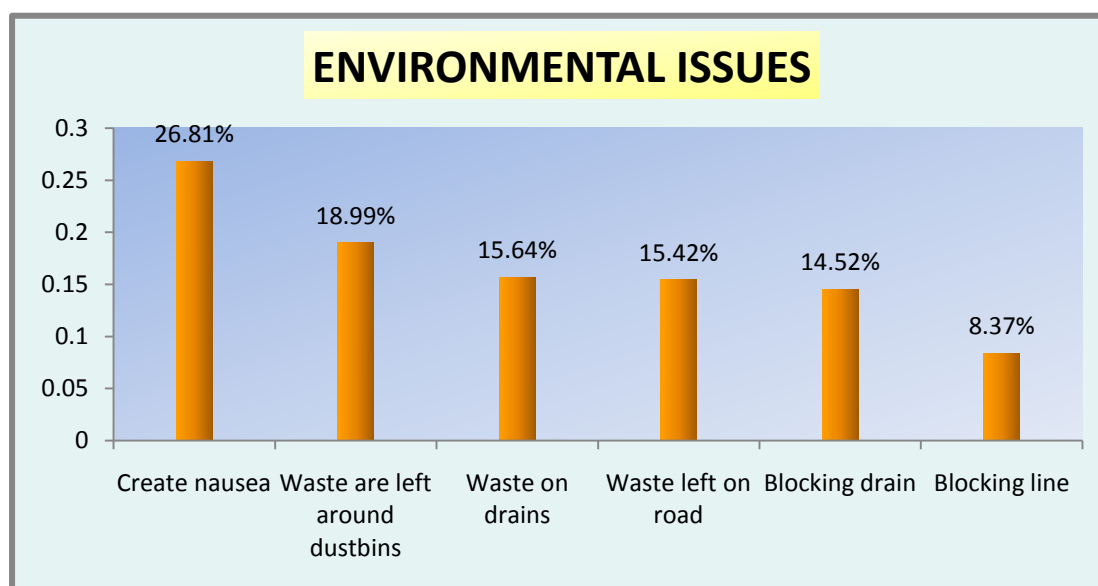


Fig No.4.9.2: Environmental issues

4.9.4. Improper waste disposal issues:

Waste disposal is one of the most important industries in the world. Without waste disposal, the massive production industries produce too much and quickly destroy the environment. This is apparent when you consider how improper waste disposal affects the environment. According to the field survey, the solid waste creates bad impact on environment but also blocking drain(14.83%),blocking lines(7.97%),spread odour(23.93%) and mosquito(32.45%).

Table No.4.9.1:Improper waste disposal issues

Issues	No	Percentages(%)
BLOCKING DRAIN	26	14.83%
BLOCKING LINE	15	7.97%
SPREAD ODOUR	45	23.93%
MOSQUITO	41	21.80%
DETORINATION OF ENVI.	61	32.45%

