# SOLID WASTE MANAGEMENT IN RATNANAGAR MUNICIPALITY -1 CHITWAN DISTRICT

A Thesis Submitted to:

**The Department of Rural Development,**

**Saptagandaki Multiple Campus**

**Bharatpur, Chitwan**

**In Partial Fulfillment of the Requirements for the Degree of Master of Arts (M.A.)**

**in**

**Rural Development**

**By**

**SATISH KUMAR GUPTA**

**Saptagandaki Multiple Campus, Bharatpur, Chitwan**

**T.U. Reg. No. 9-2-241-60-2005**

**Exam Roll No. 2400027**

**April, 2017**

# DECLARATION

I hereby declare that the thesis entitled **Solid Waste Management in Ratnanagar Municipality -1 Chitwan District** submitted to Saptagandaki Multiple Campus, Bharatpur Chitwan, is entirely my original work prepared under the guidance and supervision of my supervisor. I have made due acknowledgment to all ideas and information borrowed from different sources in the course of preparing this thesis. The result of this thesis have not been presented or submitted anywhere else for award of any degree or for any other purpose. I assure that no part of the content of this thesis has been published in any form before.

Satish Kumar Gupta

# RECOMMENDATION LETTER

The thesis entitled **Solid Waste Management in Ratnanagar Municipality -1 Chitwan District** has been prepared by **Satish Kumar Gupta** under my guidance and supervision. I, hereby forward this thesis to the evaluation committee for final evaluation and approval.

_____

Mr. Ram Prasad Tiwari
(Lecturer)
Department of Rural Development,
Saptagandaki Multiple Campus, Bharartpur, Chitwan

Date: ----------

# ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to Mr. Ram Prasad Tiwari as my guide who has not only inspired me but also provided constructive suggestions and outstanding guidance to prepare my Thesis successfully.

My special thanks go to Mr. Khem Narayan Upadhaya, Campus chief Saptagandaki multiple campus, Bharatpur, Chitwan. Likewise, I would like to thank all my lecturers of the Rural Development. Their valuable suggestions and comment help me to make this thesis. I also express my heartfelt thanks to my parents Gopal Gupta and late Sunita Devi who always encouraged me to complete my education giving economical support, for making my thesis presentable. There are many others, who have helped me undertake this study; I express my sincere thanks to all of them.

Finally, I would like to express grateful thank to all the respondents who helped me to provide valuable information which help me to complete this thesis. I like to give thank to Sagar Lamichhane who type this thesis. At last I acknowledged to all the writers and researchers whose idea and information were used in this and librarians who help me to provide secondary sources which used in this thesis.

Satish Kumar Gupta

# ABSTRACT

The thesis entitled "Solid Waste Management in Ratnanagar Municipality -1 Chitwan District" highlights the situation of solid waste management practices in study area. General objective of this study is to analyze the situation of solid waste management in Ratnanagar municipality ward no 1. Specific objectives are to examine the current solid waste management system in the study area. Both analytical and descriptive research design were used to complete of this study. Quantitative data were analyzed by using analytical research design and qualitative data were analyzed by using qualitative research design and find out the situation of solid waste management situation of the study area. Ratnanagar municipality ward no 1 is *Tandi Bazzar* area is the sample site of this study. Total population of the wards is 4999 (CBS Report, 2011). In main highway lines there are 201 households among them 25% households (50) were taken as sample household. From each household single individual was taken for interview by busing random sampling method. The present study was based both primary and secondary data. Secondary data were used in literature review and that were collected through library study method and books, article, journal, previous thesis are used as the main sources of secondary data. Primary data were collected from the field by using various data collection techniques such as questionnaires and observation.

Solid wastes are a growing environmental problem in the study area. Increase in population along with the rapid urbanization has led to the increase in waste generation rate in the study area. Furthermore, change in living standard of the people and change in food habit have increased the rate of inorganic waste. All these have added to the problems in solid waste management which is a global issue. The major sources of solid waste in Ratnanagar municipality are municipal, domestic, commercial and agricultural, which consists of both organic and inorganic. The total waste generated in Study area has been increasing day by day.

The citizen should be encouraged by the authority for the segregation of wastes at household level. They shall promote recycling or reuse of segregated materials. Waste minimization efforts should be motivated at the primary and secondary levels of waste collection. The citizen should be encouraged by the authority for the segregation of

waste at household level and for composting of waste for stabilization of wastes. The concerned authorities should adopt suitable technology, a combination of such technologies to make use of wastes so as to minimum burden on landfill. Landfill should be restricted to non-biodegradable and other wastes that are not suitable either for recycling or for biological processing. The concerned authority has to appoint more employees in order to extend their service area. Community participation should be increased and local NGOs should be mobilized in solid waste management. Gap between staffs within the municipality should be omitted so that ongoing event inside the municipality could be easily known and should take responsibility on the people's work inside municipality i.e. institutional strengthen should be establish.

# TABLE OF CONTENTS

Page No.

# LIST OF TABLES

# LIST OF THE FIGURES

# ACRONYMS

| | |
|---|---|
| CBOS | : Community Based Organization |
| CBS | : Central Bureau Of Statistics |
| EIA | : Environmental Impact Assessment |
| GoN | : Government of Nepal |
| IEE | : Initial Environmental Examination |
| NGO | : Non Government Organization |
| SW | : Solid Waste |
| SWMRMC | : Solid Waste Management and Resource Mobilization Centre |

# CHAPTER I

# INTRODUCTION

## 1.1 Background of the Study

Environmental issues are broadly classified into two groups (i) those arising from industrialization and urbanization such as pollution and solid waste (‘brown’ environmental issue) and (ii) natural resource based problem such as deforestation, land degradation and bio-diversity loss (‘green’ environmental issue). Solid waste belongs to the first category that is “brown” environmental issue, because it arises from industrialization and urbanization.

Solid waste is the combination of two words and has a single meaning. In the past, the waste generated had not been much of a problem, but at present the term solid waste has emerged as a great problem, the problem that has a direct bearing on the environment of any place. The waste has always been there since the existence of human society as the waste arises from the human activities. Solid waste includes the waste resulting from human being and animal activities that are discarded as useless or unwanted or waste is the material which is not considered useful by its owner. It is an unwanted material of an individual and due to this, waste is not of his/her concern. So, it is the major problem in the environmental sanitation. The accumulation of solid waste in the environment is hazardous to health. Not only that, solid waste are the pollutants to soil, air and water with important implication for public health. They are also aesthetic or visual pollutants. They are primarily urban problems of the world. In the past, little was wasted; almost everything was reused, recycled or assimilated into soil. Even today, in small rural communities, nature usually takes care of waste. With a few localized exceptions, the dumping of organic waste around houses in rural communities causes few problems; natural systems are able to absorb it and recycle its nutrients. Concentration of people in urban areas with very population densities, use of non-biodegradable materials, new sources of waste (shops, institutions and factories) and the maintenance of traditional habits and attitudes, appropriate to rural but not to urban living, have disturbed this balance. In towns, the dumping of waste around houses results in an accumulation of health and environmental problems.

Solid waste includes waste resulting from human activities and animal activities. According to Pandey all living organisms during their live, consume water, food and other materials. While consuming these things, organisms produce waste. These wastes can be classified as solid waste, liquid waste and gaseous waste" (Pandey2004). The term solid waste has recently been brought into use in order to differentiate between the present day broad concept involving waste management and the previous emphasis on garbage and other house hold wastes. Solid waste is now generally taken to include all non-gaseous. Non-liquid wastes resulting from the wide range of community, industrial, commercial and agricultural activities. Basically solid waste means waste that is solid in form and is regarded as waste in its present condition. It can be a small pace of paper to a thick book or something else.

In the Kathmandu valley, numerous uncontrolled waste dumps developed close proximity to dwellings. These heaps transformed entire urban areas into slums, marred the historical beauty of the towns, and most significant, constituted a massive threat to public health (Thapa, 2008).

Waste management in Nepal has always been considered the responsibility of untouchable castes. Traditionally, people from these castes were hired by town administrations to collect solid wastes, most often equipped with primitive tools such as a buffalo rib to lift waste and a kharpan (basket slung on the shoulder) to carry and dump the collected waste in nearby open field of on river banks (Thapa, 2008)

Solid waste management is a recently developed concept which has been felt by the world's people. Once it was commonly thought of as simple "pick up the waste and go dump it in a hole somewhere". Today, nothing can be farther from the truth. When done well solid waste management successfully blends the diverse interests of a large "stakeholder" community together. Waste management still is a linear system of collection and disposal, creating health and environmental hazards (Gupta, 2012).

With growing urbanization and higher population densities and changing waste composition and growth in the amounts of solid waste, traditional practices of waste management could not keep pace.

Solid waste management is one of the most serious environmental problems of the urban areas in Nepal. Previously people had never ever given a single attention to it,

neither in its generation nor in its disposal. Human consciousness was so much focused on the rapid growth of urbanization and infrastructural development. One after another people kept themselves busy on making their lives fast and best. In this pace of movement, they got no time to think about minor things. Hence the proper waste management remained neglected, that resulted into everyone's problem. It has emerged as a problem of the nation too. Every country around the world has once faced with this problem. Specially, developing countries are facing this problem more than the developed one.

The management of solid waste so has become of primary importance. Developing countries like Nepal have a significant problem of solid waste management. Different resources are to be mobilized in the proper way; economic conditions have to be improved; and finally, people have to be educated. There are many techniques of solid waste management. Reduction of solid waste is the simplest way of managing the solid waste. Similarly, compost preparation, sanitary land filling, burial are other ways.

The concept of waste management planning is fairly new to Nepal. Rapid urbanization since 1950 has forced many towns to try and tackle the problem by recognizing the importance of efficient solid waste management. Regarding solid waste management, solid waste act (1988) and municipal act (1990) were established by Solid Waste Management and Resource Mobilization Centre (SWMRMC) and Municipal Councils. These agencies are engaged in exercising power to instruct prohibit and impose penalty for unhygienic disposal of solid waste in open space, places of public interest streams, etc. both of these institutions have losing efforts to implement the act.

Solid waste management has become a major problem in reference to the rapidly growing population, industrialization and urbanization. In order to improve SWM of Ratnanagar municipality has introduced an integrated solid waste management strategy which is efficient, cost effective and environmentally sound with maximum involvement of local community. Ratnanagar municipality is fast growing urban area of Chitwan district where solid waste management is going to be a serious problem. In this study it will analyzes the ways of solid waste management in Ratnanagar municipality ward no 1 Tandi market area.

## 1.2 Statement of the Problem

The rate of urban expansion differs from place to place and from time to time due to different prevailing factors such as infrastructure development, health and education facility, employment opportunities etc. urbanization helps to develop a country on one hand but on the other it brings out the problem like over population and environmental degradation etc. urbanization and waste generation go simultaneously. These things create a problem of solid waste and its management.

Nepal is moving on the track of rapid development, so the problem of solid waste comes in as we go ahead. Previously people had never ever given a single attention to it, neither in its generation nor in its disposal. Human consciousness was so much focused on the rapid growth of urbanization and infrastructural development. One after another people kept themselves busy on making their lives fast and best. In this pace of movement, they got no time to think about minor things. Hence the proper waste management remained neglected, that resulted into everyone's problem. It has emerged as a problem of the nation too.

Urbanization in Nepal has risen to a serious waste problem. According to a study, some 350,000 residents of Kathmandu now produce an estimated 140 tons of waste per day, of which about two thirds by volume is deposited outside the compound. The amount of waste generated will affect all stages of solid waste management, i.e., collection, transport, storage, and disposal (IUCN, 1989).

Waste management in Nepal has always been considered the responsibility of untouchable castes. Traditionally people from these castes were hired by town administrations to collect solid wastes, most often equipped with primitive tools such as a buffalo rib to lift waste and a Kharpan (basket slung on the shoulder) to carry and dump the collected waste in nearby open field of on river banks (Thapa, 2008). In Nepal, traditional rural habits of throwing waste outside the house still exist in urban areas.

The perception of being and feeling responsible for the waste one produces is sometimes in conflict with traditional beliefs and practices. In traditional Hindu culture, only certain people, within a strict caste system, are responsible for cleaning tasks and

waste disposal. For other castes responsibility ceases once waste is placed outside the house (IUCN, 1989).

Although the local municipal bodies were responsible for soled waste collection and disposal, they generally lacked waste handling management. Moreover, information on disposal site is not available for some municipalities. No official disposal site exists for Dhankuta. Collected waste is thrown directly into the surrounding forests without treatment such as burning or covering the waste with soil. Despite the constrains, significant advances have been made since 1988 in management solid in all 33 urban centers of Nepal (IUCN, 1989). People, mostly women, who are responsible for the household duties, dispose of household garbage close to their dwellings where it causes an unsanitary and smelly living environment. So it has become essential to throw light on the necessity for solid waste management aware to every member of a society, whether poor or wealthy, young or old, male or female.

In the context of study area solid management is being a serious problem because unmanaged construction of the market produced solid waste in large scale. In this study I have study the situation of solid waste management in Ratnanagar municipality ward no 1 Tandi Market. To analyzes the situation of solid waste management in the Ratnanagar municipality ward no 1 it is concentrated on does municipality properly managed the solid waste that produce in market area and how can we manage solid waste produce in the market area and why solid waste management is being serious issue in the study area and what is the way to solve the problems of solid waste management in the study area.

### 1.3 Objectives of the Study

The general objective of this study is to analyze the situation of solid waste management in Ratnanagar municipality ward no 1. The specific objectives are as follows:

i. To examine the current solid waste management system in the study area.
ii. To analyze the sources and composition of solid waste.
iii. To explore the problems and prospects of solid waste management.

## 1.4 Significance of the Study

At present solid waste management has emerged as a serious urban environmental problem. Currently, some efforts are being made to tackle these problems. However, it does not seem to be sustainable. This study tries to view the overall waste problem and waste management system of the Ratnanagar municipality. The present study is important as it gives information about how the concerned authorities are dealing with solid waste problem in order to manage them properly using modern and advanced technology.

## 1.5 Limitations of the Study

Due to limitations of time and resources, the following limitation is set for the study.

i. The study has concentrated on Ratnanagar municipality ward 1 Tandi Market areas.
ii. The composition of the waste is shown in terms of chemical or biological components.
iii. The study does not consider the solid waste mixed in sewage system.
iv. Only limited number of respondents (50) were participated in this study

## 1.6 Organization of the Study

The study has been organized in five different chapters. Chapter I includes introduction part of the study, statement of the problem, its objectives and limitations. Chapter II comprises with the review of literature and Chapter III deals with the methodology of the study. Likewise, Chapter IV describes data analysis of the study. Lastly, Chapter V projects the conclusions and recommendations of the study.

