"A Study of Social Aspects of Solid Waste Management in Municipal Corporation Gurugram"

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CANDIDATE'S DECLARATION

I hereby declare that the research work embodied in this thesis entitled **"A Study of Social Aspects of Solid Waste Management in Municipal Corporation Gurugram"** carried out by me under the guidance and supervision of **Dr. TRUPTI SINGH** is an original work and does not contain part of any work submitted for the award of any degree either in this University or any other University around the globe.

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CERTIFICATE OF SUPERVISOR

This is to certify that Mr./Ms./ Smt. /Km. **SATISH KUMAR** has completed the necessary academic turn and the swirl presented by him/her is a faithful record of bonafide original work under my guidance and supervision. He/She has worked on **"A Study of Social Aspects of Solid Waste Management in Municipal Corporation Gurugram".** No part of this thesis has been submitted by the candidate for the award of any other degree or diploma in this or any other University around the globe.

Supervisor

Name: Dr. TRUPTI SINGH

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Abstract

Municipal solid waste (MSW) is one of the major areas of concern all over the world. In a developing country like India, there is a rapid increase in municipal solid waste due to urbanization and population growth. Composition of waste varies with different factors like living standards, climatic conditions, socio-economic factors etc. Municipal solid waste (MSW) is on the increase, and the large quantities of waste has become a challenge to manage. However, the study investigates the current scenario of two selected Zones I and II in Gurugram with respect to municipal solid waste, their quantity, quality and its management. The study also aims at giving a brief overview of MSWM in two different Zones I and II of the Gurugram city.

Gurgaon is one of the fastest growing cities in India. Rapid development and habitation in the city is generating all kinds of waste, which is becoming a serious health and sanitation hazard for its residents. Apart from MSW waste, Gurgaon generates a lot of e-waste (due to a huge corporate sector) as well as bio-medical waste (due to a growing hospital sector). Besides, industrial waste (including sludge etc.) is also generated in large quantities due to growing industrial base. The city has an urban area at about 167 square km. and a resident population of about 1,514,085 in 2011. It generates 449 metric tons of Municipal solid waste as pr MCG officials every single day.

The proposed study was conducted in Gurugram, Haryana to understand about the solid waste management practices in Gurugram city along with people's participation in the management of solid waste. Among the 4 Zones, the present study has covered only two Zones I and II, covering 450 households as the respondents of the study. It has integrated various stake holders such as households, sanitary workers, engineers, executives, senior health inspectors, entrepreneurs/vendors, and ward-level elected representatives to understand their perceptions on solid waste management.

Sanitary workers, households, elected representatives from Gurugram Metropolitan Development Authority (GMDA) and Municipal Corporation of Gurugram, entrepreneurs/vendors, and administrative staff personnel are the five key categories of respondents in this study. The purpose of the study is to understand the role that multiple players play in effectively managing solid waste. An approach like this one is taken with the goals of gaining a comprehensive understanding of the topic from a variety of perspectives

and arriving at an effective model for waste management.

For the research study the chapter has been divided into 5 chapters such as :

Chapter I : Introduction:

The theoretical concepts related to the civic participation, municipal solid waste management, global issues, local issues, and about the sanitary workers role in Municipal solid waste management are discussed in this chapter. This chapter was covered all functional aspects of Solid Waste Management. This chapter was covered introduction of research methodology, scope, significance, objectives and hypotheses of the study, primary and secondary data collection methods and limitations of the study.

Chapter II: Review of Literature:

This chapter has been covered published and unpublished literature review on the Municipal solid waste management, and related issues.

Chapter III: Profile of Study Area:

The chapter was covered the profile of selected municipalities under study. The profile deals with the basic information of the municipal council, present solid waste management status and practices adopted.

Chapter IV: Data Interpretation and Analysis :

This chapter presents the primary data collected through the study. The output data is presented in frequencies, percentages, mean and standard deviation. Also, narrative presentation of qualitative data is made.

Chapter V : Major finding, Conclusion and Recommendation:

This chapter sums up the results and provides suggestions for effective Municipal solid waste management strategies**.**

Keywords : Municipal Solid Wastes, People's participation, general awareness, waste management, Municipal Corporation of Gurugram and Manesar

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LIST OF ABBREVIATIONS

BWM	Bio-medical Waste Management
CBO	Community Based Organisations
CPCB	Central Pollution Control Board
CPHHEO	Central Public Health and Environment Engineering Organisation
CSD	Commission on Sustainable Development
EPA	Environment Protection Agency (USA)
EPA	Environment Protection Act (India)
E-waste	Electronic Waste
GHG	Green House Gases
GOI	Government of India
HSMD	Hazardous Substance Management Division
HWM	Hazardous Waste Management
MC	Municipal Corporation
MT/Day	Metric Tone per Day
MoEFCC	Ministry of Environment, Forest and Climate Change
MoUD	Ministry of Urban Development and Poverty Alleviation
MSWM	Municipal Solid Waste Management
NGO	Non-governmental Organisations
NSWAI	National Solid Waste Association of India
NUSP	National Urban Sanitation Policy
SBA	Swach Bharat Abhiyan
SCS	Stationary Container System

SWM	Solid Waste Management
TSDF	Treatment, Storage and Disposal Facility
UIDSSMT	Urban Infrastructure Development Scheme for Small and Medium Towns
ULB	Urban local body
URM	Urban Renewal Mission
WTE	Waste-to-Energy Combustion
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
WHO	World Health Organisation
WTO	World Trade Organisation

CHAPTER 1
INTRODUCTION

1.1 Introduction

India's cities and municipalities struggle to manage solid garbage. Rapid population growth and economic growth boost urban consumption and waste. The Indian government has improved Solid Waste Management with technology.

Waste management affects health, the environment, and aesthetics. Haryana seeks to strengthen its MSWM system, which includes collection, segregation, recycling, transportation, processing, and disposal (including composting and waste-to-energy).

According to the Constitution of India, solid waste management is a state obligation (Department of Economic Affairs, 2009). In 1992, local governments took over trash collection, treatment, and disposal by the 74th Constitutional Amendment Act. (ULBs). "New Federalism" reigns (devolution of political power to the states). Local governments handle solid waste through infrastructure, labor, and financing (Ministry of Urban Development, 2012).

Solid waste management is one of India's least-prioritized challenges. Solid waste production is 115,000 tonnes per day, up 5% annually. Local budgets spend 5 to 25% on trash collection. Despite high costs, the current level of service threatens public health and the environment (European Business and Technology Centre, 2011).

Solid waste management affects India's political, institutional, social, financial, economic, and technical aspects. These include: Solid waste management involves "users," "providers," "intermediaries," and "regulators." Household communities, NGOs, informal private sector enterprises (like rag pickers), educational institutions, private and public commercial institutions, health institutions, people, and external help agencies are examples (Schubeler et al, 1996).

Waste management benefits include "protecting population health, preserving the environment, ensuring eco-system sustainability, supporting economic development by providing demanded waste management services, ensuring the efficient use and conservation of valuable resources, and finally, waste management is a labor-intensive activity that generates employment and income within the sector" (Schubeler et al, 1996).

Improper and disorganized dumping of MSW in open places and landfills harms both people and the ecosystem. It spreads diseases that can be transmitted from humans to animals and diseases that can't be transmitted, affecting quality of life, ability to make a living, and economic production. It also contaminates soil, surface water, and ground water and produces greenhouse gases. Solid waste can be turned into a profitable resource with enough information and proper management.

1.2 Conceptual Framework of Solid Waste Management

Garbage of many different types can be found in metropolitan areas, including that which is municipal, biomedical, industrial, electronic, construction and demolition, and plastic. In this particular study, only municipal, biomedical, industrial, and electronic waste are taken into consideration. The concepts of waste management, both traditional and modern, are helpful in understanding the current context of solid waste management. There is a connection between globalization, urbanization, sustainable development, gender, and the general public with regards to solid waste. In the following subsections, the meaning and definitions of various wastes, as well as traditional and contemporary notions of solid waste, as well as the interconnectedness of waste management, will be discussed.

1.3 Meaning, Definitions and Significance of Solid Waste Management

"Management is a cycle that consists of setting goals, making long-term plans, programming, budgeting, putting plans into action, running and maintaining the plan, monitoring and evaluating, controlling expenses, and altering goals and plans, etc" (Schubeler et al, 1996, 40).

Definition of Solid Waste

The trash or garbage that is produced by a human settlement is referred to as municipal solid waste, or MSW for short.

The amounts and properties of the solid waste produced in each nation are uniquely different from those of the others. The average level of income of the people, the sources, the population, social behaviour, climate, industrial production, and the market for waste products are all factors that influence the amounts and composition (Baldisimo, 1988). In a general sense, one might claim that there is a correlation between a country's Gross National Product (GNP) and the amount of solid trash produced per capita in that country. The amount of solid garbage created grows in both weight and volume as the level of economic affluence rises. A proportionally bigger share of this waste will consist of so-called 'luxury' waste such as paper, cardboard, and plastic as well as heavier organic elements. The trash densities and moisture contents of urban solid waste in developing countries' cities are significantly higher than those of waste in developed nations' cities (Cointreau, 1984). In India, for instance, coconut hulls are more frequent in the springtime, and paper and plastic after celebrations have been conducted as instances of rubbish. This has an essential implication for the applied technology and management of solid waste composition owing to season and location (Amin, 2016).

Waste is produced in every aspect of human endeavour, including but not limited to production, distribution, consumption, and even leisure. As inputs from the environment, a society draws energy and raw resources, and as outputs, it contributes waste to the environment through the generation of solid waste. In point of fact, the concept of waste is difficult to pin down. On the other hand, the definitions that are presented below will provide a deeper insight into the idea of solid waste.

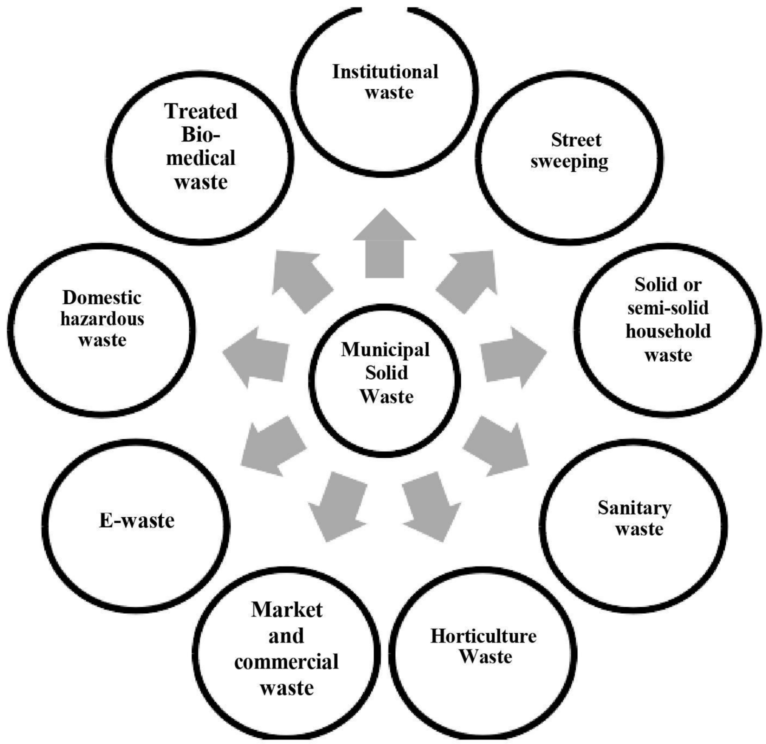
According to the United States Environmental Protection Agency's definition, municipal solid waste is comprised of non-biodegradable materials such as durable goods, containers and packaging, food wastes, yard wastes, and various inorganic wastes coming from residential, commercial, institutional, and industrial settings (Environmental Protection Agency, 2001).