Source: Field Survey,2023

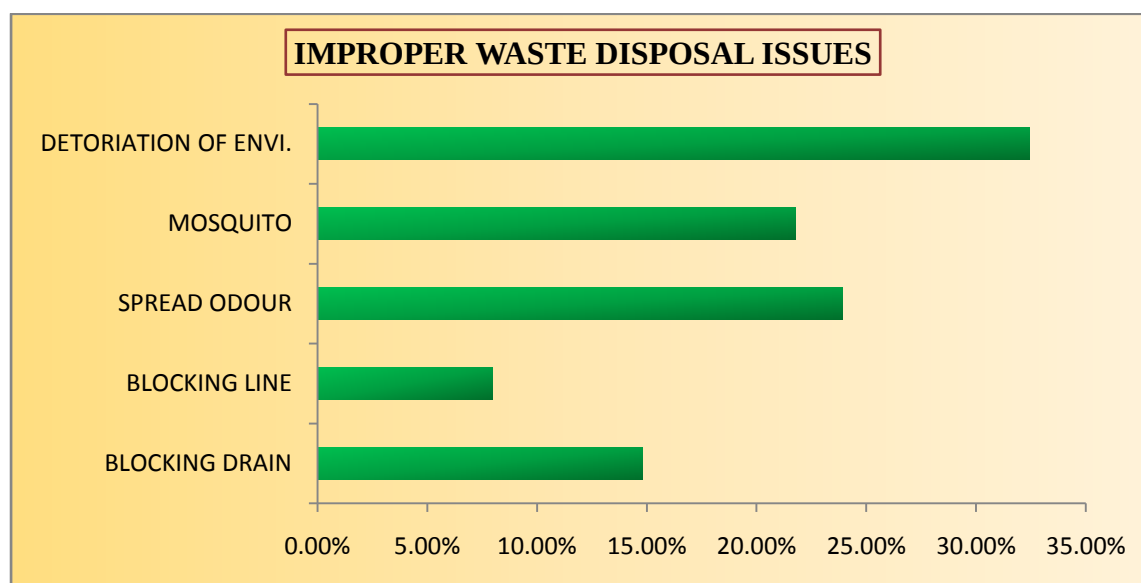


Fig No.4.9.3: Improper waste disposal issues

6.4. Environmental pollution:

Solid waste pollution is the presence or excessive presence of solid wastes in the environment (air, water, soil), making it less fit or unfit for living beings. Solid wastes are the discarded, abandoned, useless or unwanted solid materials generated in residential, industrial, commercial, construction and hospital areas. Solid waste includes not only solid but semi-solid, semi-liquid, solid in liquid wastes too. Colloquially, terms like garbage, rubbish, litter are used synonymously with solid wastes. The survey data shows that due to solid waste water pollution shows high percentages(63.54%), and ,moderate level of soil pollution(20.83%) and air pollution(15.62%).

Table No.4.9.2:Environmental pollution

Pollution	No	Percentages(%)
Air	15	15.62%
Water	61	63.54%
soil	20	20.83%
Source:Field survey ,2023		

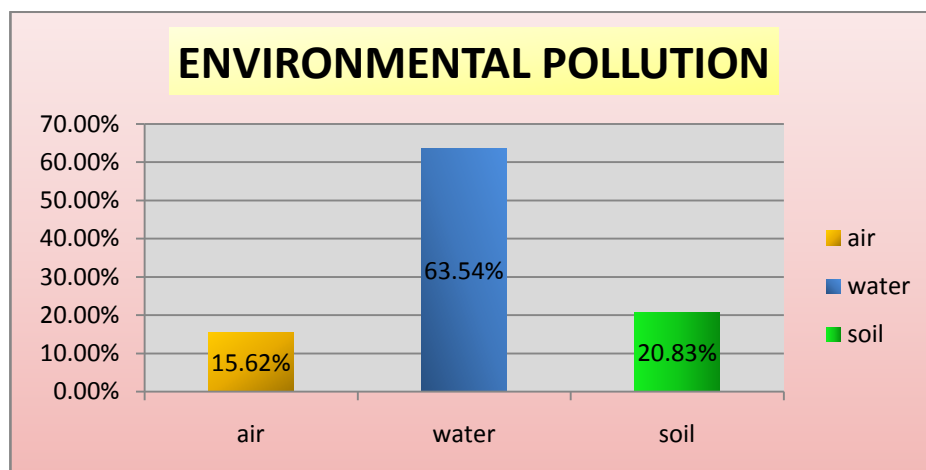


Fig No.4.9.4: Environmental pollution



Water pollution



Air pollution



Soil erosion

Plate no.4.6:Environmental pollution caused by solid waste

6.5. Diseases caused by SW:

Health and safety issues also arise from improper MSWM. Insect and rodent vectors are attracted to the waste and can spread diseases such as cholera and dengue fever. Using water polluted by MSW for bathing, food irrigation and drinking water can also expose individuals to disease organisms and other contaminants According to the survey data, two types of diseases majorly found in study area i.e. diarrhea (47.62%) and dengue (52.38%).