# CHAPTER II

# LITERATURE REVIEW

## 2.1 Theoretical Review

Economic growth and the increased pace of urbanization and industrialization in many countries have confronted cities throughout the world with the increasingly complex task of managing tons of solid wastes that are being generated daily. Generation of waste also depends on income and consumption habit of the people. Increasing urban migration and high density of population also adds to the generation of waste and all ' these factors will make waste management a difficult issue to handle in the near future, if a new paradigm for approaching it is not created (Gupta, 2012). Since waste generation is continuous and everlasting process, its solution must be found out in right time and thereby to provide healthy environment and hygienic living condition. Attention to such problem has been attracted a number of scientific researches, empirical studies and reports. This study consists of solid waste and its generation, sources and composition and its management. In this light, review of literature has been reviewed through journals, articles, reports, academic researches and published books.

In less developed countries, the amount of waste generated also varies according to the income group from which it originates. The richer the citizen the moiré waste is generated. In the situation the higher income groups are concentrated mainly in Kathmandu valley therefore there is an increase in the volume of waste.

Cointreau (1991), analyzed the effectiveness of waste collection in the developing countries. He concluded that waste collection differs rather strongly and priority is usually given to commercial areas, main streets and more prosperous neighbors. In addition, many of urban poor live in unplanned and unauthorized areas and are, therefore, not eligible for municipal service. Most municipal solid waste management schemes spend 90% of their budget on collection and transportation of waste, but only 50% to 70% of the waste the generated is collected and less than 50% of the population is served.

Spreen (1995), analyzed that the waste production is the result of urbanization and Industrialization. Migration from rural to urban areas and improved medical care,

combined with birth rates, led to an enormous growth of urban population a development, which of course, increased waste volume greatly. Industrial development has led to the manufacture of many new inorganic substances. He concluded that, since, these substances cannot decompose; the natural process of waste transformation does not absorb these substances.

Becker (1997), made a study on community organization and assessed that change in quality and composition of municipal solid waste in south Asian cities is directly related to political- economic and social factors. He assessed that the composition of waste in Nepal has shifted toward more inorganic and non- biodegradable waste since 1950s. Besides, the major reasons for the change in composition can be traced to rising standard of living and change in public taste.

Miller (1998), has discussed about the 3 major ways to deal with solid waste: throw away output approaches, resource recovery output approaches and input approaches. He said that the throw away output approaches on which we primarily rely should be shifted to a sustainable earth or low-waste approach. With this approach most of what we throw away would not be viewed as solid waste but as wasted solids, which should be reused, recycled or burned to provide energy. He further adds, this resource recovery output approach can be coupled with input approaches designed to produce less solid waste.

Jumelet (1999), mentioned solid waste management-as an essential urban services, which intends to achieve the objectives such as protection of public health, promotion of hygiene, recycling of materials, and reduction of emissions and residuals. According to him, healthy city must have a planned program for collection and proper handling and disposal of solid so as to create a safe and pleasant urban environment.

Asnani (2000), has made a study on solid waste management in the city of Ahmedabad in which he describes about the beauty of the historic city being marked by Garbage sites all over the city. His paper draws attentions to the World Bank assistance to tackle the problems and modernization plan for better understanding. Besides, the paper also hopes that the system' introduced by municipal cooperation of Ahmedabad would be able to provide a much healthier environment to the citizens by keeping the city clean.

Palnitkar (2000), has defined solid waste as a term specially used to describe non--liquid waste material that arises from domestic trade, commercial, agricultural and industrial activities.

Booth (2001), has stated that solid waste includes the whole range of rubbish, garbage, sludge and other discarded solid materials, including those from industrial, commercial and agricultural operations and from community activities that are no large wanted or needed by their users

Garg et. al. (2002), studied about the Management and Handling of solid waste in India. Further, they have mentioned about the Municipal solid wastes (Management and Handling) Rules, 2000 notified by Ministry of Environment and Forest (India) on 27th September, 2000 to regulate the management and handling of the municipal solid waste. This is an attempt to provide a set of rules and responsibilities for all the municipal solid waste in a scientific manner.

UNDP., (2007) shows that appropriate solid waste management could not be always functioned well because of lack of common consciousness, frequent communication and technical knowledge and skill in addition to the existence of a kind of the territorial imperative. However, through the study, it can be set a high valuation on the fact the all concerned especially Technical Working Group (TWG) and Task Force (T/F) members could stand up and work together for proper management of solid waste.

Divan and Rosencranz (2011), carried out the study on the Environmental law and Policy in India in which they discussed about the report prepared for the Planning Commission in 1995 in India. This report acknowledges the progressive decline in the standard of services with respect to the collection and disposal of waste.

Thapa and Devkota (2013), carried out the study of Waste Management System in Kathmandu and have categorized management system of solid waste into three categories primary or household, secondary and tertiary level of management. They assessed that if these three levels of waste management go systematically then obviously there will be appropriate solid waste management. But there is dissatisfaction in each and every level of management due to which the service has been inadequate and ineffective and urban people are facing problems.

Sinha (2014), presented a paper about solid waste management in urban areas in Malaysia. In this paper, she mentioned that the proper storage, collection, transportation and disposal of urban solid waste were essential to protect public health. She emphasized that the disposal of municipal's solid waste was an obligatory and function of the local authorities under the existing urban legislation

## 2.2 Policies Review

*The Constitution of Nepal, 2072 (2015):*

*The Constitution of Nepal, 2072* has made a notable provision in the field of environmental protection. Article 30. Rights regarding clean environment: (1) Each person shall have the right to live in a healthy and clean environment. (2) The victim of environmental pollution and degradation shall have the right to be compensated by the pollutant as provided for by law. (3) Provided that this Article shall not be deemed to obstruct the making of required legal provisions to strike a balance between environment and development for the use of national development works. (4). Imposes substantial political obligations upon the State in the sense that environmentally concerned citizens and interest groups can utilize this provision to command public attention on the environmental performance of the national government. Article, 51 (4) Making proper utilization of land through proper regulation and management on the basis of productivity of land, its nature, and also by maintaining environmental balance. (g) Policy regarding the conservation, management and use of natural resources: (1) The State shall pursue a policy of conserving the natural resources available in the country by imbibing the norms of inter-generation judicious use of it and for the national interest. It shall also be about its sustainable use in an environmental friendly way. The policy shall ensure the fair distribution of the benefits generated by it by giving local people the priority and preferential rights. (5) The State shall pursue a policy of making a sustainable use of biodiversity through the conservation and management o forests, fauna and flora, and by minimizing the negative impacts of industrialization and physical development by promoting public awareness on environmental cleanliness and protection. (6) The State shall pursue a policy of keeping necessary landmass as forest area in order to strike an environmental balance.

*Environment Protection Act, 2053 (1997):*

Although no direct provision relating to the solid Waste Management exists in the Environmental Protection Act, 2053, it has provisions relevant to the management of solid waste. In section 3 and 4 of the act, there are provisions for carrying out of Environmental Impact Assessment (EIA) or Initial Environmental Examination (IEE) and prohibition on Implementation of proposal requiring EIA without approval. This is particularly significant for the operation of few facilities like land fill sites, dumping sites etc. Section 7 of the act emphasizes the prevention and control of pollution. In accordance to the provisions of sub section under the section 7 nobody shall create pollution in such a manner as to cause significant adverse impacts on the environment or likely to the hazardous to public life and people's health. In case any person commits, any acts under the act or the rules or guidelines framer under the act, the prescribed authority can close down such acts immediately and punish the offender according to the degree of offence, with a line up to fifty thousand rupees.

*Environment Protection Rules, 2054 (19976):*

The Environment Protection Rules (EPR) is framed on the grounds of the power conferred by Section 24 of the Environment Protection Act, 2054. The rules prescribed in the EPR also have significance in the management of solid waste. According to rule 3 of the EPR a proponent (of a project) is required to carry out an IEE of the proposals mentioned in Schedule 1 and an EIA of the proposals mentioned in Schedule 2. The proposals related to municipal solid waste management in Schedule 1 and 2 of the EPR are given below.

Schedule 1:

1. Waste Management activities to be undertaken with the objective of providing services to a population ranging between 2,000 and 10,000
2. Following activities relating to waste emitted from households and residential areas:

   a) Filling of land with 100 to 1000 tons of waste a year.

   b) Activities relating to transfer stations and resource recovery areas spread over not more than 3 hectares.

c) Selecting, picking, disposing and recycling waste through chemical mechanical or biological techniques in an area of not more than 2hectares.

d) Activities relating to compost plants in an area ranging between 1 and

5 hectares

Schedule 2:

1. Waste management activities to be undertaken with the objective of providing services to a population of more than 10,000.
2. Following activities relating to waste emitted from households and residential areas:
   a) Filling of land with more than 1000 tons of waste per year.

   b) Activities relating to transfer stations and resource recovery areas spread over more than 3 hectares.

   c) Selecting, picking, disposing and recycling waste through chemical, mechanical

   or biological techniques in an area spread over more than 2 hectares.

   d) Activities relating to compost plants spread over an area of more than 5 hectares.

*Solid Waste Management National policy*, 2053(1996)

Solid Waste Management National Policy is another important legal documents concerned with the solid waste sector. The policy has the following objectives

- To make management work of the solid wastes simple and effective.
- To mobilize the solid waste as resources
- To minimize environmental pollution caused by the solid wastes and adverse effect thereof to the public health
- To privatize the management work of the solid wastes
- To obtain public support by increasing public awareness in sanitation works

The strategy adopted by the policy for achieving its objectives is the promotion of the public participation, technology, resource mobilization and privatization. The policy points out national and local level institutions responsible for the management of solid waste and describes the responsibilities and legal authority of these institutions. According to the policy, a national level institution should be formed by His Majesty's Government Nepal for the management of solid waste. In the case of local institutions, the policy mentions the Mahanagarpalika, Nagarpalika and Village Development Committees (VDC) as responsible for the management of solid waste and related activities.

**Local Self Governance Act, 2055 (1999**):

The Local Self Governance Act in the section 96 subsection C under the heading of Functions Duties and Power of Municipality and Relating to Water Resources, Environment and Sanitation authorities and makes the municipality responsible to carry out or cause to be carried out and manage the acts of collection, transportation and disposal of garbage and solid wastes.

## 2.3 Empirical Review

Udash, (2004) discussed the public health hazards in Kathmandu city and found out that thought the city has urbanized and modernized, water supplied for public sewage disposal system and the public sanitation are not actively constructed.

Thapa (2008) Ringeltaube, in the article, 'The need for a system to Solid Waste Disposal and Collection' mentions that the waste management system needs active co-operation and participation of all citizens. It describes that the method of collection of waste from streets and its transfer to community sins and from there to vehicles need to be modified so that the waste is carried out more effectively and the chances of adversely affecting the health of workers reduced. Equipment will have to be designed which satisfy the typical local problems and give economical operations.

Spreen (2009), in the article 'Solid Waste Management with people's participation' describes the urban SWM project in Katmandu valley and shows the appropriate approaches that can provide successful solution. The article concludes that urban waste management has the crucial task to provide the urban poor with proper sanitary living conditions. The financial and technical resources generally available in the third

world are totally inadequate to cope with this issue. Lastly it focuses that, urban change must not mean copying modern life style from the so called developed world. Traditional ways of life should be enhanced. They proved to be sustainable for centuries and should be given proper consideration in urban programming.

Pradhan, (2011) in a report on solid waste management practice in Kathmandu cited the problem in locating landfill site at Gokarna with the increase in urbanization and population. The study on Gokarna landfill site mention that the local people opposed for land filling when they realized that they were not involved when their locality was selected for the purpose of land filling. The detailed study on Gokarna landfill site indicate that the frequent opposition from the local people was also because SWMRMC/KMC were unable to provide them the total amount of money that was to be provided for as per the agreement made for the village development works.

Sharma (2012) has made study on the impact of domestic and industrial wastes on river pollution in Kathmandu. The study was based on the two year monitoring exercise. According to the study, the daily per capita waste generation in the Kathmandu valley is 400 gm. The density of waste was estimated to be 350-400gm/$cm^3$.the domestic sewage and industrial effluents are discharged directly into the Bagmati and Bishnumati rivers and other streams in Kathmandu. The major industries discharging into rivers in Katmandu are Banswari Tannery, The Balaju Industrial District, a number of carpet factories, The Jawalakhel Distillery and The Patan Industrial District. The bacteriological study of the sample showed the total number of coliform bacteria per 100 ml of effluents on Bagmati river was more than 4800.A chemical study of the effluent and the river water showed high conductivity of 9.73 µs/cm, BOD was 420mg/l and chloride 396 mg/l which indicates the maximum bacterial activities and it also indicates the presence of large amount of organic substance.

Gautam, (2015), "Solid Waste Management System in Kathmandu Metropolitan City" presented the solid waste management situation in ward 27 of Kathmandu Valley. He has also mentioned the involvement of NGOs at that area and conflict arose between local people, kuchikars and ward representatives. He also describes that the solid waste in the study area are residential and commercial which consists of both organic and inorganic. The daily waste production in the study area ranges from

0.17 kg/head /day in Tyouda to 0.25 kg in Ason. 58.3percent of the households use plastic bag to collect solid waste which has retarded for effective SWM. So, he suggests adopting alternative tools such as basket for collecting the wastes.

Kathmandu Metropolitan city (2016) According to a research launched on Kathmandu by KMC, the book *"Chikitsajanya Phohar Byawasthapan Nirdeshika"* mentions that, from the hospitals of Kathmandu, of the waste produced average 1.72 kg/patient /day, only 26percent is found to be harmful. Simply 80percent of waste produced from houses and hospitals or offices were equivalent to simple wastes. Only 20percent are harmful but if we do not separate them properly, the whole waste will be a harmful one. So, it suggests separating the waste at the source before managing.

The Katmandu Post April 9, 2017 published the article that 1,000 cubic metres waste produced in Katmandu in bulk. If this bulk volume is stored, we can get 67percent of organic materials, 11percent of plastics, 5percent of construction scraps, 4percent of fibers, 2percent of glass and 1percent of metals. Analyses revealed that about 70percent waste could be composted.

# CHAPTER III

# RESEARCH METHODOLOGY

## 3.1 Research Design

Both analytical and descriptive research design were used to complete of this study. Quantitative data were analyzed by using analytical research design because such types of data indicate perception of the respondents in quantitative mode and qualitative data were analyzed by using descriptive research design by using paragraph description and find out the situation of solid waste management situation of the study area.

## 3.2 Selection of the Study Area

The survey for this study was conducted at Ratnnaager municipality ward no. 1 Tandi market areas. The selected area is facing a great problem of solid waste management with the development of infrastructure. The area is getting drastic change with the increment in the solid waste and pollution creating negative impact in the study area.

The study area was selected basically to know the public perception regarding the subject matter and to view the overall condition of the waste and its management system.