The Indian Municipal Solid Wastes (Management and Handling) Rules, 2000, define "Municipal Solid Waste" as "wastes generated in municipal or notified areas in either solid or semi-solid form, excluding industrial hazardous wastes but including treated bio-medical wastes." This definition includes commercial and residential wastes generated in municipal or notified areas. The term "municipal waste" refers to rubbish that is gathered and disposed of by a local body either directly or on its behalf. In general, it is comprised of waste from households, as well as some waste from commercial establishments and waste that members of the general public have brought to municipal amenity (bulky) waste collection and disposal sites. In addition, it may comprise wastes from sweeping roads and pavements, wastes from emptying gullies, and some wastes from construction and demolition that result from activities conducted by municipal authorities (Skitt, 1992).

"Refuse from households, non-hazardous solid waste from industrial, commercial, and institutional establishments (including hospitals), market garbage, yard waste, and street sweepings" are the components that make up what is known as "municipal solid waste" (Schubeler, Christen & Wehrle, 1996, p. 9). Wastes such as product packaging, newspapers, office and classroom paper, bottles and cans, boxes, wood pallets, food scraps, grass clippings, clothing, furniture, appliances, automobile tyres, consumer electronics, and lead-acid batteries are examples of municipal solid waste. Other types of wastes that fall under this category include organic waste and hazardous waste (Babu, 2013).

According to the Solid Waste Management Rules (2016) issued by the Government of India, the following types of waste are considered to be municipal solid waste: "solid or semi-solid domestic, sanitary, commercial, institutional, catering and market waste and other non-residential wastes, street sweepings, silt removed or collected from the surface drains, horticulture waste, agriculture and dairy waste, treated bio-medical waste and e-waste, battery waste, and radioactive waste" (Solid Waste Management Rules, 2016, 02). As a result, the following items are included in the category of municipal solid waste: (Figure 1.1). The MSW Rules from 2000 have been replaced with the Solid Waste Management Rules of 2016, which govern the management of municipal solid waste. The collection, sorting, and disposal of municipal solid waste falls under the purview of urban local bodies within their respective areas (Solid Waste Management Rules, 2016).

Figure 1.1 Sources of Municipal Solid Waste Generation



Source: Solid Waste Management Rules (2016)

The State Pollution Govern Boards are in responsible of putting these principles into action, and the Biomedical Waste Management Rules, 2016, are the guidelines that are utilized to control the biomedical waste. According to the Rules for the Management of Biomedical Waste (2016), biomedical waste can be generated during the diagnosis, treatment, or immunization of human beings or animals, as well as during research activities in these fields, the production, or testing, of biological waste, or in health camps. Additionally, biomedical waste can be generated during the research activities in these fields (categories mentioned in Schedule I). In addition, when evaluating biological waste, biomedical waste may be produced (Bio-medical Waste Management Rules, 2016, 40). It is the duty of the urban local bodies to make certain that the only processed biomedical waste is thrown away with the rest of the municipal garbage.

The Hazardous and Other Wastes (Management and Transboundary Movement) Rules are the laws that regulate how hazardous waste from industries should be disposed of and managed (2016). The State Pollution Control Boards are the ones who are in charge of ensuring that these standards are followed to the letter. According to the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, 03, "Industrial waste is identified with characteristics such as physical, chemical, biological, reactive, toxic, flammable, explosive, or corrosive which cause danger or likely to cause danger to the health or environment alone or in contact with other substance." "Industrial waste can be recognized by its properties, which may include being physical, chemical, biological, reactive, toxic, combustible, explosive, or corrosive," as one definition puts it. As a consequence of this, it is the responsibility of ULBs to ensure that any hazardous waste that is generated within their command area is collected separately from other types of garbage, and that any industrial waste that is generated within their command area does not become mixed up with municipal waste.

The E-Waste (Management) Rules, 2016, regulate the disposal of electronic waste, and it is the responsibility of the state pollution control boards to make sure that these regulations are followed. E-waste, which is also known as electronic waste, is defined as "waste electrical and electronic equipment (EEE), whole or in part or rejects discarded as waste by the consumer or bulk consumer as well as rejects from manufacturing, refurbishment, and repair processes" (E-Waste (Management) Rules, 2016). This concept applies to electrical and electronic equipment as a whole as well as individual components of that equipment.

When we talk about effective Solid Waste Management, we are referring to a methodical process that includes waste sorting and storage at the point of generation, primary collection, secondary storage, transportation, cost recovery and treatment in accordance with the technology that has been recommended, and finally, the disposal of solid waste in an environmentally responsible manner. As a result, when we talk about effective Solid Waste Management, we are referring to a methodical process (Figure 1.2) (Solid Waste Management Rules, 2016; Bio-medical Waste Management Rules, 2016; Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, (E-Waste (Management) Rules, 2016) Solid Waste Management Rules, 2016 Bio-medical Waste

Management Rules, 2016 Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 E-Waste (Management ... etc.

Collection, transportation, and disposal are the three processes that make up the "system" of solid waste (Figure 1.3). Segregation and processing are generally underdeveloped areas in India, which results in ineffective waste practices, environmental and health dangers, and pollution of the air, soil, and water. Figure 1.3: Solid waste "system" (Kumar et al, 2009; Sharloy et al 2008).

Figure 1.2 Solid Waste Management 'System' recommended as per concerned legislations

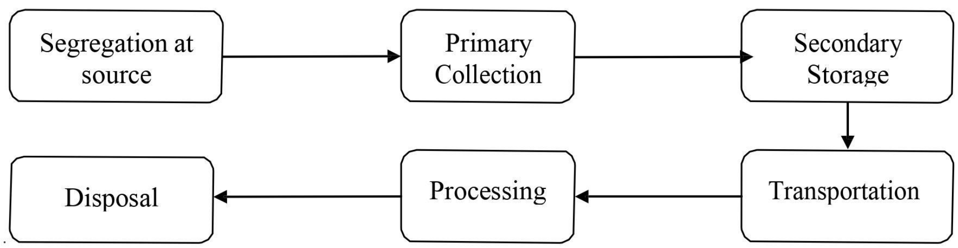
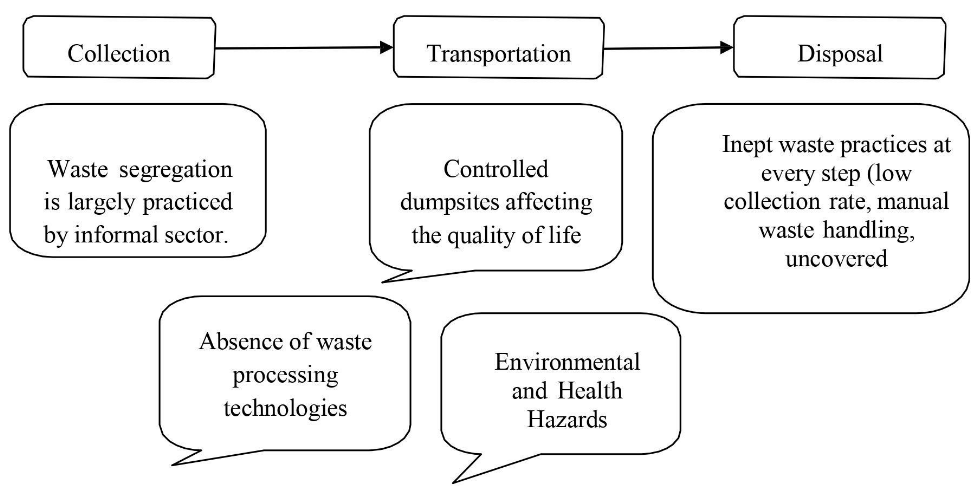


Figure 1.3 Solid Waste Management 'System' followed in reality in India



Regular waste collection services, improvements in waste collection efficiency, the selection of appropriate waste processing options, and a reduced burden on landfill sites are the results of effective municipal solid waste management. This results in fewer health problems for the public in general and waste workers in particular, as well as a better living environment, clean water resources, improved economic conditions, and a reduction in greenhouse gas emissions (Ministry of Urban Development, 2012).

1.4 Classification of Solid Waste

Different types of solid waste are separated into distinct categories according to the characteristics of the trash, including whether or not it may be reclaimed, reused, or recycled, as well as the severity of the health risks it poses to people, animals, and the environment. The goal is to assist in strategizing its management and disposal in a manner that is more scientific and systematic, and to recuperate wealth from trash. The following is the typical breakdown of the categories:

Households Waste: The majority of urban solid trash comes from residential neighbourhoods and the homes that make up its constituents. This category of waste is generated by households. It is made up of a vast number of distinct components that are difficult to disassemble, including discarded food and garden materials, paper, plastic, cardboard, glass, leather, old clothing and furniture, as well as newspapers and magazines. It has a higher concentration of inorganic elements and electronic waste in affluent neighbourhoods. When different types of trash are mixed together without distinction by the generators, waste management can frequently become extremely difficult and even impossible in some cases.

Figure No 1.4 Classification of Solid Waste

Commercial Waste: Waste from commercial establishments, such as stores, restaurants, hotels, gas stations, grocery stores, and offices, generates a wide variety of waste in total, yet a given source might only generate a single kind of waste material.

Institutional Waste: Institutional Waste is garbage that has been generated by establishments such as hospitals, schools, universities, and government offices as well as religious organisations. In most cases, it is composed primarily of paper and other lightweight materials, with only a small quantity of organic components present. Hospital waste consists of discarded blood, unwanted microbiological cultures and stocks, identifiable body parts (including those that were the result of an amputation), other human or animal tissue, used bandages and dressings, discarded gloves, and other medical supplies that may have come into contact with blood and pose a threat to the health of waste pickers and residents of the neighbourhood when combined with other types of waste.