Table No.4.9.5: Diseases caused by SW

Diseases	No	Percentages(%)
Diahsrea	50	47.62%
Dengue	55	52.38%
Source: Field survey ,2023		

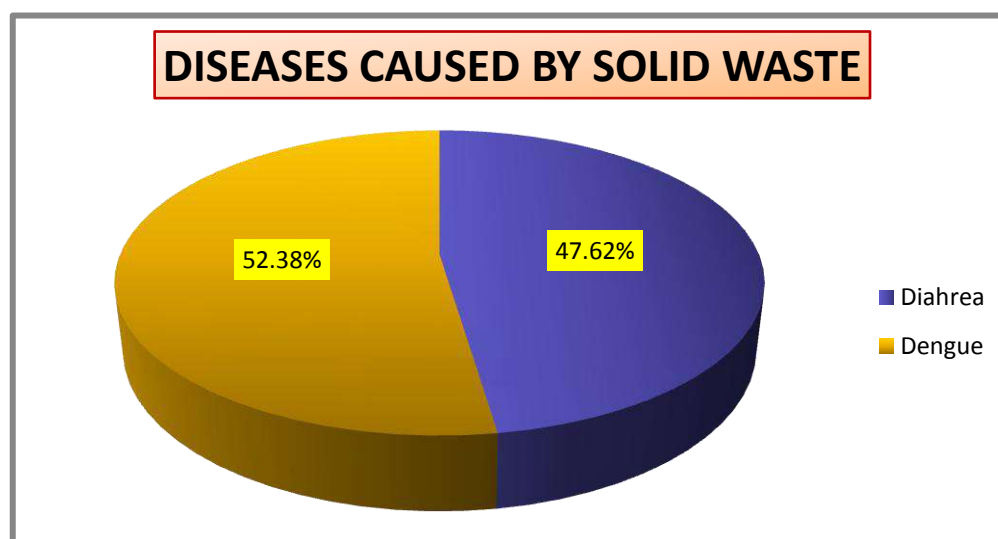


Fig No.4.9.3: Disease caused by solid waste

CHAPTER-V

5.1. Major findings

1. From the map of the study area we can see that the average elevation of the entire region is 8 meters.
2. The trends of population have been decreased from 2001-2011 and the percentage of growth has decreased upto 1.70.
3. The survey data also indicates that male child population (51%) is higher than the female child population(49%).
4. The data on age composition reveals that number of middle age groups is high(20.60%) which indicates that dependency ratio is also low.
5. The data on literacy rate shows that male literacy(93.26%) is higher than female literacy(83.35%).
6. Poverty status is also very low in the study area because 72% household are APL card holder and remaining 28% is BPL card holder.
7. Most of the people are educated upto higher secondary level(31.3%).while analyzing the marital status 52.5% people are married and 4% are unmarried.
8. Most of the people are living in the rental houses(44%) in spite of their high monthly income because they are not local,they are migrant.
9. In the study area the major source of waste is the household waste(64%).
10. In the composition of waste plastics (22.1%) are highly concentrated .
11. People of the study area are aware about the storage of waste and they generally uses rubbish bins(47.62%).and people dispose off waste regularly(87%).
12. In the study area municipal board has achieved great success(100%) for providing waste collection system in every area.
13. In the survey area majority of people suffers in dengue(38%).

5.2. CONCLUSION

Under the study of field survey of Haldia municipality area we get information about socio-economic status and also demographic profile from secondary data sources. Through this study we got information about 60 household in the study area. Most of the people are engaged in government private and trade and business. The standard of living is also good (72%). The standard of education is also good as most of the people are higher secondary (31.3%). Apart from this in the study area the Municipal Board has achieved a great success in providing waste collection facility to all the wards. In spite of these the municipal board remains behind in maintaining proper Solid Waste Management Techniques. 38% of people suffer in the area which indicates that maintenance is low. Lack of dustbin and odour problems are highly observed in the area. Being heavily dependent on the state governments for funding, these local bodies lack the resources to acquire new land or obtain the technologies required for SWM. Moreover, waste pickers, who are key workers in the industry, lack legal status and protection, and are hardly effective or capable of enforcing systems in the collection and segregation of waste. For the situation to improve, institutional and financial issues must be addressed on priority. In the study area, to enhance the efficiency of SWM local people participation should be promoted, especially in source segregation and treatment processes. The policy agenda for sustainable SWM must drive behavioural change amongst people, elected representatives and decision-makers, to minimise wastage and littering, and increase reuse and recycling. Community awareness and a change in people's attitudes towards solid waste and their disposal can go a long way in improving India's SWM system.

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