## 3.3 Sampling Procedure

Ratnanagar municipality ward no 1 is Tandi Bazaar area is the sample site of this study. Total population of the wards is 4999 (CBS Report ,2011) In main highway lines there are 201 households among them 25% households (50) were taken as sample household. From each household single individual was taken for interview by busing random sampling method.

## 3.4 Nature and Sources of Data Collection

The present study was based both primary and secondary data. Secondary data were used in literature review and that were collected through library study method and books, article, journal, previous thesis are used as the main sources of secondary data.

Primary data were collected from the field by using various data collection techniques such as questionnaires and observation chick lists.

### 3.5 Data Collection Tools and Techniques

Following tools and techniques were used to collect primary data from the field

**Questionnaire Survey**

A set of semi- structured questionnaires were prepared to generate the realistic and accurate data from the field through interview questionnaires. The respondents were requested to fill up the questionnaires. In case of the respondents who could not fill up the questionnaire, the questions were asked to the respondents and answers were filled up to collect the required data. Questions were related to waste management situation of the study area and their perception about the waste management.

**Observation Checklist**

During the time of data collection, I have frequently visited the study area and necessary data were collection by observation. I observed the landfill side and the street where solid waste was spread here and there. Necessary information was also collected from by observation check list.

### 3.6 Data Processing and Analyzing

After the data was collected from the field survey, data was checked thoroughly and edited wherever needed. Simple statistical tools like tables, graph, bar diagrams, were used to analyze the collected statistical data and other qualitative data were analyzed by using paragraph description.

# CHAPTER IV

# DATA ANALYSIS AND INTERPRETATION

In this study data were taken from Ratnanagar municipality ward no. 1 which is located in Chitwan district. In the first section of the chapter and in second section it analyzes the primary data that has been collected from the study area.

## 4.1 Introduction of the Study Area

Chitwan extends, in the 'Oriental Realm', between the north parallels of 27° 2' and 27° 46' latitude and 83° 55' and 84° 48' and 27° 46' latitude and 83° 55' and 84° 48' longitude and having the total area of the district about 2338.39. sq. km. Situated in the southern flank of Himalayas it occupies central position in the country. Chitwan, one of the five districts within the bounds of Narayani zone belongs to the central development region; it is situated at the distance of about 120 km Southwest of Kathmandu. It is bounded by Makawanpur and Parsa districts in the east, by Tanahu in the west, by Dhading and Gorkha in the north and by the state of Bihar in the south. The average length of this district from east-west is 98 km and breadth 0.5 km- 46 km.

According to the National Population Census 2011, the total population of Ratnanagar municipality was 67321The population growth rate was 6.1%. Almost all parts of the municipality have good access of roads, communication and transportation. However, only a little part of the municipality has rural area which has large number of population.

Ratnanagar Municipality is regarded as a small-sized municipality and the emerging commercial centre of Narayani Zone in the mid-southern area of Nepal. Ratnanagar Municipality now was established after the merging of ‘Unmukh’ and ‘Panchakanya’ VDC’s in 11-10-2053 B.S. The city is also known as the “City of Agro-biodiversity”. The land where the municipality official building now situated was presented by “Nathuram Mahato” for the former Debauli VDC of 0-11-12 Bigha in 10-09-2022 B.S. It is located on the East-West highway 12 km east of Bharatpur and while 152 km from the capital; Kathmandu. It is a commercial center for Padampur, Pithuwa,

Shaktikhor, Chainpur, Jutpani VDCs and other adjoining areas. It is also an entry point for the Royal Chitwan National Park to the South.

Ratnanagar is steadily gaining importance due to its potential for tourism and its proximity to Bharatpur, as much developed neighbor. RM has its office located at Bakulhar chowk, Chitwan and is the sole agency for providing municipal services and carrying out urban development works in the city of Ratnanagar. The city spread over an area of 36.29 sq km and comprises of 13 wards. Of the thirteen wards, 1, 2 and 8 are more commercialized wards among other. The minimum and maximum temperature observed were 6.2oC and 40oC respectively. The average annual rainfall observed was 1500 mm (Ratnanagar Municipality Fact sheet, 2066 B.S.).

Geographical information Ratnanagar Municipality, the 'City of Agro-biodiversity' is situated in the eastern part of neighbour commercialized municipality i.e. Bharatpur; located between the latitudes of 27o 35' and 27o 40' North and longitudes 84o 29' and 84o 33' East. The lowest elevation of municipality at 183 m MSL and highest at 214 m MSL lies at the confluence of Budhi Rapti and Khagari Khola and lies in Madhavpur respectively. This shows the relative flat terrain found in the municipality.

Rivers¬Major Rivers and Ponds  Khagari Khola (4.5 km)

- Kayar Khola (5.5 km)
- Budhi Rapti Khola (6.5 km)
- Budhi Kulo (5 km)• Panchanadi (1 km)
- Lauri Ghol (1.5 km)• Butter Khola (2 km)
- Ponds/Tal¬ Panchanadi Tal• Lauri Ghol Tal
- (No data available on the area of Pond)

The city has a well-developed road network of various categories, width and pavement types catering to the transportation needs of its citizens. The city has good transportation linkages with neighbor commercial Narayanghat city and the tourism Sauraha area up to the settlement at the rural peripheries of the city.

From 2004 to 2012 the total length of road under various road categories in Ratnanagar Municipality has increased from 136 to 405 kilometers (Table 4). This drastic increase in road length within a period of six years was a result of increase in

urban roads accompanying rapid urban expansion in agricultural lands of the RM with black topped road more than tripled (577 percent), from 26 kilometers in 2004 to 150 kilometers in 2012. With the advent of urban development and growth of the city, the road network too has expanded significantly. Like to other cities in the country shows distinct urban settlement and land use pattern. The settlements were compact in nature in the central commercial area. A cautious effort and planning. seems to have been made to preserve the fertile agricultural land. At the same time, build human settlements at a location most suitable for urban development in terms of habitation and provision of urban infrastructures and services for enhancing the tourism palace Sauraha, Chitwan National Park

There are altogether 79 institutions in Ratnanagar Municipality (RM), including government and private schools, boarding schools, colleges, government offices and Non-Government offices. Among them are 11 Primary, 31 secondary school, 3 higher secondary school and 4 colleges. According to the municipality 2010 report, 70.79 percent was literacy rate of which 83.85 percent male and 70.79 percent female were literate. Altogether there are 23 health institutions of which there are 4 hospitals, 1 sub health post and 18 clinics run by private ownership. In the commercial sector there are 2348 shops, 1 plaza, 2 hotels and 150 restaurants within the municipality premises. Inside municipality there are 58 cottage industries, 10 small industries and 8 of large scale. Till the date 5 industries were closed inside the municipality. For the recreational activities there are about five places used for. Tikaulai proposed for regional stadium, Panchakanya Community Forest and Milijuli Community Forest as picnic spot, Shantikunja Park and Laurighol land area are used for recreational purpose. There are six government offices and 24 non-government offices inside the municipality.

Solid waste processing facilities Under this section in order to maintain sanitation and community development; there is no any solid waste processing facility from the municipality as well as even from community level yet. Also there is no any plan in the municipality for the waste processing facility in the coming future too. The controlled dumping site of Ratnanagar Municipality was located inside the Panchakanya Community Forest of 131.1 Ropani area 5 km away from the main city (municipality office assumed), with dumping about 11 ton of waste each day by one tipper and tractor. The waste is collected in two shift (morning from 7 - 10 am and

day from 2 - 5 pm); in morning shift the waste of urban especially of city area is collected and in day shift waste of rural area is collected. In the dumping site area, scavenger/waste pickers came to collect the recycle able wastes. Sometime animal like 'Badel' came there for in search of food. Lacking of testing facility of pollutant contaminate in near river body through leachate there creates gap to understand the impact on near biodiversity of Barandabhar Forest. For the control of wild animals into the dumping site area wire fencing should be done.

### 4.2 Socio Economic Characteristics of the Respondents

Socio economic and cultural status of the respondents' play significant role to produce solid waste and its management. So, in this sub section it analyses the socio economic status of the respondents such as sex, caste, education etc.

#### 4.2.1 Respondents by Caste/Ethnicity

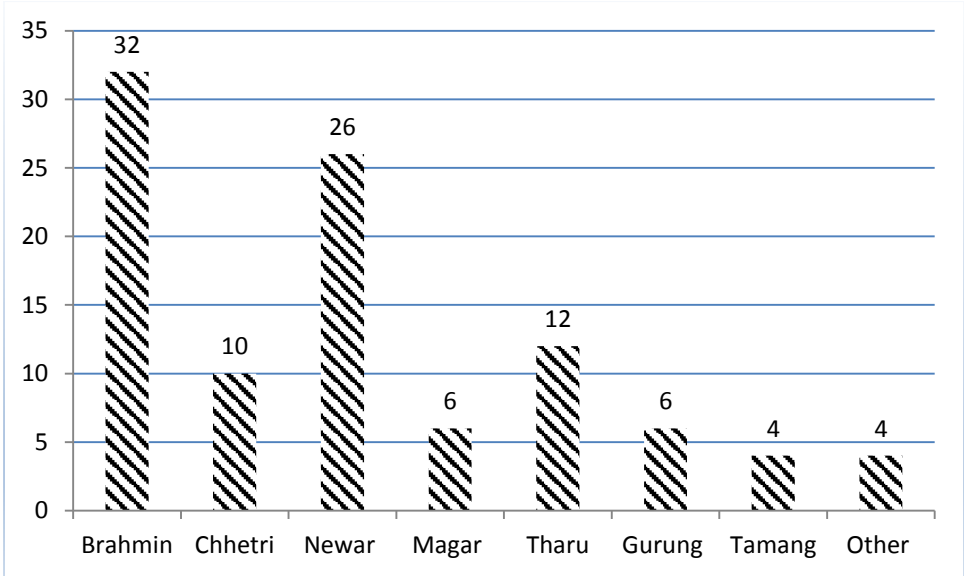
In Ratnanagar municipality ward no 2 there found diverse caste and ethnic people. The following table shows the caste/ethnicity composition among the sample borrowers.

**Table: 4.1 Respondents by Caste/Ethnicity**

| Castes/ethnicity | No. | Percentage |
|---|---|---|
| Brahmin | 16 | 32 |
| Chhetri | 5 | 10 |
| Newar | 13 | 26 |
| Magar | 3 | 6 |
| Tharu | 6 | 12 |
| Gurung | 3 | 6 |
| Tamang | 2 | 4 |
| Other | 2 | 4 |
| Total | 50 | 100 |

Source: Field Survey, 2017

**Figure: 4.1 Respondents by Caste\ Ethnicity**




Above table and figure show 32 % of total are Brahmin. 10 %were Chhetri , 26 % Newar, 6 % Magar , 12 % Tharu , 6 % Gurung , 4 percentages and 4 % Tamang of and next 4% others.

### 4.2.2 Age Distribution

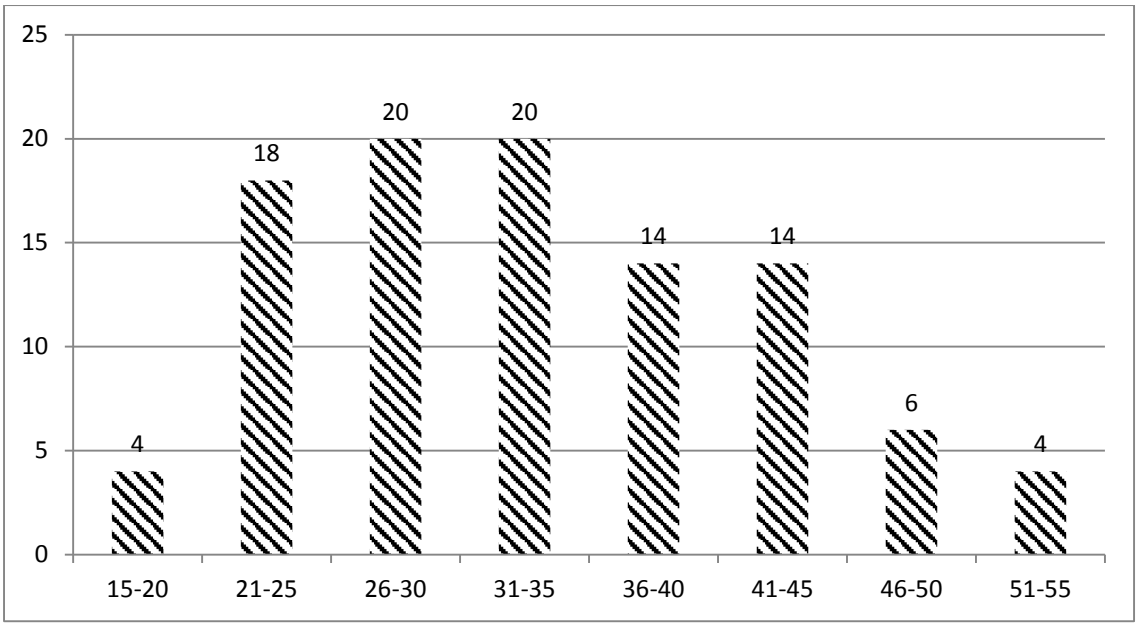
The age structure over the total sampled respondents of the study area is analyzed in the below table.

**Table: 4.2: Distribution of Respondents by Age**

| Age Group | No of Respondents | Percentage |
|---|---|---|
| 15-20 | 2 | 4 |
| 21-25 | 9 | 18 |
| 26-30 | 10 | 20 |
| 31-35 | 10 | 20 |
| 36-40 | 7 | 14 |
| 41-45 | 7 | 14 |
| 46-50 | 3 | 6 |
| 51-55 | 2 | 4 |
| Total | 50 | 100 |

Source: Field Survey, 2017

**Figure: 4.2 Distribution of Respondents by Age**




The table and figure show that most of the member is adult. Out of the total there are 58 percentages is 21-35 age group. More than 50 years are only 4 percentages of the total. It is found that the of age 21-35 are more active in income generating activities, because they are more responsible to their family's economic betterment.

### 4.2.3 Respondents' by Sex

In this study both male and female are participated in the personal interview. The following table shows the sex composition of the respondents.