Industrial Trash: Industrial garbage is produced by businesses such as those that manufacture leather goods, wool and textiles, packaging materials, and leather items. Other examples of enterprises that produce industrial waste include businesses that spin wool and produce textiles. It is also made by companies that assemble products that are imported from other countries. Garbage is comprised of a variety of elements including but not limited to metal, wood, cardboard, plastic, and textiles. This rubbish is often exclusive to the city in question and is tied to the natural resources that serve as the foundation for the industry that can be found there (Baud & Schenk, 1994).

Non-biodegradable Waste: The term "non-biodegradable waste" refers to any waste that cannot be broken down by natural processes, must be processed through artificial means in order to be reduced in volume, and does not include waste that is perishable. Among these are papers, cardboard, and other types of packaging; pouches; cassettes; computer discs; printer cartridges; clothing, furniture, and other items that have been thrown; as well as paints, light bulbs, and tubelights.

Bio-degradable Waste: Biodegradable Waste is waste that can be broken down and reduced through biological processes. Examples of biodegradable waste include food waste, flowers, fruit waste, garden waste, kitchen waste, and so on.

Hazardous Waste: In general, this refers to waste from hospitals and industries, as well as waste that is regarded as being harmful to humans, animals, and plants, and as having an impact on the ecosystem's ability to operate properly. It is made up of components that are poisonous. There are also potentially dangerous components of common home garbage. It can explode and cause reactions when it comes into contact with particular substances. Although municipal solid trash is typically not regarded as dangerous, it nonetheless has the potential to include a wide variety of compounds that could be poisonous. In industrialised nations, the percentage of such hazardous trash from households that is included in municipal solid garbage ranges roughly from 0.5 to 5 percent. Materials such as used batteries, clearers, shoe polish, paints, tins, bulbs, sprays, lubricants, cosmetic items, pesticides, aerosol cans, thermometers, mercury-containing products, sanitary towels, and other chemicals are examples of things that are regarded to be hazardous materials. **Compostable Wastes:** Compostable wastes are defined as wastes that microorganisms are able to feed on and, as a result, reduce in quantity thanks to the assistance of biological processes. These types of wastes have the potential to serve as effective nutrient fertilisers for vegetative cover without causing any disruption to the ecosystem.

Combustible Wastes: Combustible Wastes are wastes that can be burned or set ablaze in order to dispose of them in an appropriate manner; nevertheless, even after this process, a very tiny proportion of the waste is left behind, which can be combined with the soil. These wastes are known as "combustible wastes."

Inert Wastes: Inert Wastes are wastes that do not react with any chemical composition and, as a result, preserve their existing nature of composition even if they are all dumped into the soil or set fire. These wastes include radioactive wastes and wastes from nuclear power plants (Anand, 2010).

The following table provides an overview of the trash that was produced as well as an estimate of the amount of time required to decompose it. It should now be easier to comprehend the overall threat that various kinds of trash pose to the ecosystem as a result of reading this.

Table 1.1: Type of litter generated and approximate time to degenerate

Type of litter generated and approximate time to degenerate	
Type of litter	Approximate time to degenerate
Organic waste such as vegetable and fruit peels, leftover foodstuff, etc.	A week or two
Paper	10-30 days
Cotton cloth	2-5 months
Wood	10-15 years
Woolen items	1 year
Tin, aluminum, and other metal items such as cans	100-500 years
Plastic bags	One million years
Glass bottles	Undetermined

Source : Reprinted from *Types of Solid Waste*, by Teri, Retrieved from http://edugreen.teri.res.in/explore/solwaste/types.htm copyright (n. d.) by Teri

1.5 Disposal vs. Management

Common people normally adopt a wide array of approaches when it comes to getting rid of their trash. The administration of waste is turning into a problem that is growing more urgent for every municipality to address. The disposal of solid trash that is hidden from the view of the general public not only does not solve the problem, but it actually makes it much worse in the long run. Some of the well-known ramifications of this practice include potential threats to one's health, the contamination of land, water, air, and food; an unattractive environment; the loss of valuable resources that may be retrieved from solid waste; and other similar issues. People in every region of the world, even their own, need to pay attention to how rubbish is managed. Management of garbage is currently being discussed on both a global and a national scale. The management of waste becomes more difficult as the level of sophistication of human settlements increases. There is a continuing effort made to develop viable solutions to this problem; nevertheless, it is becoming increasingly apparent that technological improvements on their own won't be effective in the long run and will just make matters more challenging. Management of solid waste, which comprises the sorting of different elements and, whenever possible, the scientific recycling of those materials, is the most efficient way for dealing with solid trash. The practice of putting systems in place to allow the organized management of rubbish is referred to as "solid waste management" (SWM), which is also an abbreviation. This encompasses everything from collecting trash to transporting it to an appropriate landfill location (Robinson, 1986). Since its humble beginnings as simple garbage dumping, it has evolved into a complex spectrum of solutions that includes reusing, recycling, incineration with energy recovery, modern landfill design and engineering, and a variety of alternative technologies. In its early days, garbage dumping was the only option. Its goal is to put in place a waste management system that is not only economically and environmentally sustainable for a particular region, but also acceptable to the people who live there (World Resource Foundation, 1996; McDougall et al., 2001). This not only stops the occurrence of the aforementioned negative outcomes, but it also results in positive financial outcomes.

1.6 Management of Solid Waste

The management of municipal solid waste in India is still one of the least prioritised aspects of urban development there. Nearly more than half of the municipal solid waste that is produced goes uncollected in a number major cities (Jha, 1988). On the other hand, the management of solid waste refers to a comprehensive set of actions that cover all of the functional parts, beginning with the formation of trash and ending with its disposal. "Waste management can be regarded as the discipline that is concerned with the identification, reduction, storage, collection, transfer and transport, reuse and recycling, and effective treatment and disposal of wastes," when various functional elements are considered (Anand, 2010, p. 1).

When it comes to the management of municipal solid waste, the place where the garbage is generated requires the utmost attention in terms of how it should be managed. The generation of waste is a basic and essential feature that varies depending on the region, socio-economic circumstances, and background of the people. As a result of globalisation and increased marketization, the amount of waste that is produced every day is growing steadily not only in large cities but also in smaller towns and villages. Over the past few decades, there has been a considerable increase in the amount of trash generated in residential settings, urban settings, and industrial settings due to the rapid growth of the world's population and the accompanying urbanisation. The amount of solid garbage that was produced by cities and towns in India was estimated to be 6 million tonnes back in 1947; this number has now climbed to 48 million tonnes after 50 years from 1997. The nation's six largest cities each contribute approximately 18% of the country's GDP.

1.7 Importance of Solid Waste Management

In today's modern society, solid waste management is a service that cannot be overlooked. It is very important to manage and handle solid waste in accordance with prescribed law to ensure that the environment is not littered and polluted as this can not only be very harmful for the environment as a whole but also for the people who are a part of the environment. This is why solid waste management is important because it is very important to manage and handle solid waste in accordance with prescribed law. The most important reasons why effective management is essential in today's world are concerns over the cleanliness of the environment and the health of the general population. One of the other goals is the reduction and eventual elimination of waste materials for the purpose of improving the overall quality of life and economic growth in the society.

1.8 Seven Principles of Solid Waste Management

The seven principles or the 7 Rs of solid waste management are as following –

Rethink: Before making any purchases at this point, you should give some serious consideration to whether or not the item in question is truly required. If you do not have an immediate need for it, is there a risk that it may be wasted? To give one illustration, you must avoid purchasing plastic water bottles because of the severe damage they cause to the natural world. Instead, you should invest in a bottle made of glass or steel so you may reuse it.

Refuse: Refuse to Buy Overpacked Materials and Plastic Bags Refuse to buy overpacked materials and plastic bags for your items. Bring your own reusable shopping bag with you to every store you visit, whether it's made of jute or paper. Refuse to do anything to harm nature.

Reduce: Make an effort to cut down on the amount of garbage produced in your home. Only purchase items that are absolutely necessary for you. Reuse whatever plastic bags you already have on hand. Reuse items such as paper, glass jars, and storage containers. Create compost for your plants using the trash that can be broken down by organisms. When you withdraw money, you should make every effort to avoid taking paper receipts. Reduce the amount of solid waste that is unnecessary.

Reuse: The most effective method for reusing wasted products is to recycle the majority of them so that they can be transformed into other useful items. Items made of plastic, glass, and paper, amongst others, are simple to recycle and can therefore be reused. You can also give away your old garments or put them to use around the house if you want to repurpose them.

Repurpose: Changing or modifying an item in order to find new uses for it is an example of repurposing, also known as upcycling. For example, you might hang an old tyre from a tree and use it as a swing, you could paint some old shoes and make them look brand new, you could use some little glass jars as candle stands, etc.

Repair: In the context of the management of solid waste, the practise of repairing broken or aged materials in order to breathe new life into them and reduce the amount of garbage generated is of the utmost importance. For instance, repairing your broken chair or radio rather than tossing them away is a better option than throwing them away.

Rot: Rotting, also known as composting, is a biological process in which biodegradable solid wastes are allowed to decompose in the presence of a microorganism such as fungi or bacteria, transforming the waste into organic matter that is high in carbon and nitrogen and, as a result, functions well as an environmentally friendly manure that can be used in agricultural practises for the purpose of growing plants and trees.

1.9 Urbanisation and Waste Management

Growing urbanisation presents an ever-increasing set of issues for the solid waste management industry. The rate of urbanisation in India has accelerated in recent years, and the country now ranks among those with the highest rates of urbanisation worldwide. Urbanization has evolved into an essential and irreversible process that is also a significant contributor to the expansion of national economies and the alleviation of poverty. "The rapid pace of population increase, deteriorating prospects in rural areas, and the move from a stagnating and low paying agriculture sector to more paying urban employment, significantly contribute to urbanisation." [Citation needed] (Ministry of Urban Development, 2013-14). According to Vij (2012), "In many cities, the rapid population increase had overtaken the capacity of municipal authorities to deliver even basic amenities." This was mentioned in the article. Urbanization is a direct contributor to the production of trash, and the unscientific management of waste creates health risks and adds to the degradation of urban environments. The management of solid waste in India, which is currently a massive undertaking, is projected to become even more challenging as a result of the country's growing urbanisation, altering lifestyles, and rising levels of consumerism. This problem has been made much worse by limited financial resources, institutional failings, an inappropriate selection of technology, and apathy on the part of the general population regarding solid waste. (Vij, 2012).