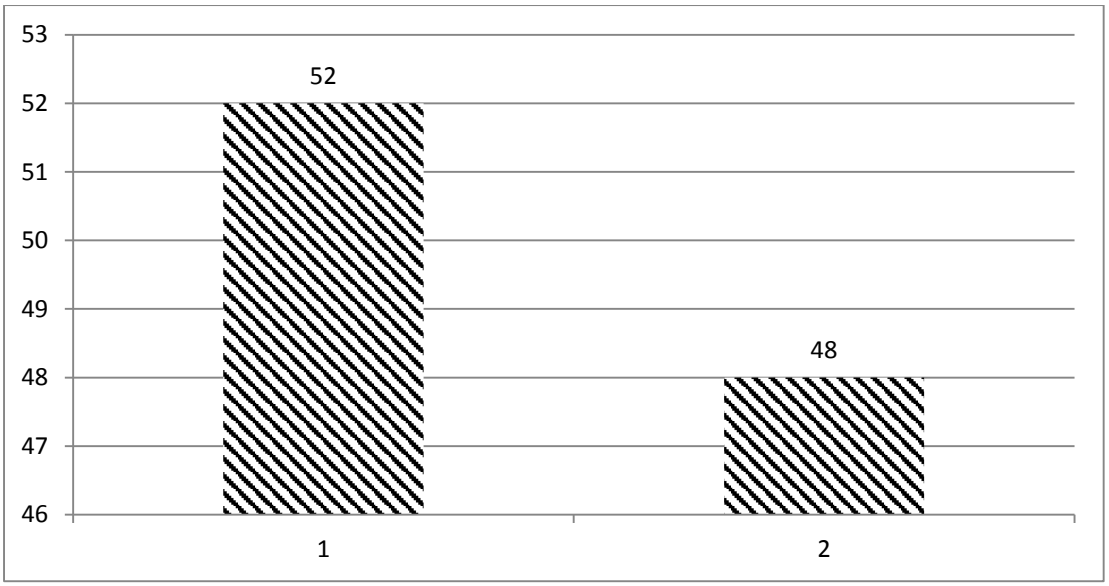
**Table: 4.3 Distribution of the Respondents by Sex**

| **Sex** | **No of Respondents** | **Percentage** |
|---|---|---|
| Males | 26 | 52 |
| Females | 24 | 48 |
| Total | 50 | 100 |

Source: Field Survey, 2017

Above table and figure indicate the sex composition of the respondents. Data shows that 52% respondents are males and 48% respondents are females.

**Figure: 4.3 Distribution of the Respondents by Sex**




### 4.2.4 Marital Status

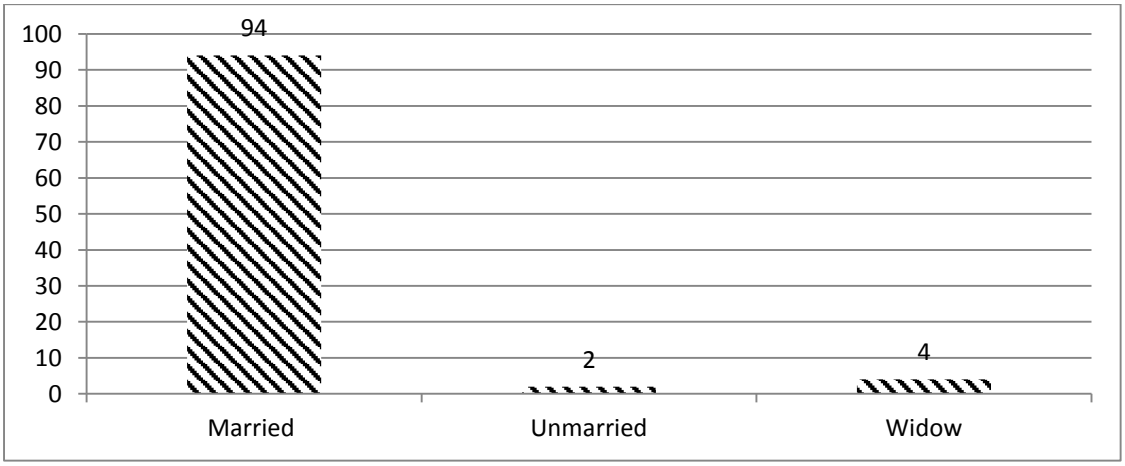
The marital status over the sample respondents in the study area is analyzed in the table.

**Table: 4.4 Distributions of Respondents by Marital Status**

| Marital Status | No of Respondents | Percentage |
|---|---|---|
| Married | 47 | 94 |
| Unmarried | 1 | 2 |
| Widow | 2 | 4 |
| Total | 50 | 100 |

*Source:* Field Survey, 2017

**Figure: 4.4 Distributions of Respondents by Marital Status**



The table and figure show that most of the members are married. Of the total sample member there are 98 percentage are married among them 4 percentage are widow. Only 2 percentage of are unmarried.

### 4.2.5 Distribution of Respondents Religion

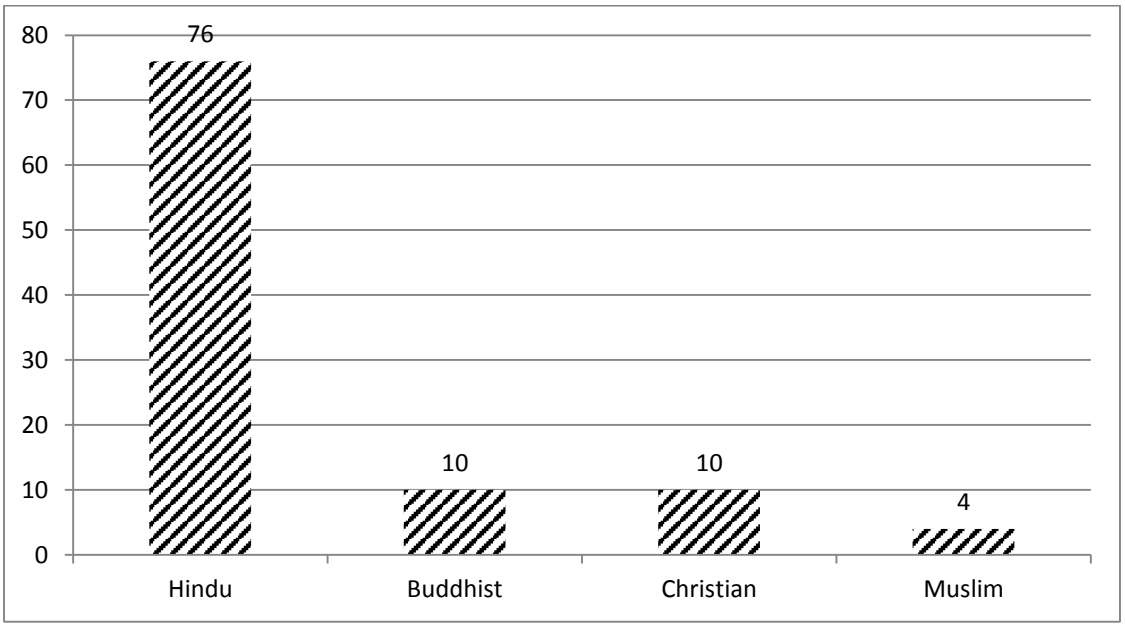
Respondents' have different social composition of various religions. There is diversity of religion, among them Hindu, Buddhist, Christian, and Muslim are available. The percentage of various religions is shown in the table below.

**Table: 4.5 Distributions of Respondents by Religion**

| Religion | No of Respondents | Percentage |
|---|---|---|
| Hindu | 38 | 76 |
| Buddhist | 5 | 10 |
| Christian | 5 | 10 |
| Muslim | 2 | 4 |
| Total | 50 | 100 |

*Source:* Field Survey, 2017

**Figure: 4.5 Distribution of Respondents by Religion**



The table and figure show that Hindu is the highest among the borrowers which is 76 percentage, similarly, Buddhist and Christian are 10 percentage and Muslim is only 4 percentage. This table shows that multi religious people live in the study area.

### 4.2.6 Distribution of Respondents by Education

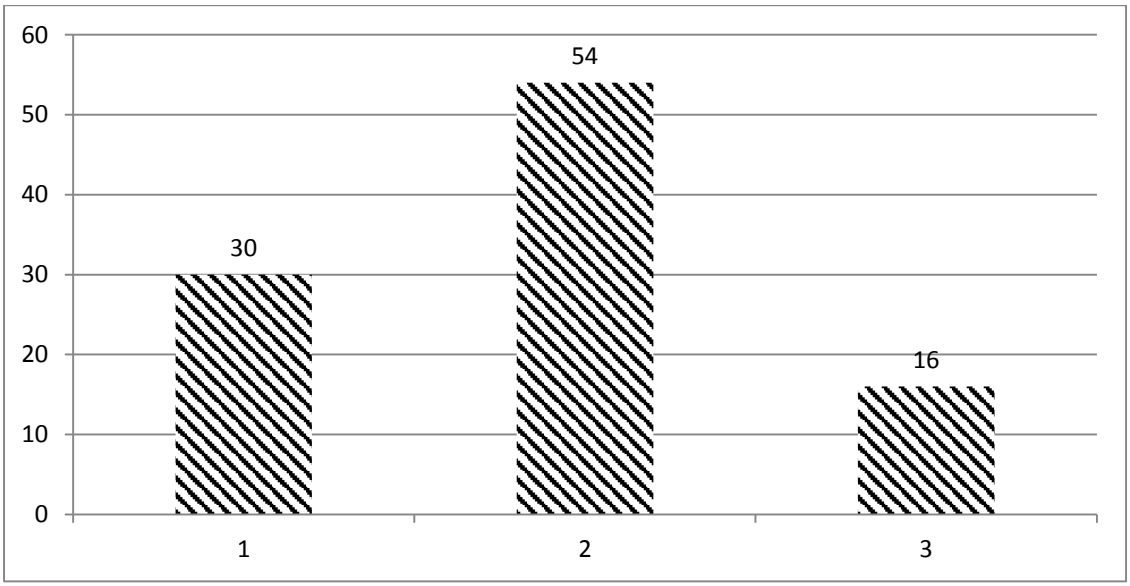
Education is one of the major factors for social as well as economic development. It affects all sectors of the society. The educational status of the borrowers is shown table below.

**Table: 4.6 Distributions of Respondents by Education**

| Educational Status | No of Respondents | Percentage |
|---|---|---|
| Literate | 15 | 30 |
| Secondary | 27 | 54 |
| +2 and Above | 8 | 16 |
| Total | 50 | 100 |

*Source:* Field Survey, 2017

**Figure: 4. 6 Distributions of Respondents by Education**




Above table and figure shows the education status of the respondents'. It is found that 30% are literate and 54% passed secondary level and 16% passed +2 above.

### 4.2.7 Respondents by Family Size

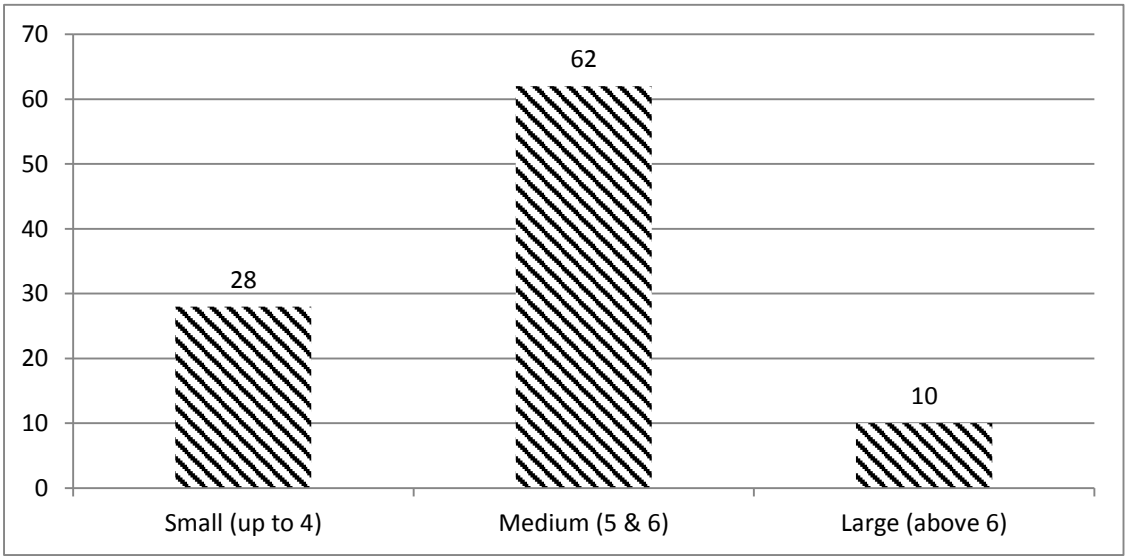
The size of a family is determined by the number of the family members in the household. This shows that the size of a family determines the women's awareness about having children. The following table shows the family size of the borrowers.

**Table: 4. 7 : Respondents by Family Size**

| Family Size | No of Household | Percentage |
|---|---|---|
| Small (up to 4) | 14 | 28 |
| Medium (5 & 6) | 31 | 62 |
| Large (above 6) | 5 | 10 |
| Total | 50 | 100 |

*Source*: Field Survey, 2017

**Figure: 4.7 Respondents by Family Size**




Out of the total borrowers, 62 percentages has medium size of family (5 & 6) and 28 percentages of has small size family (up to). It has been noted that there is only 10 percentage who have large size (above 6) family.

### 4.2.8 Occupation of the Respondents

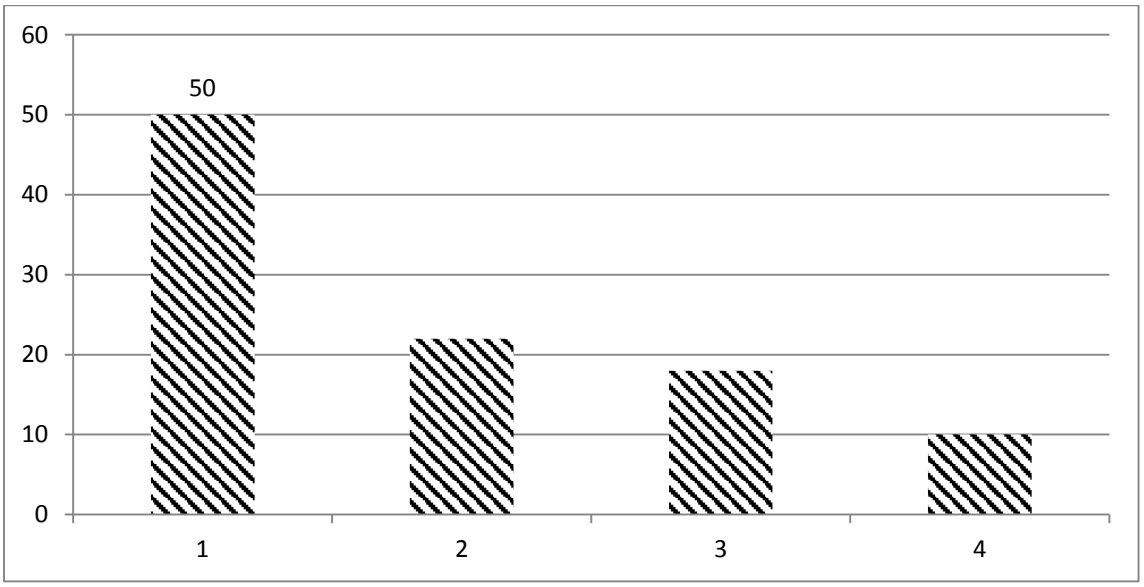
In my study are there have been living people with different occupation. The following table highlights the caste composition of the respondents.

**Table: 4.8: Distribution of the Respondents by Occupation**

| Occupations | No of Respondents | Percentage |
|---|---|---|
| Business | 25 | 50 |
| Farming | 11 | 22 |
| Service | 9 | 18 |
| Others | 5 | 10 |
| Total | 50 | 100 |

Source: Field Survey 2017

**Figure: 4.8: Distribution of the Respondents by Occupation**




Above table and figure show the occupation status of the respondents. Data shows that 5% of the respondents are involving in business and 22% are farmer. In the same way, 18% involved in service and 10 % follow the other occupations like foreign job, labor etc.

### 4.2.9 Respondents' having Knowledge about Solid Waste Management

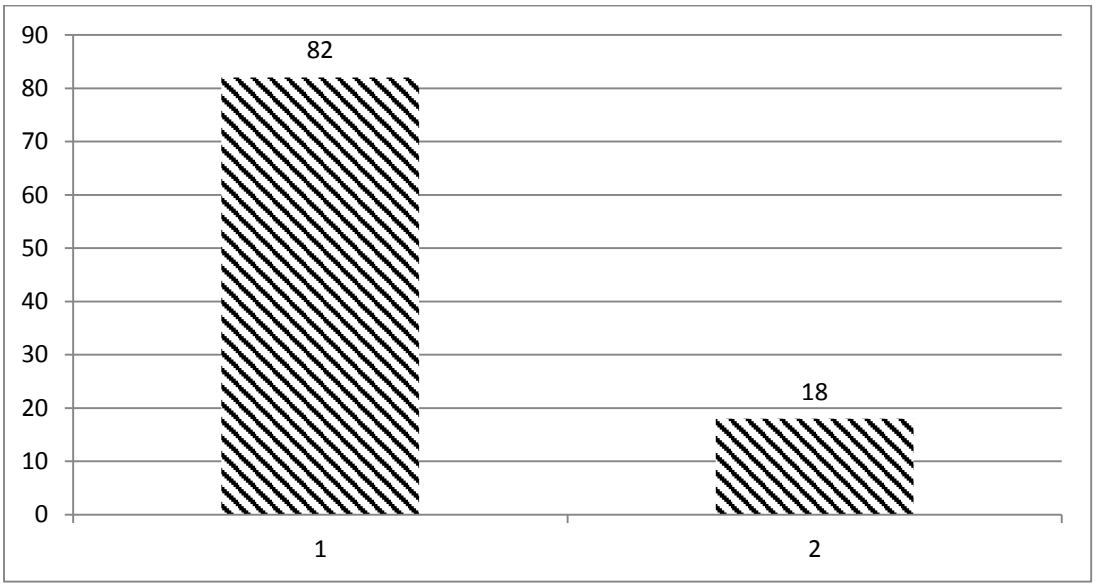
In the study area different types of people have been living. Some people have not concrete idea about the solid waste. The following table indicates the situation of respondents by having knowledge about solid waste.

**Table: 4.9 Respondents' Having Knowledge about Solid Waste Management**

| Knowledge | No of Respondents | Percentage |
|---|---|---|
| Yes | 41 | 82 |
| No | 9 | 18 |
| Total | 50 | 100 |

*Source:* Field Survey, 2017

**Figure:4.9 Respondents' having Knowledge about Solid Waste Management**




Above table and figure show the situation of the respondents by having knowledge about sold waste management. Data shows that only 81% respondents have knowledge about solid waste management and rest of 18% have no idea about sold waste management. S it need to give training about solid waste management.

## 4.3 Solid waste Management Source and Composition in Ratnanagar Municipality

In Ratnanagar Municipality there is no any provision for the special wastes such as hospital wastes, waste generated from slaughter houses, toxic and hazardous waste, etc. The inhabitants were found to throw such wastes haphazardly and then the waste is collected by the municipality are taken direct to the controlled dumping site inside the community forest without any treatment. The negligence and lack of awareness among the peoples of special waste generator along with no laws of conduct from the municipality level is the main reason for insufficient management towards special waste. The pros and cons of current practices are;

The rapid growth of urbanization and high density of population give rise to many problems like solid waste management etc. Like in many urban areas, Ratnanagar municipality is also facing the problem of solid waste management. The increasing amount of municipal solid waste being generated has become a serious problem to urban managers due to its impact on public health and sanitary condition. Moreover, municipal solid waste management effects the local, regional and global environments. Therefore, it is essential to treat municipal solid waste properly in order to decrease the negative effects on human health and ecosystem. However, in developing cities, there are barriers, to proper municipal solid waste management, such as the lack of management capacity, financial resources, expertise and knowledge.

The local people dump their household/commercial waste in the evening and morning into permanent community bins or mobile garbage provided by the government. If anyone is found dumping their solid waste in the afternoon, he/she have to pay fine for it. Garbage littered outside are collected by Municipality and deposited into these bins. In bazaar area, the government has distributed two types of bins and is given below: -

### I. (a) Green Color Dustbin

The green color dustbin is for the wet waste such as organic waste.

**i. (b) Blue Color Dustbin**

The blue color dustbin is for dry waste such as paper, plastic, rags, metal and other inorganic waste.

Every day in the morning the waste collection vehicles come for waste collection with bell system or ringing bell. The collected wastes are loaded on the vehicle by Municipality office. The wastes collection vehicles make a round of all the streets for waste collection. Waste collection from core area is a challenging and tough job. There is no door to door collection system in Study area. Therefore, households are requested to dump solid waste on roadside community bins.

### 4.3.1 Place of Dumping Household Waste by the Respondents

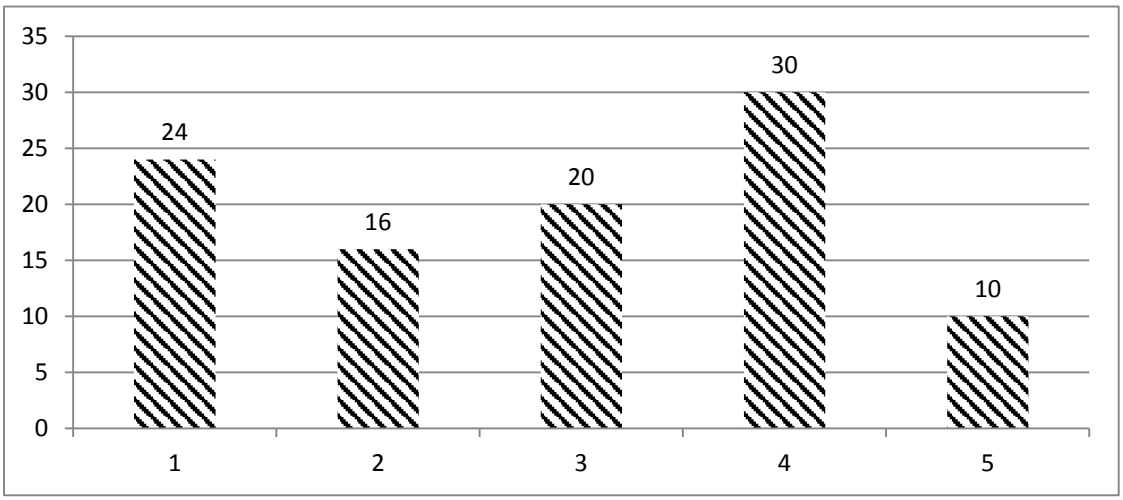
In my study area people dump solid waste in different places. The following table highlights the place where people usually dump the solid waste that produce from their home.

**Table: 4.10 Place of Dumping Household Waste by the Respondents**

| Places | No of Respondents | Percentage |
|---|---|---|
| Container | 12 | 24 |
| Open space | 8 | 16 |
| Backyard | 10 | 20 |
| Roadway | 15 | 30 |
| Others | 5 | 10 |
| Total | 50 | 100 |

*Source:* Field Survey, 2017

**Figure: 4.10 Place of Dumping Household waste by the Respondents**




Above table and figures indicate the situation of place dumping household waste. Data shows that 24% put in container and 16% throw in open space. In the same way, 20% collect in backward of the house and 30% throw in road way and other 10% throw whatever they like.

### 4.3.2 Opinion of the Respondents about the Increasing of Solid Wastes in Municipality

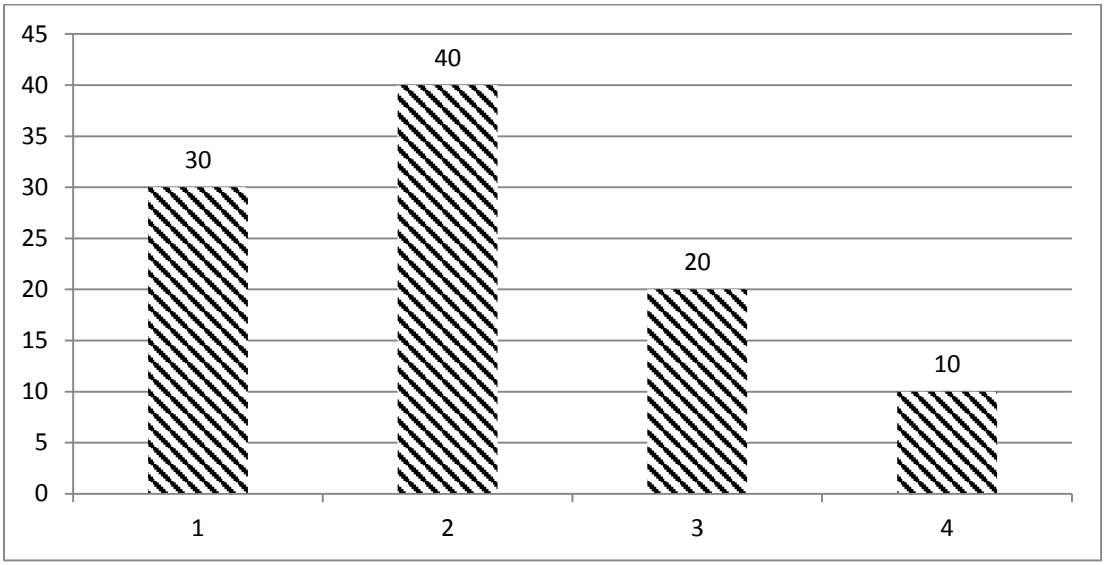
All the respondents are argued that the quantity of solid waste is increasing day by day in municipality. They have given various reasons. The following table indicates the respondents' opinion about the causes of increasing solid waste in municipality.

**Table: 4.11 Opinions of the Respondents about the Increasing of Solid Wastes in Municipality**

| How do you think the solid waste in increasing day by day? | No of Respondents | Percentage |
|---|---|---|
| Due to population increase | 15 | 30 |
| Change in food habit | 20 | 40 |
| Not taking care of it | 10 | 20 |
| Other | 5 | 10 |
| Total | 50 | 100 |

*Source:* Field Survey, 2017

**Figure: 4.11 Opinions of the Respondents about the Increasing of Solid Wastes in Municipality**




Above table and figure show the opinions of the respondents to increasing solid waste in municipality. Data shows that 30% focus on population growth and 40% indicate that changing food habit. In the same line 20% suggested that people not care about the waste and 10% give other answers.

### 4.3.3 Frequency of Waste Collection in Study Area

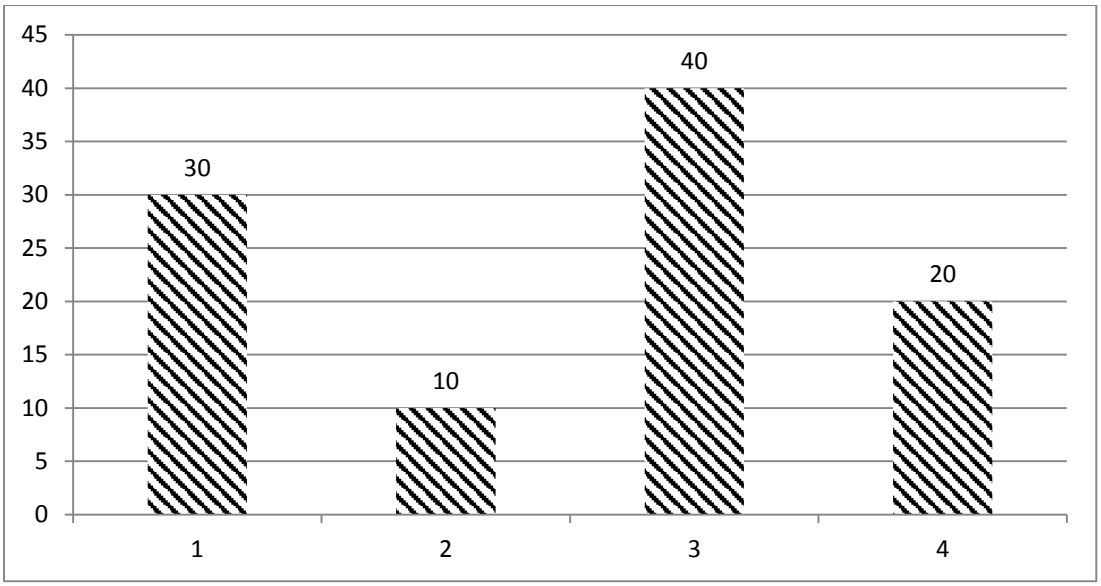
In my study, there is no fixed time of collecting waste. The following table shows the frequency of waste collection in particular respondents' house**.**

**Table: 4.12 Frequency of Waste Collection in Study Area**

| What is the frequency of the waste collection? | No of Respondents | Percentage |
|---|---|---|
| Once a week | 15 | 30 |
| Daily | 5 | 10 |
| Alternative day | 20 | 40 |
| Other | 10 | 20 |
| Total | 50 | 100 |

*Source:* Field Survey, 2017

**Figure: 4.12 Frequency of Waste Collection in Study Area**




The table mentioned above indicates the frequency of waste collection in the study area. Data shows that 30% argued there has collected once a week and 10% answer there has daily collection. In the same line 40% noticed that there has collected alternative day and 20% give other answers such as municipality hardly collect the waste from house.