1.10 STRATEGIC ASPECTS OF SOLID WASTE MANAGEMENT

According to Peter Schubeler, Karl Wehrle, and Jurg Christen (1996), in order to achieve sustainable and effective waste management, development strategies need to go beyond purely technical considerations in order to formulate specific objectives and implement appropriate measures with regard to the political, institutional, social, financial, economic, and technical aspects of municipal solid waste management. In other words, development strategies need to go beyond purely technical considerations in order to achieve sustainable and effective waste management (MSWM). Institutional considerations focus on the assignment of tasks and obligations, whereas political considerations are concerned with the formulation of objectives and top priorities, as well as the definition of roles and responsibilities, as well as the legal and regulatory framework. The social aspects of municipal solid waste management include the patterns of waste generation and handling of households and other users; the financial aspects of municipal solid waste management deal with budgeting and cost accounting, capital investment, cost recovery and cost reduction issues; the economic aspects are concerned with the impact of services on economic activities, the cost-effectiveness of MSWM systems, and the macro-economic dimensions of resource use and conservation; and finally, the technical aspects of municipal solid waste management include the management of waste in a manner that is environmentally sound. [4]

1.11 POLITICAL ASPECTS OF SOLID WASTE MANAGEMENT

The setting of goals and priorities, the defining of responsibilities and jurisdiction, and the establishment of a legal and regulatory framework all fall under the purview of the political elements of solid waste management. It is necessary to clarify the aims and priorities of society with regard to the preservation of the environment and the provision of equitable service access in order to garner the support of the general public and the resources that are necessary for their accomplishment.

When it comes to the political viability of MSWM systems, having a crystal clear definition of jurisdiction and functions is absolutely necessary. The multi-sectoral waste management strategic plan offers a foundation upon which to carry out the established duties of various government entities and other actors. The MSWM should have very few bylaws, ordinances, and rules, all of which should be open and clear, explicit, and equitable. [4]

1.12 INSTITUTIONAL ASPECTS OF SOLID WASTE MANAGEMENT

Institutional components of solid waste management include the assignment of roles and responsibilities, as well as organisational structures, procedures, methods, institutional capacities, and engagement from the private sector. An efficient MSWM is contingent on there being a suitable division of responsibilities, authorities, and revenues between the national, provincial, and local levels of government. Cooperation between municipalities is absolutely necessary in metropolitan regions since MSWM responsibilities sometimes extend across multiple levels of local government. A comparable allocation of powers and capacities is required in order to decentralise the responsibility for MSWM. In most cases, it necessitates alterations to the organisational structures, staffing plans, and job descriptions of the local agencies that are in question. The areas of strategic planning and financial management ought to receive the primary focus of any capacity-building efforts pertaining to MSWM. There are frequently inconsistencies between the work criteria for MSWM and the actual qualifications of the staff; hence, training and the development of human resources are essential components. The involvement of the private sector in MSWM necessitates a transition in the role of government institutions away from the provision of services and toward regulation. A competitive bidding process, sufficient technical and organisational competence, appropriate regulatory tools, and effective monitoring and control systems are necessary conditions for successful participation of the private sector. The contribution made by unorganised workers who gather rubbish has the potential to be greatly improved via the implementation of proper organisational procedures. [4]

1.13 SOCIAL ASPECTS OF SOLID WASTE MANAGEMENT

The patterns of trash generation and processing of families and other users, community-based waste management, and the social conditions of garbage employees are all examples of social elements of solid waste management. Both the attitudes and the socio-economic circumstances of a population are important factors in determining the patterns of waste generation. Campaigns aimed at raising awareness and educational initiatives may have a positive influence on people's attitudes regarding garbage.

There are a lot of residential neighbourhoods with low incomes where the only workable alternative is community-based solid waste management. Nevertheless, the establishment of functional links between community-based activities and the municipal system is of utmost significance. Even in areas where municipal garbage collection services are offered, the participation of MSWM customers is necessary for the smooth running of MSWM. The spirit of cooperation can be bolstered by the implementation of general awareness-building programmes in addition to MSWM information efforts. Workers in the waste industry, particularly those employed in the informal private sector, are vulnerable to socially unstable situations, as well as substantial health concerns in their line of work. Their working conditions, earnings, and access to social services should all see improvements as a result of the support. [4]

1.14 FINANCIAL ASPECTS OF SOLID WASTE MANAGEMENT

Budgeting and cost accounting, as well as capital investment, cost recovery, and cost reduction and reduction are all parts of the financial side of solid waste management. The accessible practical methods of budgeting, cost accounting, financial monitoring, and financial evaluation are utilised far too infrequently, despite the fact that they are crucial to efficient MSWM. Their use should be aggressively pushed inside institutional development programmes in order for those programmes to be successful. A local budget, loans from financial intermediaries, and special loans or grants from the central government are the primary alternatives for financing capital investments for MSWM. Other potential sources of funding include grants. Although investment authority should be transferred to local governments, central money is frequently required for certain projects. User charges, municipal taxes, and intergovernmental transfers are the primary possibilities for paying recurring expenditures associated with MSWM; nonetheless, it is evident that user charges should be given unambiguous precedence. However, in order to provide fair access to services, it is frequently necessary to engage in some degree of cross-subsidization and/or derive finance from general resources. The performance of MSWM's fee collection is frequently subpar. Attaching payments for solid waste collection to the invoicing for another service, such as water supply, can frequently result in an improvement in the situation. The funds generated by municipal solid waste services typically find their way into a general municipal account, where they are typically consumed by the municipality's overall expenses. For the revenues from MSWM to be used for the purpose for which they were meant to be used, there must be clear political choices as well as independent accounting methods. In most cases, the possibility for expanding MSWM revenues is quite low; decreasing costs and accomplishing more with less resources are, without fail, the most effective approaches to increase financial sustainability. [4]

1.15 ECONOMIC ASPECTS OF SOLID WASTE MANAGEMENT

The economic aspects of solid waste management are concerned with the influence that services have on economic activity, the cost-effectiveness of MSWM systems, the macroeconomic features of resource usage and conservation, and the creation of money. The accumulation of solid waste and the requirement for collection services typically rise in tandem with the expansion of an economic system. In most cases, it is necessary to make a compromise in order to achieve both the goal of providing a low-cost collection service and the goal of protecting the environment. The life-cycle expenses of buildings and equipment, in addition to the long-term economic impact of the services that are given, are what determine whether or not MSWM systems are cost-effective economically. The results of economic evaluation are a valuable contribution to MSWM's strategic planning and investment programming processes.

The wasteful use of materials should be discouraged by the implementation of measures that also encourage the reduction of waste. Internalizing the costs of waste management as much as feasible during the production, distribution, and consumption stages is the most effective strategy to encourage the effective use of materials and the conservation of resources. It is possible that the involvement of the private sector in waste management will result in a lower number of jobs in the sector. The primary objective of economic policy should be to boost the efficiency and labour productivity of MSWM, and the secondary objective should be to enhance employment opportunities by broadening the scope of existing services. [4]

1.16 TECHNICAL ASPECTS OFSOLID WASTE MANAGEMENT

The recovery of trash, final disposal, and treatment of hazardous waste are all examples of the technical components of solid waste management. Other technical aspects include the design, implementation, and maintenance of collection and transfer systems. These facets are focused with the more technical aspects of managing solid waste. When planning and acquiring technical facilities and equipment, one must give careful thought to the operating characteristics, performance requirements, and maintenance needs of the items, in addition to the anticipated expenses during the length of their lifetimes. It is of the utmost importance that corrective maintenance, preventative maintenance, and the availability of spare parts all receive careful consideration. Throughout the entirety of the process of designing transfer facilities and equipment, it is necessary to take into consideration the characteristics of the local collection systems as well as the capacity of the facilities that are currently in use for waste disposal. The local communities that are going to be impacted by the local collection systems ought to be actively involved in the process during which they are designed. Scavenging and other forms of informal trash recovery have the potential to become more productive if the right support measures and a technically sound infrastructure for waste management systems are put into place. Both public sector involvement in rubbish recovery and the leasing of waste recovery rights to enterprises in the private sector should be considered viable options here. When it comes to the disposal of waste, sanitary landfills are virtually always the best option in countries that are still developing their infrastructure. If we wish to lessen the harmful impact landfills have on the environment around them, we must ensure that their locations are well thought out, that their designs are precise, and that they are effectively maintained. The origins of hazardous waste materials need to be identified, recorded, and prioritized for effective handling, and infectious wastes from healthcare settings require even more concentration and attention. [4]

1.17 INTEGRATED SOLID WASTE MANAGEMENT

The environmental movement was the one that first officially established integrated solid waste management (SWM) as a guiding principle for the management of a society's garbage in the late 1960s. SWM stands for integrated waste management. Waste managers during this time period were not constrained by low financial resources in the majority of industrialized nations because this period coincided with a time of economic success throughout the industrialized world. As a result of this, the new paradigm of integrated SWM was widely implemented in industrialized countries up until the beginning of the economic recessions that occurred in the early 1980s (Schall, 1995). The concept of integrated SWM covers a lot of area and involves a lot of different aspects. According to the principles of Integrated Solid Waste Management (SWM), decisions about waste management should take into account not only economic and environmental aspects, but also social and institutional considerations. Examples of economic concerns that could be taken into consideration include the costs and benefits of implementation, the available municipal budgets for waste management, and the spin-off impacts on other sectors of the economy in terms of investments. The environmental aspect may involve local issues (like an increased risk of illnesses and pollution of groundwater), regional issues (like resource depletion and acid rain), and global issues (like climate change and pollution of the oceans), among other potential concerns (i.e., global warming and ozone depletion). Child labor is one example of a social issue that needs to be addressed, along with the repercussions on human health and employment prospects in both the formal and informal economies. The usage of child labor is one example of a social issue that needs to be addressed.

In integrated solid waste management, the institutional component works toward the construction of a system that can successfully incorporate the major stakeholders. This is not the least important step, but it is one of the most important one. The balancing act that must be accomplished between these four dimensions is the component of integration that must be considered. For instance, even though recycling may be preferred from an environmental point of view in certain circumstances, the presence of institutional complications or the associated financial costs may prevent waste recycling from being promoted and implemented in integrated solid waste management. This is due to the fact that recycling may be preferred from an environmental point of view in certain circumstances. In some circumstances, this might actually be the case. This is the situation, for instance, with recycling plastic bags in industrialized countries, where the benefits to the environment are negligible when weighed against the high costs of labor and the lack of necessary infrastructure. In such nations, recycling plastic bags does not represent a realistic economic option. The fact that striking a balance between these four qualities can be a challenging endeavor is not something that should come as a complete shock to anyone. Lardinios and Klundert (1997) state that the genuine integration can take place on a few distinct levels, including the following:

1.18 Waste Management System in India

The market for waste management can be broken down into the following four submarkets: the market for municipal garbage, the market for industrial waste, the market for biomedical waste, and the market for electronic waste. Because each of these four types of trash has its own set of distinguishing qualities, it is subject to a different set of rules and restrictions than the others. The actual waste generation, primary storage, primary collection, primary collection and transportation, primary collection and transportation, secondary collection and transportation, recycling activity, treatment, and disposal are the components that determine how waste is managed in practice in India. The municipal corporations of each city in India, in addition to the departments of public health, play an extremely important position in the waste management system of the nation as a whole. The