### 4.3.4 Time of the Day of Waste Collection

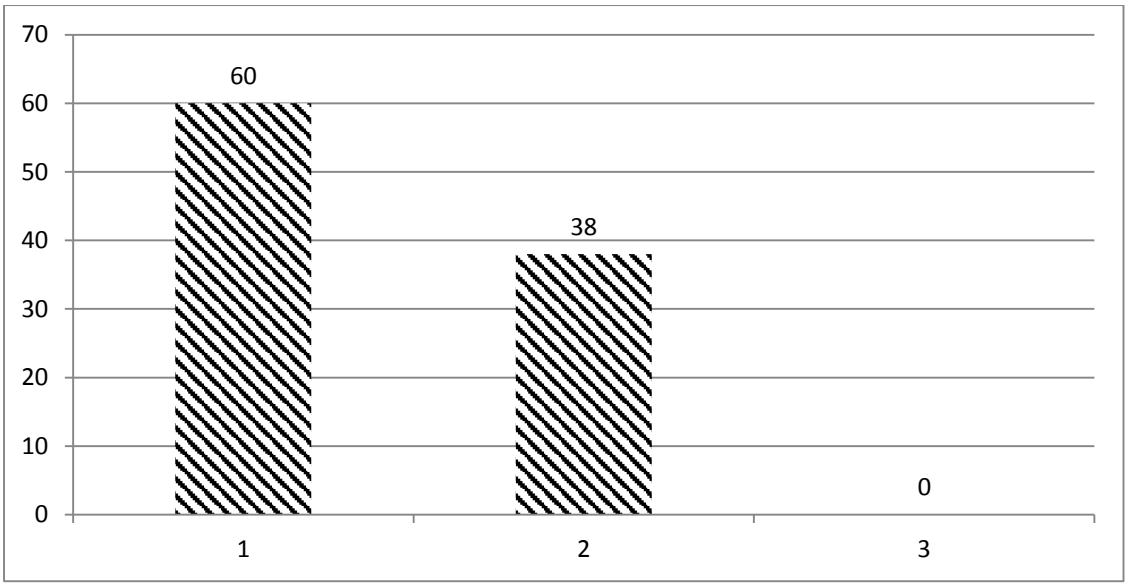
**Municipality collects waste in different time that highlights in the following table.**

**Table: 4.13 : Time of the day of waste collection**

| In which time of the day waste collection does? | No of Respondents | Percentage |
|---|---|---|
| Morning | 30 | 60 |
| Day | 19 | 38 |
| Evening | 1 | 2 |
| Total | 50 | 100 |

*Source:* Field Survey, 2017

**Figure: 4.13 Time of the Day of Waste Collection**




Above table and figure shows the time of waste collection in day by municipality. Data shows that 30% respondents answer at morning time and 38% noticed that municipality collect waste at day time and 2% gives answer some time municipality collect waste at evening time.

### 4.3.5 Place of Municipal Container Located

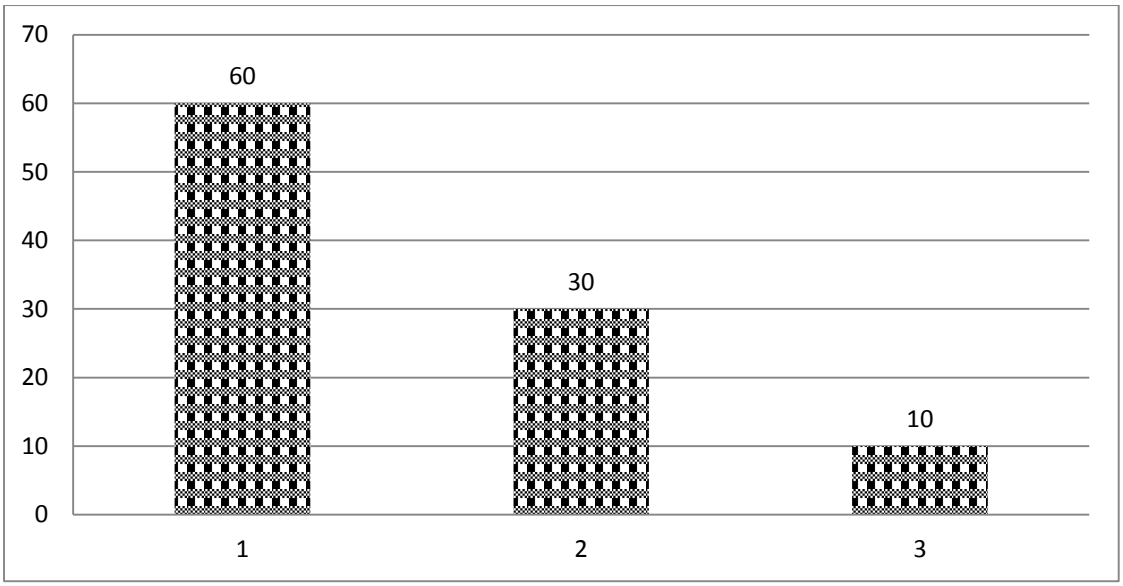
There is no fixed place to locate container in the municipality. The following table highlights the location of putting container by the municipality.

**Table: 4.14 Place of Municipal Container Located**

| Where is the Municipal container located? | No of Respondents | Percentage |
|---|---|---|
| Open space | 30 | 60 |
| Beside road | 15 | 30 |
| Other | 5 | 10 |
| Total | 50 | 100 |

*Source:* Field Survey, 2017

**Figure: 4.14 Place of Municipal Container Located**




Above table and figure show the place of municipal container located area. Data shows that 60% answer as open space and 30% noticed that municipality put it as beside road and 10% shows other space like before individual house.

### 4.3.6 Types of Waste Collection System in your Society

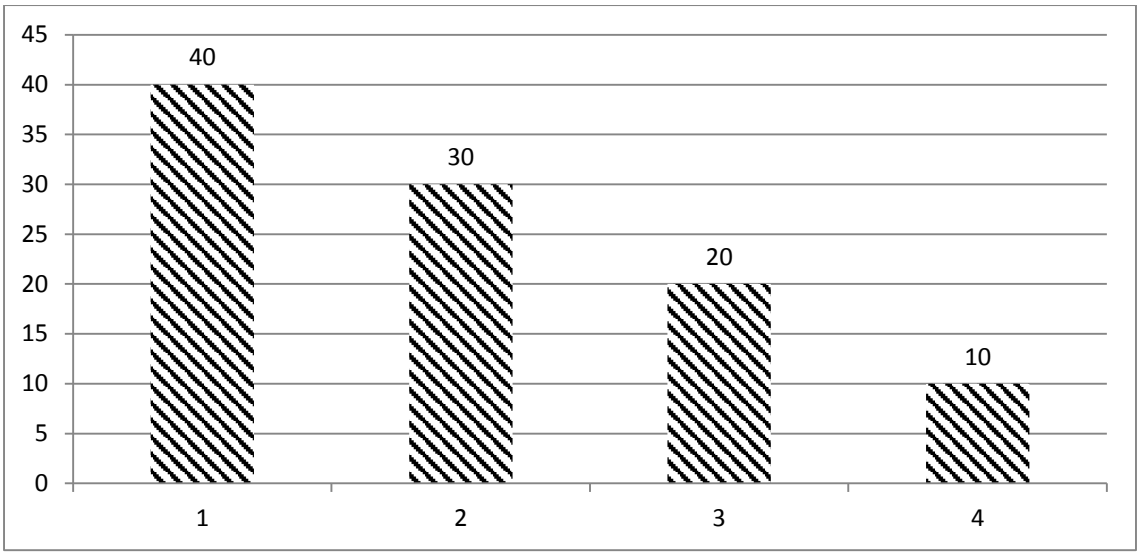
There is not fixed waste collection system in the study area. The following table highlight the waste collection system that practice in study area.

**Table: 4.15 Types of Waste Collection System in your Society**

| What type of waste collection system do you have in your locality from the concerned agency? | No of Respondents | Percentage |
|---|---|---|
| Door to door | 20 | 40 |
| Dumping | 15 | 30 |
| Waste collection by street sweeping | 10 | 20 |
| Other | 5 | 10 |
| Total | 50 | 100 |

*Source:* Field Survey, 2017

**Figure: 4.15 Types of Waste Collection System in your Society**




The table mentioned above show the types of waste collection system of the study area. Data shows that 40% argued door to door system and 30% focused on dumping system. In the same way, 20% indicate that waste has been collected by street sweeping and other 10% gives different answers.

### 4.3.7 Problems face by Respondents due to Waste

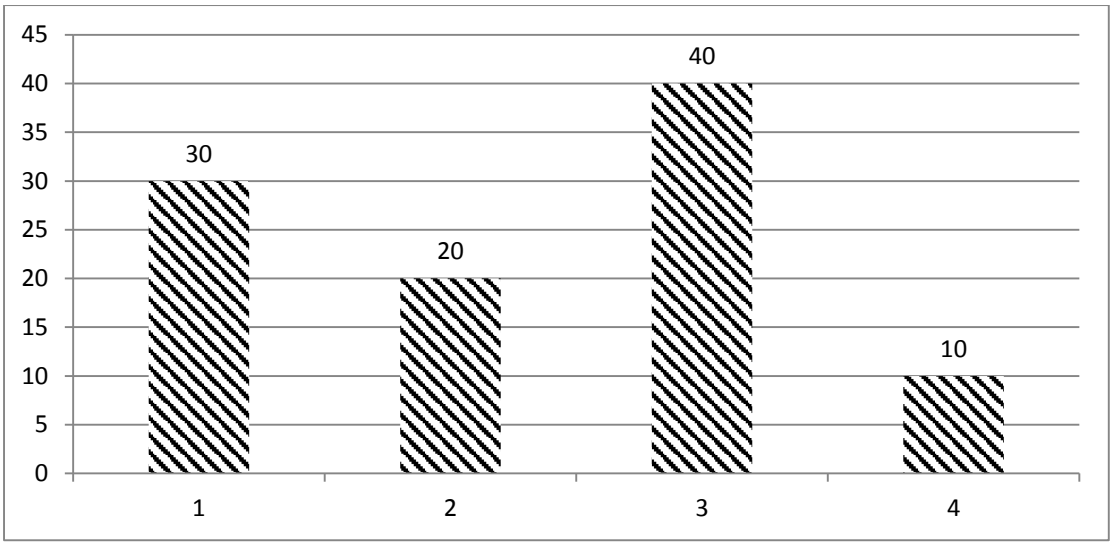
Due to the waste respondents are facing various problems in the study area. The following table highlights the problems that have facing by the respondents.

**Table: 4.16 Problems face by Respondents due to waste**

| What type of problem do you face when these waste were not collected? | No of Respondents | Percentage |
|---|---|---|
| Land pollution | 15 | 30 |
| Health hazard | 10 | 20 |
| Bad smell | 20 | 40 |
| Other | 5 | 10 |
| Total | 50 | 100 |

*Source:* Field Survey, 2017

**Figure: 4.16 Problems face by Respondents due to Waste**




The table and figure mentioned above highlight the problems faced by the respondent due to waste. Data shows that 30% focuses on land pollution and 20% argued that effects in health hazard. In the same way, 40% focuses on bad smell and 10% give other answers.

### 4.3.8 Respondents Manage Waste before Prevailing Waste Management System

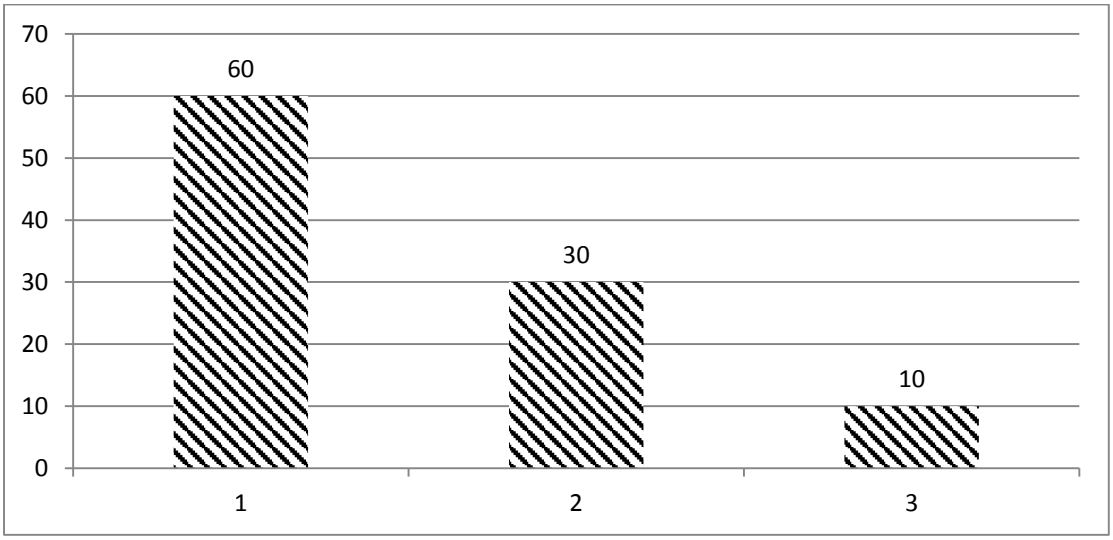
Before prevailing waste management system in the study area respondents used different method that has highlighted in the following table mentioned below**.**

**Table: 4.17 Respondents Manage Waste before Prevailing Waste Management System**

| How had you used to manage the waste before this prevailing waste collection system? | No of Respondents | Percentage |
|---|---|---|
| Throwing it in open space | 30 | 60 |
| Road way | 15 | 30 |
| Other | 5 | 10 |
| Total | 50 | 100 |

*Source:* Field Survey, 2017

**Figure: 4.17 Respondents Manage waste before Prevailing Waste Management System**




Above table and figure indicate the situation of mange waste before starting waste management system in the study area. Data shows that 30% throw in roadway and 60% collect in open space. Only 10% dispose by using other method.

### 4.3.9 Respondents' opinion for Sustainable Waste Management

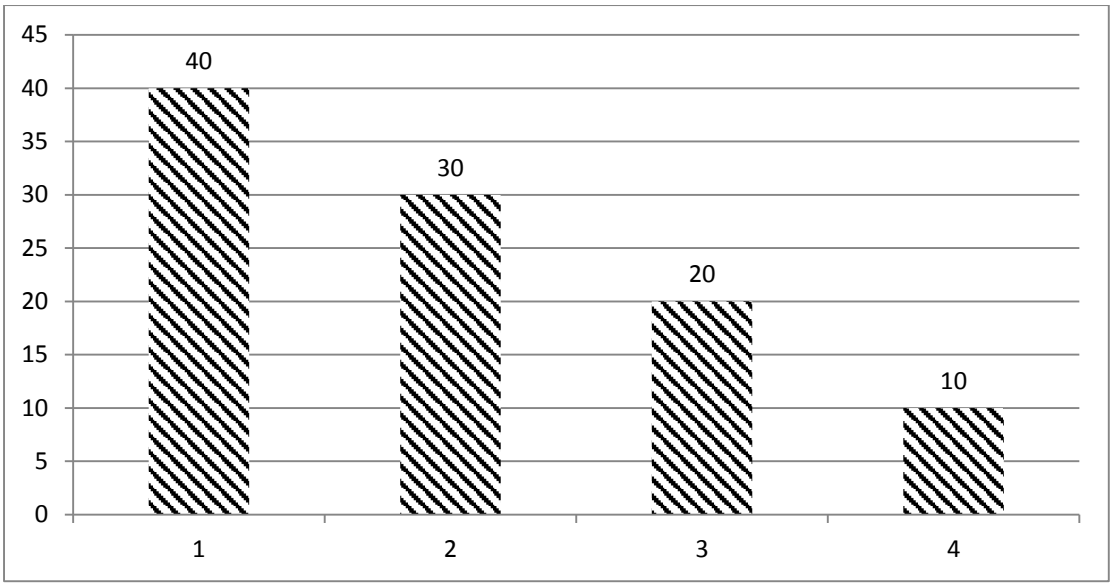
Respondents have given different opinions for the sustainable waste management in the study area. The following table projects the situations that are as follows.

**Table: 4.18 Respondents' Opinion for Sustainable Waste Management**

| Which process would be more appropriate for sustainable waste management? | No of Respondents | Percentage |
|---|---|---|
| Recycling Method | 20 | 40 |
| Landfill Method | 15 | 30 |
| Composting Method | 10 | 20 |
| Other | 5 | 10 |
| Total | 50 | 100 |

*Source:* Field Survey, 2017

**Figure: 4.18 Respondents' Opinion for Sustainable Waste Management**




Above table and figure indicate the respondents' opinion for sustainable waste management. Data shows that 40% focus on recycle and 30% highlights on landfill method. In the same way, 20% focuses on composing method and 10% focuses on other methods

### 4.3.10 Respondents' Opinion for the Long Term Solution of Solid Waste in the Study Area

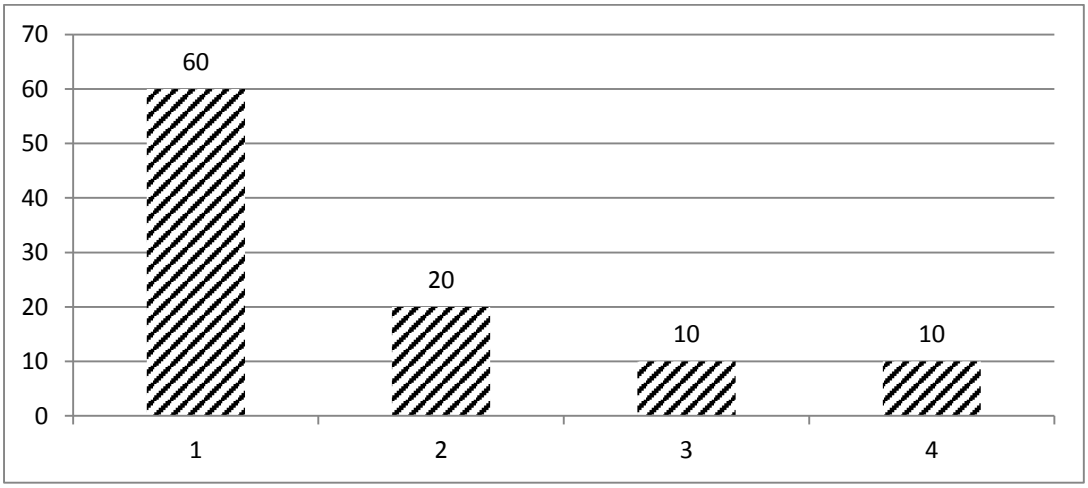
Respondents' have given differ opinions about long tern solution of solid waste management in the study area that mentioned in the following table.

**Table: 4.19 Respondents' Opinion for the Long Term Solution of Solid Waste in the Study Area**

| How can we have the long term solution of the problems emerging from solid waste? | No of Respondents | Percentage |
|---|---|---|
| Public awareness | 30 | 60 |
| Wards responsibility | 10 | 20 |
| Community based efforts | 5 | 10 |
| Others | 5 | 10 |
| Total | 50 | 100 |

*Source:* Field Survey, 2017

**Figure: 4.19 Respondents' Opinion for the Long Term Solution of Solid Waste in the Study Area**




Above mentioned table and figure indicate the respondents' opinion about long tern solution of solid waste management in study area. Data shows that 60% focus on public awareness and 20% highlights on wards responsibility. In the same line 10% focus on community based effort and next 10% concentrates on other ways.

### 4.3.11 Respondents' feeling on Present Waste Management System

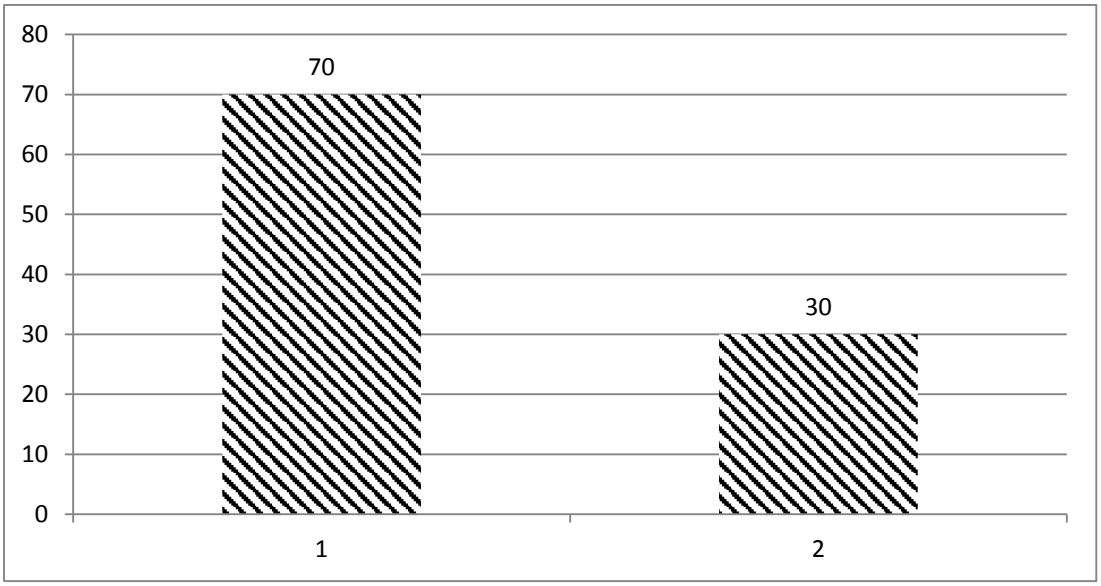
Respondents" have different feeling about present waste management system that followed by the municipality. The following table highlights the situation.

**Table: 4.20 Respondents' Feeling on Present Waste Management System**

| Are you satisfied with the waste collection system? | No of Respondents | Percentage |
|---|---|---|
| Yes | 35 | 70 |
| No | 15 | 30 |
| Total | 50 | 100 |

*Source:* Field Survey, 2017

**Figure: 4.20 Respondents' Feeling on Present Waste Management System**




Above table and figure highlight the respondents' feelings about present waste management system adopted by the municipality. Data shows that 70% are satisfied and 30% are not satisfied with the present system of waste management.

### 4.3.12 Respondents' Contribution of Waste Management

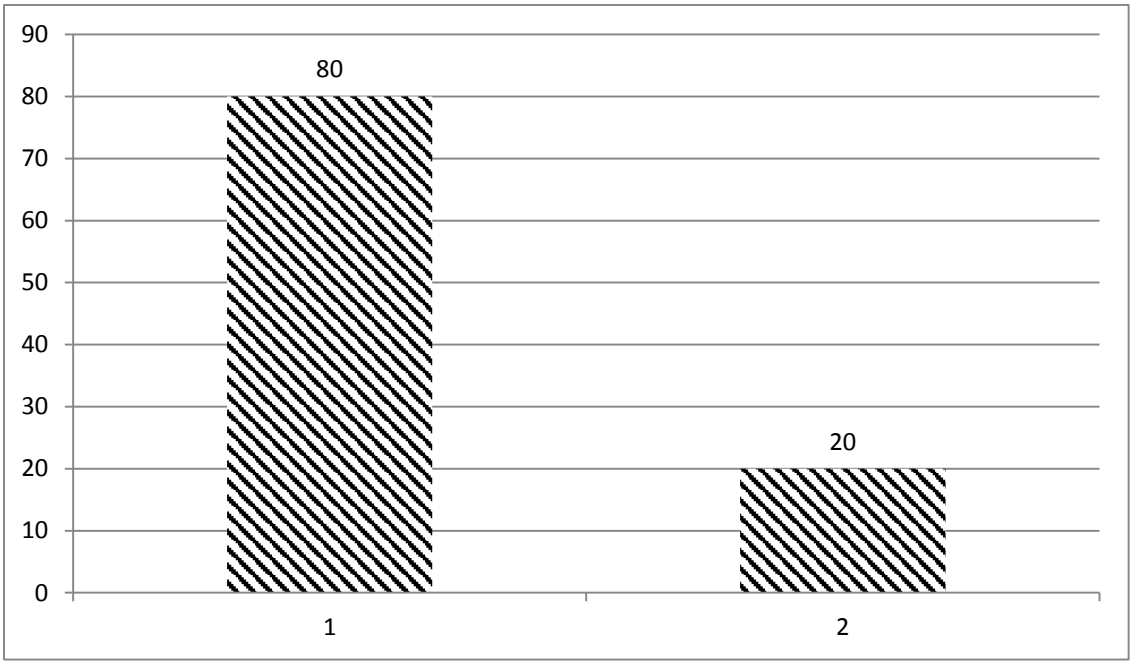
Some of the respondents have given contribution to manage waste that produced in municipality. The following table highlights the situation

**Table: 4.21 Respondents' Contribution of Waste Management**

| Do you have to pay for the waste collection service? | No of Respondents | Percentage |
|---|---|---|
| Yes | 40 | 80 |
| No | 10 | 20 |
| Total | 50 | 100 |

*Source:* Field Survey, 2017

**Figure: 4.21 Respondents' Contribution of Waste Management**




Above table and figure highlight the respondents' contribution of waste management by paying fee. Data shows that 80% pay the fee for waste management and 20% still have not pay for waste management.

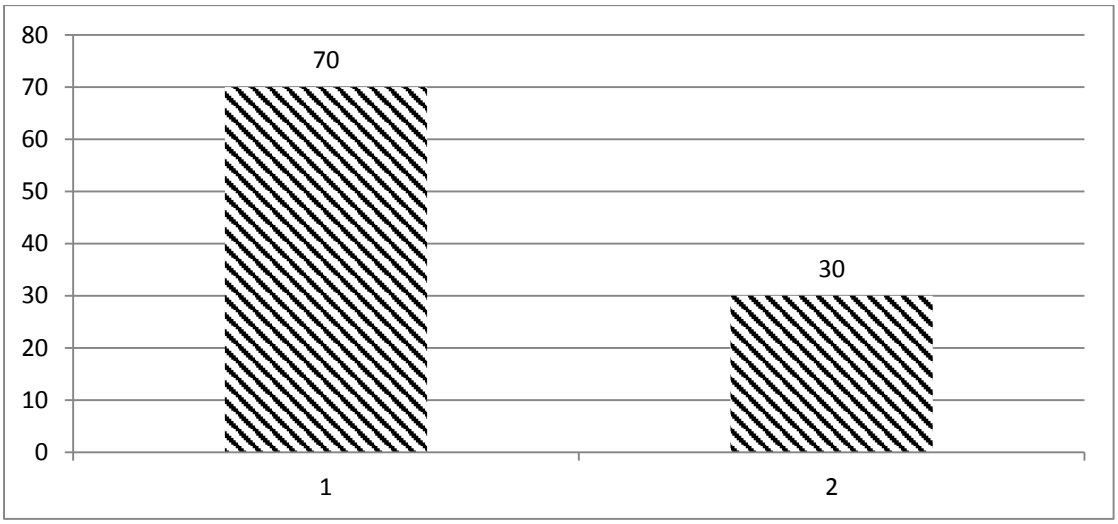
### 4.3.13 Involvement of the NGO in waste management

**Table: 4.22 Involvement of the NGO in Waste Management**

| Are there any NGOs involved in this activity? | No of Respondents | Percentage |
|---|---|---|
| Yes | 35 | 70 |
| No | 15 | 30 |
| Total | 50 | 100 |

*Source:* Field Survey, 2017

**Figure: 4.22 Involvement of the NGO in Waste Management**




Above table and figure show the situation of the involvement of the NGO in solid waste management in Ratnanagar municipality. Data shows that 70% answered there is involvement of NGOS and other response that there is no involvement of the NGOs in waste management.

### 4.4 Situation of Solid Waste Production

Nature of solid waste depends upon the sources from which the wastes are generated. In general, rural areas produce more biodegradable waste, whereas in urban areas biodegradable and non- biodegradable waste are found because of the varied sources of solid waste.

**Table:4: 23 Sources and Types of Solid Waste**

| Sources | Types |
|---|---|
| 1.Residential | Organic waste, paper, plastics rags, cloths, bottles and others |
| 2.Hotel/Restaurant | food waste, paper plate, disposable cup and spoon, plastics and others |
| 3.Grocery shop | Rotten vegetables, peel off |
| 4.Fish/Meat shop | Feathers, Hairs, Horns and Bones and others |
| 5.Institutional area | paper, plastics, rubbish ashes, food waste |
| 6.Hospital/Clinic | paper, plastics cotton, syringes, gauge, rags, cloths, rubbish ash |
| 7.Industry/Factory | food waste, paper, packing materials, cloth, ash, scrap, rags and others |

*Source: Field Survey, 2017*

The composition of solid wastes is similar throughout the world, but the proportions vary widely. The generated waste is composed of both biotic and abiotic elements. Biotic elements contain degradable waste like garbage, combustible material such as the branches and yard trimmings, dead animals, rags and temple offerings, some industrial waste and sewage waste. Abiotic elements are non-biodegradable components consists of waste such as old machine parts, demolition waste and construction waste etc. Over the years, it is likely that changes occur in the composition of waste for reasons such as: -

- A rising standard of living and changes in public taste which particularly influence the proportion of non-biodegradable waste;
- Changes in food technology (food processing and packaging) to increase the use of materials such as plastic, tins, metals and paper and
- Paving of roads which could cause a decline in inert materials.

Waste is a part of human activity from time immemorial and its management is essential. Management of solid waste has become a problematic job in recent years. The basic problems of solid waste in the study area are as follows: -

- Lack of dumping site
- Improper management of waste from the concerned agency

- Lack of technology for managing the waste
- Unable to enforce proper rules and regulation.
- Lack of public awareness.

The range of key issues that have to be tackled when seeking to improve solid waste management includes: -

- Daily waste collection service to be provided
- Door to door waste collection service to be provided
- Proper implementation of rules and regulations.
- Public awareness programs to be launched
- Proper location of dumping site
- Maximum numbers of containers to be provided
- Proper management of solid waste from the concerned agency
- Both government and private sector to come forward for proper management of solid waste.