Municipal Corporation is responsible for the management of all municipal solid trash that is produced within the city limits. This duty is in addition to the other obligations that fall within its purview. The Department of Public Health is responsible for a wide variety of tasks, including but not limited to sanitation, the cleaning of public streets, the control of epidemics, and the prevention of food adulteration. The Municipal Corporation has a clear and well-established line of command for all of the tasks that it plays due to its long history. The position within the Municipal Corporation with the highest level of responsibility inside the Municipal Corporation is that of the Mayor of the Municipal Corporation. The position of Mayor is held by someone who has been elected to it for a period of five years. After the Mayor, the City Commissioner is the person who holds the position of second-in-command. There is a role known as the Executive Officer, and the person in charge of reporting to the city commissioner is termed that person. This role is in charge of supervising a few different departments, including the public health department, the water works department, the public works department, the home tax department, the lighting department, the projection tax department, the demand department, and a workshop. One of these individuals serves as the department head for each of these departments. The Department of Public Health has the following individuals working for it as staff members: a Chief Sanitary and Food Inspector, other Sanitary and Food Inspectors, a Sanitary Supervisor, a Health Officer, and other Sanitary and Food Inspectors brooms and dustpans, and so on. The process that is collectively referred to as "solid waste management" is comprised of four distinct phases: cleaning the streets, collecting the trash, transporting it, and eventually disposing of it. These four steps make up the entirety of the operation (SWM). The activities of cleaning and collecting garbage are delegated to the department of public health within the city Municipality Corporation. On the other hand, the department of transportation within the city Municipality Corporation is in charge of the transportation of garbage as well as its disposal. The entirety of the city has the potential to be divided up into a great number of distinct zones. These zones have been separated even further into a number of unique sanitary wards so that it is easier to collect and transport solid waste. This is done in order to facilitate the collection and transportation of solid waste. At present point in time, the vast majority of waste management in India comprises of collecting junk from residential and industrial areas and dumping it at disposal sites. This activity takes place in both urban and rural settings. The authorities, who are often municipal, are responsible to handle the solid waste that is generated within their respective boundaries. This obligation applies only to the garbage that originates inside those bounds. The process that is considered to be normal is to collect the solid waste at the spot where it is generated and then transport it to distant locations for disposal. These locations are known as dumping grounds and/or landfill sites. The sole treatment that is given to garbage after it has been emptied in this manner is to scatter the heap across a wider region in order to conceal it from the gaze of the general public. This is the only treatment that is supplied. The gathering of trash is normally carried out in accordance with the provisions of a contract. In the majority of towns, the responsibility for this duty falls on rag pickers, part-time contractors, and government agencies.

Waste Collection in India: Primarily by the city municipality

- No gradation of waste product eg bio-degradable, glasses, poly bags, paper shreds etc.
- Dumps these wastes to the city outskirts Local raddiwala / kabadiwala (Rag pickers)
- Collecting small iron pieces by magnets
- Collecting glass bottles
- Collecting paper for recycling

In Gurugram - Municipal corporation of Gurugram vehicle

Every municipality has its own special configuration of sweepers that are reserved for the primary garbage collection and for keeping the streets clean. Every sweeper is responsible for maintaining the cleanliness of a particular area on a daily basis, which is often a roadway and all of the side lanes that it contains. The vast majority of the time, municipal solid waste is either thrown directly onto the streets or into plastic bags before being collected by road sweepers and stacked into mounds. After that, the garbage is either taken by hand-cart trolley to adjacent open dumps or to dumpsters, or it is immediately carried by tractor trolley to the boundaries of the city. If it is moved by hand-cart trolley, the dumps and dumpsters are adjacent to the city. The road sweepers are equipped with a variety of tools and implements, some of which include a broom, pan, favda (spade/showel), hand-carts, panji (little pointed hand rake), gayti (pointed small spade to clean road-side open drains), and buckets. Other tools include a pointed small spade to clean road-side open drains. After cleaning the streets, wheelbarrows are utilized to collect the rubbish that is left behind, and then those wheelbarrows are dumped either into trash cans that have been put along the roadsides or into an open area that is used for municipal disposal. The garbage that has been gathered from collection locations (open dumping areas or bins) is loaded onto a variety of vehicles, such as tractors and bull carts, by workers who are employed by the municipality, and is then transported to disposal sites. The workers will use chabra, which are wooden baskets, to collect the municipal solid garbage from the collection stations when necessary. After that, they will manually load it into the vehicles. One or two trips to the final disposal location are the average number of journeys that a bull cart does each day, while a tractor makes two or three excursions, and garbage collectors/dumper placers make four journeys. In the end, recycling and reuse are completed by a variety of recycling units that are located in a variety of cities. One component of recycling is the process of transforming waste items into different forms that are capable of being reused. The concept of recycling and reuse is firmly embedded in Indian culture. This can be traced, in large part, to the present socioeconomic realities and, in part, to the traditional norms of the country as a whole. A number of cities in India have developed into important centers for recycling activities as a result of the huge quantities of recyclable materials that arrive from neighboring towns and villages. This is due to the fact that these cities are located very close to one another. The recycling industry focuses primarily on processing paper, plastic, glass, and metals as the principal types of materials it receives. Recycling, on the other hand, is not the solution to each and every one of our issues. It is not a system that can be utilized to handle all different kinds of waste products; this is because it cannot. For a wide variety of materials, recycling methods are either not readily available or pose significant health risks. There are occasions when the costs connected with recycling are so high that it becomes impractical. The informal sector's participation in the management of solid waste includes recycling, which is a substantial component of that participation. In reality, there are phases in the process of recycling waste that are both controlled and uncontrolled in nature. The lower portions of the waste-recycling sector, including garbage and dump-pickers, itinerant trash purchasers, and tiny dealers, make up the unstructured portion of the waste-recycling industry. On the other hand, the larger merchants, wholesalers, and manufacturers make up the organized element of the waste-recycling sector. This segment of the industry is known as "organic" recycling.

Challenges in India

The failure to collect and sort rubbish at the location where it was generated, the lack of suitable land, the unlawful disposal of electronic waste, and a number of other causes are among the most serious problems and obstacles. The practice of simple dumping of mixed garbage is the practice that is practiced nearly everywhere; however, it is more prevalent in developing countries due to the fact that these nations are unable to muster the financial resources necessary to implement the expensive technologies proposed by industrialized nations.

In India, "The new Municipal Solid Trash Management Rules 2000," which came into force in January 2004, do not even attempt to manage waste in a circular manner. This failure occurred since the rules were written in 2000. Since the beginning of 2004, compliance with these regulations was required. The management of trash is still dependent on a linear system of collection and disposal, which presents concerns for both the environment and for the health of humans. It is projected that metropolitan regions in India would be presented with a considerable difficulty regarding the disposal of waste over the course of the next several years. To a more recent point in time, the issue of junk was seen to be one of cleaning up and getting rid of the rubbish in its entirety. A more in-depth analysis of the situation, both now and in the foreseeable future, reveals that waste needs to be managed in a holistic manner, with recognition given to the role that natural resource roots play as well as the effects on human health. This is the case whether the waste is being managed now or in the foreseeable future. Waste has the potential to become rich resources, which not only has a tremendous potential for providing livelihoods for the urban poor, but also has the potential to enrich the soil through composting and recycling, as opposed to spreading pollution as has been the case up until this point in time. The problem of garbage management will become more difficult to tackle in the near future if a new approach to dealing with rubbish management is not developed in the near future. This is occurring as a result of an increase in the number of people coming to urban regions, which already have a substantial population density.

We are unable to disregard the possible threats that may materialize as a result of private sector involvement in waste management, despite the fact that there is a strong desire for such participation. The presence of the private sector is associated with a number of possible problems, some of which include a lack of transparency, a business failure that could later result in disruptions of public services, and a lack of cooperation between different stakeholders. The subject of how effective public-private partnerships can be is likewise counted among the most important questions. We are reminded of the cooperation that existed between a company based in Chennai and the massive French corporation Onyx for the purpose of collecting garbage. On the other hand, we genuinely have no clue as to how successful it was in the real world. The disposal of garbage resulted in enormous costs being expended by the Corporation. Despite this, there were a number of complaints that were made against the company. In any case, the operation consisted entirely of nothing more than the collection of garbage and its subsequent disposal in the designated landfills. It is not necessary to perform any engineering miracles in order to complete the process of collecting and disposing of waste. There is reason to be optimistic about the future of environmentally responsible waste management practices if municipal authorities are successful in persuading private enterprises (such as onyx) to compost and recycle trash rather than simply dumping them. These policies need to be accepted, and the duties of each party need to be outlined in a way that is appropriate and managed appropriately.

Even though the government of India has proposed a variety of solutions to the problem of urban solid waste, particularly over the course of the past few years, sustainable solutions for either organic or inorganic waste have not been developed and are not being addressed. This is particularly true for recent years. Recycling used materials is the most economically sound choice that can be made for countries still in the process of industrialization. This is true not only in terms of the supply of labor chances for the urban poor who lack skills, but also in terms of the investment that is made. However, they do so in a piecemeal fashion and do not address the structure that is required to enable recycling to take place. All policy documents and legislation dealing with urban solid waste mention or acknowledge recycling as one of the means of diverting garbage. This is the case despite the fact that recycling is one of the ways waste can be diverted from landfills. There has been no discussion of important topics such as the responsibility of the industry, the necessity of a key paradigm to enable sustainable recycling, and the necessity of catalyzing waste reduction through, for example, improved packaging. These are all topics that should have been discussed but have not been. It is not sufficient to recycle only a few distinct sorts of materials, such as plastics, paper, and metals. There are many other types of things to recycle as well. The low-end technology that is now being used is incapable of recycling a wide variety of new materials, the vast majority of which are utilized for the purpose of packing goods. In addition to that, there is a huge issue with inadequate occupational safety requirements for both the workers and the waste pickers, which is a problem that has to be addressed immediately.

New and expensive technologies are being pushed in India in an effort to alleviate the problem of urban rubbish, but the government of India is ignoring the potential negative effects that these technologies could have on the environment and society. This is especially true when it comes to the thermal treatment of waste, which may involve a variety of processes including, but not limited to, gasification, incineration, pyrolysis, or pellatization. It is not possible to obtain a substantial amount of fuel value (caloric value) from India's waste content in order to make the production of energy financially viable. It is essential to provide either supplementary fuel or another type of source of energy. These technologies put the safety of entire communities in jeopardy, and as a result, they are met with broad resistance. For example, during the past five years the United States has been unable to establish a new incinerator, despite the fact that in other countries the costs associated with burning rubbish have skyrocketed as a direct result of increasing environmental regulations. This is the case despite the fact that in other nations the costs associated with burning rubbish have skyrocketed as a direct result of increasing environmental regulations. Even though more industrialized nations are moving away from the use of incinerators because of the high costs connected with doing so (due to tighter standards of pollution control), emerging nations have become potential clients for dumping technology of this kind.

1.19 Significance of the study:

One of the most significant causes for concern all around the world is municipal solid waste, sometimes known as MSW. As a result of urbanisation and rising population levels, emerging nations like India are experiencing a precipitous rise in the quantity of trash generated by their municipalities. The composition of garbage changes depending on a variety of factors like living standards, climate conditions, socioeconomic considerations, and so on. The amount of municipal solid waste (MSW) being produced is growing at an alarming rate, making it increasingly difficult to control the situation. Nevertheless, the purpose of the study is to analyse the existing situation in Gurugram's Zones I and II with regard to the quantity of municipal solid waste they produce, the quality of that garbage, and how it is managed. In addition, the purpose of the study is to provide a concise summary of MSWM in the two distinct Zones I and II of the city of Gurugram.

Additionally, the purpose of this research is to investigate how various stakeholders view their roles in the management of solid waste management. A review of the relevant literature has shown that the problem of solid waste is caused by rapid industrial development, an increase in consumption, shifting lifestyles, and the aspirations of various classes of people living in urban and rural communities. Studies have indicated that the amount of solid trash generated in metropolitan cities is substantially higher than that generated in rural areas. This is in comparison to the amount of waste generated in rural areas. The consumption patterns and financial resources of people in metropolitan areas are directly tied to the amount of waste that is produced from solid waste. On the other side of this debate is the question of how stakeholders should deal with and dispose of solid waste.

The workers' knowledge needs to be improved through information and sensitization in order to meet the demands of the time. If the waste is sorted into different piles before being thrown away, it will be easier for the workers to handle the rubbish. As a result, the purpose of this study is to raise awareness among members of the general public in order to address the difficulties associated with waste segregation.

1.20 Scope of the study:

The proposed study was done in Gurugram, Haryana, to learn about how solid waste is handled in the city, as well as how people in Gurugram help to handle solid waste. Only two of the four zones, I and II, were looked at in this study, and 450 households were asked to take part. It has brought together different groups, such as households, sanitation workers, engineers, executives, senior health inspectors, entrepreneurs/vendors, and ward-level elected representatives, to find out what they think about managing solid waste.

The study looks at the subject from different points of view. The first thing to look into is how much solid waste is made by households in the area. The waste generation part of the investigation focuses on the type of waste made, the amount of waste made, and the reasons why too much waste is made. The "management" part is another important part of the research. The focus of the study on waste management is on "collection," "sorting," "disposal and recycling," and "reuse and recycling."

The investigation into the "collection" part starts with how stakeholders feel about the right way to separate trash before throwing it away. It also looks at whether the stakeholders get rid of their trash in places designated by the city, if they do it the right way, and if they act responsibly when doing so. From an administrative point of view, the "collection" part of the inquiry looks at how well the city's administrative body handles the waste it makes, and it also looks at how waste is collected in the area under study. The "segregation" part of the investigation looks at how well the system sorts the trash into categories like "organic" and "inorganic" or "recyclable," "upcyclable," and "not recyclable." The "disposal and recycling" part of the research looks at the kinds of methods used to get rid of the trash and how well they work. The goal of the investigation is to find out if the system for collecting trash and getting rid of it is balanced or if trash piles up because it takes too long to get rid of it. Another important thing to know is if the waste disposal unit recycles any of the trash.

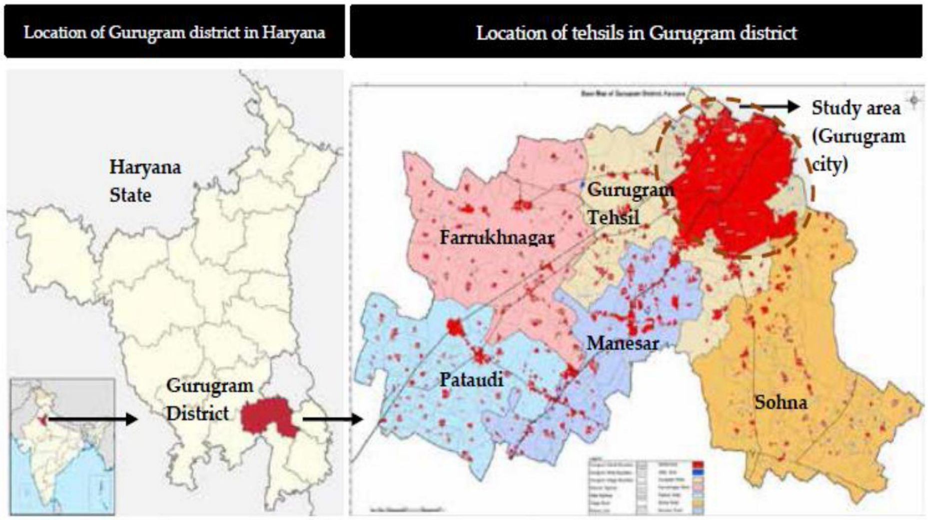
The goal of the study is to find the system's strengths and weaknesses in the area being looked at. The goal of this approach is to come up with a better way to deal with waste, starting with the people who make it, or "stakeholders." It also tries to figure out what works and what doesn't by looking at policy and practise from an administrative point of view. The goal of this investigation, according to the researcher, is to come up with a good model for managing waste that works from the bottom up.

1.21 Geographical Area of the Study

Only 17.5% of Haryana's garbage gets properly recycled or composted. The remaining 78% is disposed of in landfills. Nearly a quarter of the state's daily trash comes from the heavily urbanised and industrialised Gurugram-Faridabad area. Haryana State Pollution Control Board (HSPCB) data from 2019 estimates that one thousand tonnes of garbage are thrown away every day in the Gurugram-Faridabad metropolitan area.

Gurugram, which is the capital of the Indian state of Haryana, can be found at coordinates 28.3606° N and 76.8721° E. Approximately 30 kilometres to the south of New Delhi, India's capital city. The district is a major satellite city of Delhi and a part of the National Capital Area. Throughout Haryana, Gurugram serves as the economic and monetary hub.

The district can be found in the south-eastern protrusion of the State and has a common northern border with Delhi. Its northern and western borders are shared with the districts of Jhajjar and Rewari, its southern and southeastern borders with those of Mewat and Palwal, while its eastern border is shared with the districts of Faridabad. A large number of tiny hill ranges belonging to the Aravali and Mangar Bani mountain systems can be found inside Gurugram. In total, the 1257 km2 that make up Haryana's Gurugram district include 976 km2 of rural space and 281 km2 of urban sprawl. There are four smaller administrative divisions inside the district proper: Gurugram (West), Gurugram (South), Badshahpur, and Pataudi. Gurugram, Sohna, Pataudi, Farrukh Nagar, and Manesar make up five revenue tehsils, whereas Wazirabad, Badshahpur, Kadipur, and Harsaru make up four sub-tehsils. Four rural development blocks (Gurugram, Sohna, Farrukhnagar, and Pataudi) are included. A total of 333 square kilometres make up the Gurugram tehsil, with a rural portion of 131.8 square kilometres and an urban portion of 201.3 square kilometres. The municipal area of Gurugram, which is the city itself, is 250 km2. Specifically, the Gurugram city (municipal area) of Gurugram tehsil in the Gurugram district was taken into account.



Map 1.1 : Geographical location of Gurugram city in Gurugram district

Administrative Structure

1. Sub Divisions (3): Gurgaon (North, South & Pataudi)
2. Tehsils (5): Gurgaon, Sohna, Pataudi, Farrukh Nagar, Manesar
3. Blocks (4): Gurgaon, Sohna, Farrukh Nagar , Pataudi
4. Municipal Committees/Municipality (4) (Nagar Palika) : Sohna, Pataudi, Haily Mandi, Farrukh Nagar
5. Municipal Council (1) (Nagar Parishad) : Sohna
6. Municipal Corporation (2) (Nagar Nigam) : Municipal Corporation, Gurugram Municipal Corporation, Manesar
7. Population (Census 2011): 15,14,085

Haryana is the state that Gurugram is located in. The term "millennium city" refers to this location the most frequently. In the context of the National Capital Region, it is one of the most populous urban areas (NCR). According to the Department of Town and Country Planning, the population of the city has increased from 0.7 million in 2001 to more than 2.5 million in 2011 (Census report, 2011). Furthermore, it is expected that the city's population would increase to 4.25 million by the year 2030. The city's per capita income is the third highest in India, coming in behind only Chandigarh and Mumbai. The city covers an area of approximately 232 square kilometers and is subdivided into 35 different wards. The regions of Gurugram South, Gurugram North, Gurugram West, and Gurugram East are the four administrative zones that make up the city of Gurugram.

In June of 2008, the Municipal Council of Gurgaon was converted into a Municipal Corporation, and the Urban Local Body's (ULB) authority was increased from 25 square kilometers to 168 square kilometers as a result. The MCG is responsible for maintaining jurisdiction over a region that is approximately 232 square kilometers in size. The operation of the MCG is governed by the Haryana Municipal Corporation Act, 1994 (Act), which is supervised by the Directorate of Urban Local Bodies (DULB), which is part of the Government of Haryana (GoH). The Council of the ULB is the highest decision-making authority in the ULB. Ward Councillors from each of the 35 municipal wards vote every five years to elect new Council members for the Council. The position of Mayor, who is responsible for leading the Council, is chosen by the Councillors. The operations of the ULB are supervised by the Municipal Commissioner (MC), who is appointed to that position by the state government. When it comes to monitoring the services provided by the MCG, the MC receives assistance from the respective department heads as well as the Additional Commissioners. The basic responsibilities of the MCG consist of keeping the city clean, managing solid waste, maintaining roads, drainage, and sewerage systems, maintaining gardens, dividers, and circles, providing street lighting, and so on.

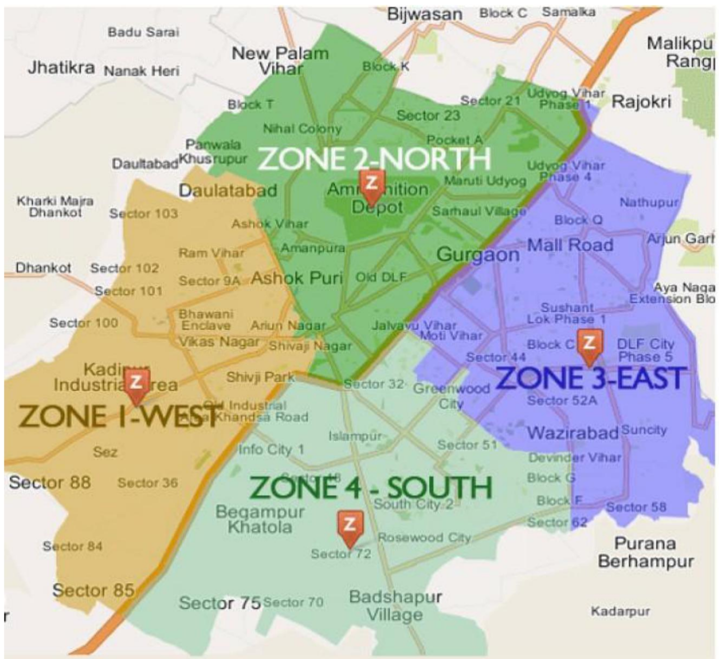
Gurugram Municipal Corporation The amount of rubbish that is generated per person in Gurugram every single day is 320 grams, and this figure accounts for residential, business, and institutional waste. In addition, the city produces approximately 700 tons per day (TPD) of garbage from building and demolition, 1.5 TPD of biological waste, and 70000 tonnes of electronic waste per year. According to the categorization of trash that is considered to be municipal solid waste, 71 percent of it is composed of waste from kitchens, 12 percent is recyclable, and 17 percent is inert. Every single day, the city generates more than one thousand thousand tonnes of municipal solid waste. It is anticipated that the production of solid waste will increase to 2900 TPD by the year 2041. The yearly incremental rate of waste generation in Gurugram is 1.33, as indicated by the data provided by MCC. As a consequence of this, there would be a significant amount of rubbish produced per square kilometer in a city like Gurugram. In addition, the city's high population density and position as a hub for the service sector both contribute to a rise in the amount of rubbish that is produced. Because of the large amount of waste that is produced in the city, it is essential to have an effective waste management system in place in order to forestall any catastrophes.