The prospects given by the local people are the outcome of their day to day experiences. It is necessary to incorporate the mentioned suggestions while making any solid waste management strategy in study area.

With the rapid urbanization the waste generation trend is ongoing day by day. The present scenario of waste management even at municipality level was as that in household level. That is; the waste collected first either sweeping mainly in city area was collected different points. After then, the waste was found to be collected by either tractor or tipper/compactor and transported to the landfill site situated inside the catchment of Panchakanya Community Forest within periphery of Ramsar Site "Beeshhazari and Associated Lakes" at Barandabhar Forest where river flows side wise only differing a distance of only 10-20 meter which in coming future it directly influences with severe unmanaged waste. Although there is sufficient opportunity to manage the waste of the municipality by involving the private sector, CBOs, and other interested organization; no any step was taken except the last decision on giving to private sector was passed by the high municipality official level. However, in some of the households, the organic wastes were found to be used as the organic manure. There was absence of well sanitary landfill site within the municipality. The mistake again done from the municipality level was found to be ongoing construction of next

landfill site by the riverside moving inside in the Barandabhar Forest area. Although the budget allocation of Rs 8 lakhs was done in 2068 B. S. for bringing tractor for SWM, no step seems to be implemented in this part. The wastes are dumped openly and the plastics and papers were also found to be thrown carelessly either in the roadside or into the rivers. So the river especially that moves across the city area was in miserable condition. Similarly, there is also no provision for the special waste management. Also the effectiveness of awareness program was conducted from the municipality level to the locals and staff level too.

# CHAPTER V

# SUMMARY CONCLUSIONS AND RECOMMENDATIONS

## 5.1 Summary

In the context of study area solid management is being a serious problem because unmanaged construction of the market produced solid waste in large scale. The study focused on the situation of solid waste management in Ratnanagar municipality ward no. 1 Tandi Market. General objective of this study is to analyze the situation of solid waste management in Ratnanagar municipality ward no. 1. Specific objectives are **t**o examine the current solid waste management system in the study area, to analyze the sources and composition of solid waste and explore the problems and prospects of solid waste management. Both analytical and descriptive research design were used to complete of this study. Quantitative data were analyzed by using analytical research design and qualitative data were analyzed by using qualitative research design and find out the situation of solid waste management situation of the study area.

Ratnanagar municipality ward no 1 is *Tandi Bazzar* area is the sample site of this study. Total population of the wards is 4999. In main highway lines there are 201 households among them 25% households (50) were taken as sample household. From each household single individual was taken for interview by busing random sampling method. The present study was based both primary and secondary data. Secondary data were used in literature review and that were collected through library study method and books, article, journal, previous thesis are used as the main sources of secondary data. Primary data were collected from the field by using various data collection techniques such as questionnaires and observation.

A set of semi- structured questionnaires were prepared to generate the realistic and accurate data from the field through interview questionnaires. The respondents were requested to fill up the questionnaires. In case of the respondents who could not fill up the questionnaire, the questions were asked to the respondents and answers were filled up to collect the required data. Questions were related to waste management situation of the study area and their perception about the waste management. During the time of data collection, I have frequently visited the study area and necessary data were

collection by observation. I observed the landfill side and the street where solid waste was spread here and there. Necessary information also collected from by observation check list. After the data was collected from the field survey, data was checked thoroughly and edited wherever needed. Simple statistical tools like tables, graph, bar diagrams, were used to analyze the collected statistical data and other qualitative data were analyzed by using paragraph description.

Socio economic characteristics of the respondents such as castes, education, and sex also play important role for the producing and management of the solid waste. In this study 32 % of total are Brahmin, 10 %were Chhetri, 26 %were Newar, 6 % were Magar, 12 % Tharu , 6 % Gurung , 4 percentages and 4 % Tamang of and next 4% other. Out of the total there are 58 percentages is 21-35 age group. More than 50 years are only 4 percentages of the total. It is found that the of age 21-35 are more active in income generating activities, because they are more responsible to their family's economic betterment. 52% respondents are males and 48% respondents are females. 76 percentages, similarly, Buddhist and Christian are 10 percentages and Muslim is only 4 percentages. This table shows that multi religious people live in the study area. 62 percentage has medium size of family (5 & 6) and 28 percentages of has small size family (up to). It has been noted that there is only 10 percentage who has large size (above 6) family.

It shows that 24% put in container and 16% throw in open space. In the same way, 20% collect in backward of the house and 30% throw in road way and other 10% throw whatever they like. 30% focus on population growth and 40% indicate that changing food habit. In the same line 20% suggested that people not care about the waste and 10% give other answers. 30% argued there has collected once a week and 10% answer there has daily collection. In the same line 40% noticed that there has collected alternative day and 20% give other answers such as municipality hardly collect the waste from house. 60% answer as open space and 30% noticed that municipality put it as beside road and 10% shows other space like before individual house. Opinion for sustainable waste management. Data shows that 40% focus on recycle and 30% highlights n landfill method. In the same way, 20% focuses on composing method and 10% focuses on other methods

## 5.2 Conclusions

Solid wastes are a growing environmental problem in The study area. Increase in population along with the rapid urbanization has led to the increase in waste generation rate in the study area. Furthermore, change in living standard of the people and change in food habit have increased the rate of inorganic waste. All these have added to the problems in solid waste management which is a global issue. The major sources of solid waste in Ratnanagar municipality are municipal, domestic, commercial and agricultural, which consists of both organic and inorganic. The total waste generated in Study area has been increasing day by day.

The management of waste is fully maintained by Municipality and provides different services such as collection, transportation and disposal of waste. There is no door to door collection of domestic waste. Local people have to dispose their household waste themselves in the nearby community bins provided by the government. The concerned authority is lacking modern and advanced technology for handling municipal waste. There is no experts and trained person who can help to develop some strategic planning for proper waste management. The main bazaar is well served by the department but it is due to the lack of sufficient tools and manpower, the concerned authority is unable to provide service in all areas of Study area.

The local people are also not much concerned about the municipal waste. Though they manage their household waste by disposing it in the community bins but they have not shown any interest to find out the sustainable management of municipal waste. There is lack of public awareness and participation for proper management of solid waste. Only few of the households segregate their household waste at home before dumping. Rests of them dump it without segregation. The concerned authority is trying their best to make maximum community participation.

Different projects have been launched by the government for the proper management of solid waste and to keep the city clean and green.

### 5.3 Recommendations

Based on the findings of the study the following recommendations are suggested for further improvement in the solid waste management in the study area.

- The concerned authority should provide door to door collection service
- The citizen should be encouraged by the authority for the segregation of wastes at household level. They shall promote recycling or reuse of segregated materials.
- Waste minimization efforts should be motivated at the primary and secondary levels of waste collection. The citizen should be encouraged by the authority for the segregation of waste at household level and for composting of waste for stabilization of wastes.
- The concerned authorities should adopt suitable technology, a combination of such technologies to make use of wastes so as to minimum burden on landfill.
- Landfill should be restricted to non-biodegradable and other wastes that are not suitable either for recycling or for biological processing.
- The concerned authority has to appoint more employees in order to extend their service area.
- Community participation should be increased and local NGOs should be mobilized in solid waste management.
- There should be immediate need of landfill site (sanitary landfill; if possible) in the other place than the existing landfill area like community forest, parks, human settlement area, etc. which directly impact on livelihood of people and biodiversity.
- Alternative way of awareness programs on SWM should be found out and facilitate behavioral changes within local level as well as training for SWM related staffs on SWM should be provided because they can play a vital role in waste management sector.
- Formulation of policy for SWM from municipality level along with budgeting on SWM should be given in priority for healthier livelihood.
- Gap between staffs within the municipality should be omitted so that ongoing event inside the municipality could be easily known and should take

responsibility on the people's work inside municipality i.e. institutional strengthen should be establish.

- Collection to Final disposal system should be improved, developed within workers by providing schemes could facilitate on SWM in an efficient way. f) Updating the data on different sector like SWM, UEIP, administrative, etc. should be done time to time. g) High waste generator place should be identified in order to easy and fast management of solid waste.

- Lastly, the enforcement of these measures has to be ensured through appropriate laws and regulation and regular monitoring of development activities.

# REFERENCES


Anand, P.B. (1999) "Waste Management in Madras", *Environment and Urbanisation*, Vol. II, No. 2., 161- 176.

Asnani, P.V. (2000) *Modernization of Solid Waste Management Practical in the city of Ahmedabad-India* Vol. C GTZ KTM, Nepal

Becker, Scott. (1997). *Community Organization and Solid Waste Management in the Kathmandu Valley*. Himalayan Research Bulletin, Vol. XVII, No.1

Booth, B.E. (2001). *Urban Health and Development.* Delhi Himalayan research Centre

Brandon, C and Ramankutty, R. (1993). *Toward an Environmental Strategy for Asia.* summary of World Bank Discussion Paper. Pg. No. 6-12

Bhide, A.D., 1991, Solid Waste Management of Dhaka, Kunla and Natore Municipality of Bangladesh. A Case Study Report.

ENPHO (2003). *Chikitsajanya Phohar Byawasthapan Nirdeshika*, Kathmandu: KMC.

Environmental Science Students (1999) Solid Waste Management Practices in Kathmandu. A report, Department of Environmental Science, KU.

Gautam, S.M. (2015) "Solid Waste Management in Kathmandu Metropolitan City". M.A, thesis, Department of Geography, TU, Kirtipur.

Gupta, K. Sanjaya.(2012). *Rethinking Waste Management*. New Delhi: Sunlight publisher

Garg, V.K; Bishnoi, M.S and Malik, C.P. (2002). *Introduction Text of Environmental Policies and Law.* Bhagalpur: Author

IUCN. (1992). *A Review of Solid Waste Management in Urban Nepal*, NPC/IUCN, NCS, Implementation Programme. pp. 6-24.

IUCN, (2001). Solid Waste Management in Gilgit, Draft Project Proposal. pp 3-15.

Jadhav, H.V. (1995). *Environmental Pollution.* Delhi: Green Society

Khan, P. (1992) "Environmental Setting and Priority Area for Action" *Environment and Urbanisation*", Vol. 4, No.1. pp. 9-11.

Lekhak, H.D and B. Lekhak, (2003). *Natural Resource Conservation and Sustainable Development in Nepal*, Kshitiz Publication, Kirtipur.

Miller, G.T., (1998). *Living in the Environment an introduction to Environment Science.* Kolkata: Greenhouse publisher

Palnikar, S, (2000) "*Municipal Solid Waste: Manual on Solid Waste Management*". All India Institute of Local self-Government. pp.!-9.

Parajuli, R.(2001). "Knowledge, Attitude and Practices in Solid Waste Management", thesis, M.A, Department of Sociology, TU, Kirtipur.

Pandey, R., (2004). "A study on Occupational Health Problems of Sweepers and Scavengers of Kathmandu", Department of Human Geography, University of Oslo. pp. 94-95.

Pradhan, P.K. (2011). "*Population Growth, Migration and Urbanisation and Environmental Change in Kathmandu Valley*", Paper presented at Wagen.

Sharma, A., (2012). Report on the Impact of Domestic and Industrial Wastes on River Pollution in Kathmandu", Department of Microbiology, TU, Kirtipur.

Singh N., (2016). "Mitigating Nimby (Not in My Backyard) Syndrome as barriers to landfill siting. A case Study on Economic and Regulatory Measures for Banchedanda Landfill Site", Kathmandu, Nepal. Asian Institute of Technology, School of Environment, Resource and Development, Bangkok, Thailand.

Spreen, E.(2009). *Solid Waste Management with Peoples' Participation- Experience from the Kathmandu Valley*, SWMRC/GTZ, Kathmandu.

Thapa, G.B. and S, R. Devkota. (2013). *Managing the Waste in Metro Kathmandu*. ACRD, Monograph I, Kathmandu.

Thapa, S.B. and J. Ringeltaube. (2008).*The Need for a System to Solid Waste Disposal and Collection*. Kathmandu: Nepal MAB Committee.

Thapa,Selina.(2002). Solid Waste Management of Dharan Municipality. Dissertation submitted to Dept of Gegraphy, T.U., Kathmandu, Nepal.

Udash, R.(2004). Composting as an Option in the Municipal Solid Waste Management of Kathmandu Metropolitan City. thesis, M.Sc, Department of Science in Environmental Management, PU, Shantinagar, Kathmandu.

UNEP (2001). *State of Environment*. UNEP, Nepal.

UNDP.(2007). *Environmental Problem of Urbanization and Industrialization*, the existing situation and future direction. KTM, Nepal, June.

Vesivalo, Jaakko (2001). Solid Waste Management in Biratnagar-Dharan, Industrial Corrider, Nepal. Consultancy Report.

# ANNEXES

Annex: 1 Questionnaire

**1. Interview Questionnaire**

2. Socio economic characteristics of the respondents

1. Name
2. Address
3. Sex
4. Age
5. Education
6. Caste/ethnicity
7. Marital status
8. Religion:
9. Family Size
10. Occupation

**11.** Having knowledge about solid waste management

**3. Question related to solid waste management in Ratnanagar municipality**

1. Where do you dump your household waste?

   a. Container b. Open space c. Backyard

   d. Roadway e Others

2. How do you think the solid waste in increasing day by day?

   a. due to population increase b. Change in food habit

   c .Not taking care of it. d. Others

3. What is the frequency of the waste collection?

   a. Once a week b. daily

   c. Alternate day d. Others

4. In which time of the day waste collection does?

   a. Morning time b. Day time c. Evening time

5. Where is the Municipal container located?

   a. Open place b. beside the road

6. What type of waste collection system do you have in your locality from the concerned agency?

   a. Door to Door. b. Dumping

   c. Waste collection by street sweeping d. Others

7. What type of problem do you face when these waste were not collected?

   a. Land Pollution b. Health Hazards

   c. Bad smell d. Others

8. How had you used to manage the waste before this prevailing waste collection system?

   a. Throwing it in open space b. Roadway

   c Others

9. Do you have to pay for the waste collection service?

   Yes ( ) No ( )

10. If yes, how much do you have to pay for the service per month?

    .....

11. Are you satisfied with the waste collection system?

    Yes ( ) No ( )

12. Are there any NGOs involved in this activity?

    Yes ( ) No ( )

13. Which process would be more appropriate for sustainable waste management?

    a. Recycling Method b. Landfill Method

    c. Composting Method d. Others

14. How can we have the long term solution of the problems emerging from solid waste?

    a. Public awareness  b. Wards responsibility

    c. Community based efforts  d. Others

15. Do you have any suggestions regarding solid waste management system?

    .....

16. Do you have any idea about the best collection system?

    .....

17. What are the problems of solid waste management?

    .....