As a consequence of this, the study is a cross-sectional assessment into the generation and management of solid waste in two wards located in Gurugram.

The planning and management of garbage collection and disposal are the responsibilities of the Municipal Corporation of Gurgaon (MCG), the city's administrative body. In terms of its operational obligation, the MCG is only accountable for the garbage that is produced inside the bounds of its municipal jurisdiction (primarily old Gurgaon). Permanent waste management in HUDA sectors is the responsibility of both private contractors and RWAs, in addition to HUDA employees. Currently covering an area of 231 square kilometers, the city of Gurugram is subdivided into 35 distinct municipal wards. It contains 37 settlements that have been urbanized. The Aravalli Mountain ranges are the oldest mountain ranges in India, and Gurugram is situated on the northern fringes of these ranges. This city is home to roughly 250 of the companies that make up the Fortune 500, and the fast growth that has occurred here has significantly contributed to the increase in pollution. In light of the urgency of the situation, the city is making concerted efforts to put into place workable policies and technology for the management of solid waste for the long term. In addition to MCG, a number of other organizations have authority over the solid waste industry. These organizations include the Haryana Urban Development Authority (HUDA), the Haryana State Industrial and Infrastructure Development Corporation (HSIIDC), and commercial colonizers like DLF and Unitech. Over the course of the past year, MCG has assumed responsibility for the majority of HUDA's garbage collection and disposal operations. To be clear, 55 percent of the garbage is collected from the areas of Old Gurugram that are maintained by the MCG, and 25 percent comes from the areas of HUDA sectors 1 to 57. The remainder comes from private colonies in the Udyog Vihar sector 37 area, such as those developed by DLF and HSIIDC.

The position of the Commissioner sits atop the organizational chart, and he has one Additional Commissioner who reports to him. There are four Joint Commissioners assigned to each of the four zones, and their responsibilities include maintaining cleanliness, enforcing regulations, engineering, and planning. A single Sub-Divisional Officer (SDO), assisted by a Senior Sanitation Inspector and a Sanitation Inspector, is in charge of supervising the 122 colonies that make up Zones I and II. The SDO reports to a single Senior Sanitation Inspector. In zone 3, there is one Senior Sanitation Inspector in addition to two Sanitary Inspectors who assist the SDO. Within Zone IV, there is one Senior Sanitation Inspector in addition to one Sanitation Inspector who provide assistance to SDO.

The MCG areas totaling 207 square kilometers have been divided into four zones for the purpose of solid waste management. These zones are referred to as Zones I, II, III, and IV. The first zone, Zone I, has 30 community bins, the second zone, Zone II, has 34 community bins, the third zone, Zone III, has 19 community bins, and the fourth zone, Zone IV, has 23 community bins. There are 470 large waste receptacles and 6,800 smaller waste receptacles spread among the four zones. On average, each vehicle makes four trips during the process of collecting trash and transporting it to one of four transfer stations (Dundahera, Sohna Road, Palam Vihar, or Khandsa). There are approximately 40 vehicles that are used for this process. Additionally, the MCG has provided a consultant for each zone to work with.



Map. 1.2: Zones of Gurugram District

In order to conduct door-to-door collections and street sweeping services, the MCG has engaged into service contracts with a number of companies. One contractor has been granted responsibility for 24 of the 35 wards for the purpose of the door-to-door collection, while the remaining 11 wards are handled either by workers of the MCG or by third-party agreements. There are a total of 35 wards in the city. These agreements cover the collection of waste from commercial and residential areas that contain shopping areas and other establishments. The MCG maintains a team of approximately 3,600 sanitary employees at all times. This workforce is constituted of both permanent and contractual employees, and it is dispersed throughout four distinct zones. As may be seen in Figure, the MCG waste generation was segmented into different zones.

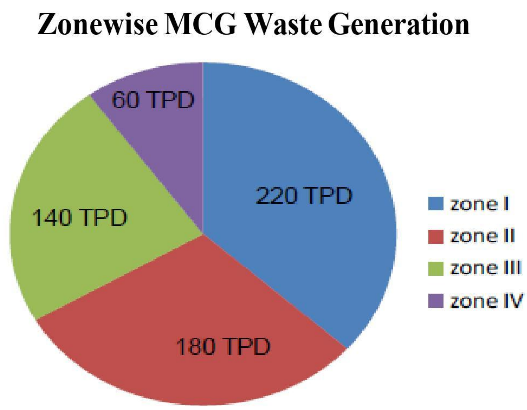


Fig. 1.2: Zone-wise MCG waste generation in Gurugram District

Old Railway Road may be accessed from Khekri Dhaula Toll in Zone I by going to the left, and vice versa (Zone II). Supporting the SDO, who is accountable for 122 colonies across Zones I and II, are one Senior Sanitation Inspector and one Sanitary Inspector respectively. At the moment, there is just one contractor who is accountable for door-to-door collection, although a number of additional contractors are accountable for street sweeping. The MCG has personnel assigned to active duty in a number of different regions.

There is not presently a private contractor in Zone III who is responsible for door-to-door collection (Star Mall, Sector 31 toward Delhi upto MCG limits). One of three separate companies is responsible for sweeping the roadways. Under the supervision of the Sub-Divisional Officer, one Senior Sanitary Inspector along with two Sanitary Inspectors carry out their duties (SDO).

In Zone IV, there is no door-to-door service provided by a private contractor (Star Mall, 31 toward Jaipur until Kherki Dhaula Toll Tax). This service is being provided by two different companies simultaneously. The SDO is responsible for the supervision of a Senior Sanitary Inspector as well as a Sanitary Inspector.

If you live in Gurugram, you may thank the Municipal Corporation of Gurugram, which serves as the city's central garbage management authority. One commissioner, one deputy commissioner, and four joint commissioners (JC) oversee each of four administrative districts. Each JC in each zone is responsible for overseeing the disposal of trash, with the help of SDOs and inspectors from the health department. A total of 3,648 people, including both full-time and part-time workers, are employed by the MCG in the area of sanitation.

However, a brand-new organization with the catchy acronym "Gurugram Metropolitan Development Authority" (GMDA) has been established. An organizational chart for the GMDA is shown in Chart. 1.1.

GMDA's mission is to maintain Millennium City's steady expansion while improving citizens' standard of living. Members of Resident Welfare Associations (RWAs), employers, and workers' groups are only some of the groups that may be represented on the GMDA. Members of the GMDA, who serve primarily in an advisory capacity, are welcome to attend meetings and sit in on discussions alongside ex-officio members. The Greater Miami Development Authority (GMDA) is planning to establish a Residents Advisory Council (RAC) to advise and guide the Authority in its planning and implementation of various development initiatives. In addition to focusing on infrastructure, GMDA is in charge of the mobility management plan and the urban environment management sustainability strategy.

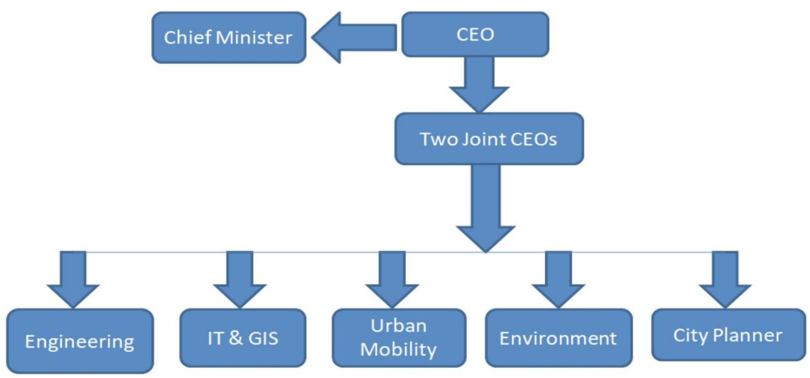


Chart. 1.1: GMDA organization chart

The Gurgaon Metropolitan Development Authority (GMDA) will cover 54% of the area that will be developed as a metropolitan area. This area is likely to grow to 70%. For integrated development, the GMDA area will cover most of the district. The metropolitan area would include all of the areas run by the Municipal Corporation of Gurugram. This includes the areas up to the border with Delhi, the border with Jhajjar, 2 km past the Kundli-Manesar-Palwal Expressway, and Gwal Pahari, which is on the way to Faridabad. The authority will build and take care of these areas, which include 137 villages. It will work as a single body to help develop the metropolitan area. The goal of the GMDA is to make Gurugram's urban planning and development a more collaborative process. The different groups will work with the government to give advice on problems that residents face. This will help us do projects with the help of the people who live there. Also, it has to make sure that the people who live there have a decent standard of living and create jobs.

The Haryana government has split the Municipal Corporation of Manesar (MCM) into seven zones to make sure that development projects are run better. While zones 1-3 have only been homes, zones 4-6 have had businesses, and zone 7 has been made up of rural areas. "The Haryana State Industrial and Infrastructure Development Corporation (HSIIDC) has plans to turn the rural areas into an industrial zone," MCM officials said. "Because of this, they have been added to the municipal limits."Zone 1 has been include Sector 90-95A, 95B and 99A and Dhorka, Gopalpur, Garhi Harsaru, Wazirpur, Hayatpur and Meoka villages.

Zone 2 has been include Sector 81-82A, 85, 86, 88 and 89 and Badha, Nawada Fatehpur, Sikandarpur Badha, Rampur and Lakhnola villages.

Zone 3 has been include sectors 77- 80 and Naurangpur, Bar-Gujjar and Shikohpur villages.

Similarly, Zone 4 has been include Sectors 87, 96-98, M9, M10, M12- M15 and Jhund Sarai (Viran), Jhund Sarai (Abad), Bhangrola, Kankrola, Naharpur Kasan villages.

Zone 5 has been include M3-M8, M11 and Dhana, Basharia and Baskushla villages.

Zone 6: Sectors M1-M6A and Khoh and Manesar villages come under Zone 6.

Meanwhile, Zone 7 encompasses Sectors P1-P7, Kasan, Sehrawan, Nainwal, Fazalwas and Kukrola villages. The municipal corporation will have two engineering divisions to ensure effective implementation of developmental activities.

1.22 Aim of the Study:

The aim is to study the "**A Study of Social Aspects of Solid Waste Management in Municipal Corporation Gurugram"**.

Objectives of the study:

1. To Study of Social Aspects of Solid Waste Management in Municipal Corporation Gurugram and Manesar .
2. To study the present Solid Waste Management Practices of selected Zones I and II of Municipal Corporation Gurugram and Manesar in the Gurugram city.
3. To identify the major problems related to Solid Waste Management practices of Zones I and II of Municipal Corporation Gurugram and Manesar in the Gurugram city.

4. To identify the problems of stakeholders related to Solid Waste Management practices of selected Zones I and II of Municipal Corporation Gurugram and Manesar in the Gurugram city.
5. To examine the relationship between awareness and practice on solid waste management among the community people.
6. To suggest feasible solutions for the effective implementation of Solid Waste Management practices.

1.23 Hypothesis of the Study

The participatory waste management model is not holistically implemented due to lack of systematic integration of stakeholders in the solid waste management system.

1.24 Research Design:

The research uses a descriptive design to capture the subject's current state. The researcher has used a positivist worldview to analyze the situation quantitatively. People's knowledge and perceptions on solid waste, waste management, and related concerns are investigated. The purpose is to define different factors to analyze each stakeholder's role in solid waste management. This design combines numerous stakeholders' opinions into a whole. This helps deduce the subject from many perspectives and infer a complete solution. Qualitative data from one of the stakeholders is collected and presented narratively to confirm the overall conclusions.

1.25 Population and Sampling Procedure of the Study

Sanitary workers, households, elected representatives from Gurugram Metropolitan Development Authority (GMDA) and Municipal Corporation of Gurugram, entrepreneurs/vendors, and administrative staff personnel are the five key categories of respondents in this study. The purpose of the study is to understand the role that multiple players play in effectively managing solid waste. An approach like this one is taken with the goals of gaining a comprehensive understanding of the topic from a variety of perspectives and arriving at an effective model for waste management.

1.26 Tools of Data Collection

a. Socio-demographic data sheet
b. Interview schedules on solid waste, waste management prepared for the different stake holders.

The socio-demographic data was prepared in order to offer questions to the respondents.

These questions contained information regarding the respondents' ages, education levels, sexes, religions, housing types, and other relevant specifics. Details such as socio-economic situations, the type of profession, recreational features, and sources of revenue for the livelihood were also included as part of the study, and they were collected using the socio-demographic schedule. This was done in order to compile the information.

In addition, a detailed interview schedule was developed in order to ascertain the perspectives of the various stakeholders about the generation, segregation, disposal, recycling, and reuse of solid waste. The knowledge that the stakeholders have regarding the management of solid waste was also evaluated, in addition to determining what the stakeholders' perceptions are on the topic.

The categories of those who have a stake in the project—namely, sanitary workers, households, elected representatives from the Municipal Corporation of Gurugram and the Municipal Corporation (Nagar Nigam) Manesar, entrepreneurs/vendors, and administrative staff personnel—were taken into account when developing the five distinct schedules that were put together. The schedules that have been made for each category of these responders have been done so on the basis of the kind of contribution that they have been making to the cause of solid waste management. The use of the schedules allowed for the identification of the respondents' perceptions and levels of knowledge on the management of solid waste.

1.27 Method of data collection:

The research is mostly based on first-hand information from five types of respondents. But in order to design and plan the research, secondary data about waste production and management in the area being studied was also gathered and analyzed. Face-to-face interviews with five groups of respondents—sanitation workers, households, elected officials from the Municipal Corporation of Gurugram and the Municipal Corporation (Nagar Nigam) of Manesar, entrepreneurs and vendors, and administrative staff—were used to get the primary data. In addition to the interview schedule, the researcher held a focus group discussion with sanitation workers to find out what they thought about waste management, since they are the ones who do the work on the ground level. The main information was gathered over a period of six months, from June 2020 to November 2020. Every interview was 25 minutes long.

The secondary data needed for the study came from sources like journals, reports, magazines, books, seminar proceedings, government publications, websites, policy and program notes, and other materials about waste management.

Table 1.2 Respondents considered for the study

Sr. No.	Respondents	Tools	Number of Respondents covered
1	Number of Household from **Municipal Corporation, Gurugram (Nagar Nigam)** Zone 1: Ward no 11, 12, 21, 20 Zone 2: Ward no 9, 13, 14, 15 **Municipal Corporation, Manesar** Zone 1: Sector 90-95A, 95B and 99A and Dhorka Zone 2: Sector 81-82A, 85, 86, 88 and 89 and Badha	Interview schedule	150 respondents (from each Municipal Corporation (Nagar Nigam) 300
2	Sanitary workers of both the Municipal Corporation (Nagar Nigam) Gurugram and Manesar	Interview schedule	(25 sanitary workers (from each Municipal Corporation (Nagar Nigam) Total 50
3	Responsible personnel from solid waste management department.	Interview schedule	15 respondents x 2 (from each Municipal Corporation (Nagar Nigam) Zone 1 and 2 = 30 respondents
4	Respondents such as Entrepreneurs/ vendors	Interview schedule	25 respondents x (from each Municipal Corporation (Nagar Nigam) Zone 1 and 2 = 50 respondents
5	Elected Representatives / Ward members	Interview schedule	Total 30 members from Municipal Corporation (Nagar Nigam) Gurugram and Manesar

Inclusion and exclusion criteria:

In order to define the boundaries of the research, the researcher has set a few inclusion and exclusion criteria. In addition to setting the target population, it also helps the researcher in identification of appropriate subjects/respondents who can contribute to meaningful data to the research.

The following table highlights about the categories of people are included and excluded in the scope of the study.

Table 1.3 Inclusion and exclusion criteria

Inclusion criteria The following categories of people are included from the scope of the study	**Exclusion Criteria** The following categories of people are excluded from the scope of the study.
Stake holders	**Stakeholders**
1. Residents: The residents with Eighteen years and above from the selected **Municipal Corporation, Gurugram (Nagar Nigam)** Zone 1: Ward no 11, 12, 21, 20 Zone 2: Ward no 9, 13, 14, 15 **Municipal Corporation, Manesar** Zone 1: Sector 90-95A, 95B and 99A and Dhorka Zone 2: Sector 81-82A, 85, 86, 88 and 89 and Badha	***1. Residents:*** Below eighteen years of age Wards other than **Municipal Corporation, Gurugram (Nagar Nigam)** Zone 1: Ward no 11, 12, 21, 20 Zone 2: Ward no 9, 13, 14, 15 **Municipal Corporation, Manesar** Zone 1: Sector 90-95A, 95B and 99A and Dhorka Zone 2: Sector 81-82A, 85, 86, 88 and 89 and Badha respectively. The bulk waste generators such as schools, hospitals, marriage halls etc.
2. Sanitary Workers: Sanitary workers employed by government bodies selected Zones 1 and 2 of (MCG) and MCM	**2. Sanitary Workers:** Sanitary workers other than those from falling in Zones 1 and 2 of (MCG) and MCM respectively. And the informal waste collectors operating in the region
3. (MCG) and MCM staff: Administrative officers from throughout (MCG) and MCM administrative jurisdiction.	**3. (MCG) and MCM staff:** Non-administrative staffs excluded from the study. Administrative staffs other then Zones 1 and 2 of (MCG) and MCM
4. Ward Representatives: Ward representatives from the selected Zones 1 and 2 of (MCG) and MCM	**4. Ward Representatives:** Ward representatives other than those from Zones 1 and 2 of (MCG) and MCM
5. Vendors/Entrepreneurs: Street vendors/vegetable/fruits stalls, saloons, slaughter houses/poultry shops and small hotels/canteens.	**5. Vendors/Entrepreneurs Categories**: Large scale industries and service sector institutions are excluded. And solid waste management contractors operating in the selected regions. Informal and unorganaized Waste collector

1.28 Data analysis

The raw field data was reviewed, edited, categorized, and coded before analysis. Descriptive statistical analyses of the primary variables were performed first. Tables and graphs depict the results produced, which include frequencies, percentages, means, and standard deviations. In addition, some inferential statistical methods are used, and the outcomes are tabulated. Statistical Package for the Social Sciences, Version 25 was used to conduct all analyses on the primary quantitative data. The data were collected through a series of interviews and focus group discussions with Sanitary Workers, and are presented in a narrative format.

1.29 Limitations of the study:

a. The study is confined to only Zones 1 and 2 of (MCG) and MCM both.
b. Stake holders from the Zones 1 and 2 of (MCG) and MCM were only considered.
c. Generation of waste due to industries and other large-scale commercial parties was not taken into consideration.

1.30 Chapter Plan

Chapter I : Introduction:

The theoretical concepts related to the civic participation, municipal solid waste management, global issues, local issues, and about the sanitary workers role in Municipal solid waste management are discussed in this chapter. This chapter was covered all functional aspects of Solid Waste Management. This chapter was covered introduction of research methodology, scope, significance, objectives and hypotheses of the study, primary and secondary data collection methods and limitations of the study.

Chapter II: Review of Literature:

This chapter has been covered published and unpublished literature review on the Municipal solid waste management, and related issues.

Chapter III: Profile of Study Area:

The chapter was covered the profile of selected municipalities under study. The profile deals with the basic information of the municipal council, present solid waste management status and practices adopted.

Chapter IV: Data Interpretation and Analysis :

This chapter presents the primary data collected through the study. The output data is presented in frequencies, percentages, mean and standard deviation. Also, narrative presentation of qualitative data is made.

Chapter V : Major finding, Conclusion and Recommendation:

This chapter sums up the results and provides suggestions for effective Municipal solid waste management strategies.

Chapter No. 2
Review of Literature

2.1 Review of Literature

In order to establish the significance of the study, a vast amount of literature from various sources, such as books, papers, and journals, was studied in order to comprehend the problem, assess the degree of their coverage, and identify areas that had received insufficient attention. While the review is provided chronologically, the literature has also been grouped according to the concerns specifically addressed by the work and in accordance with the study's aims. The three major categories are: Multiple facets of solid waste management, the solid waste management value chain: processes and systems, and stakeholder participation in solid waste management.

Various Dimensions of Waste Management: This section analyzed the studies that were related to the various aspects of waste management, such as the impact of urbanization and globalization on waste management practices; the analysis of the policy and regulatory framework of waste services, in addition to other contemporary policies and programs; and the environment and health hazards that are caused by ineffective waste management.

According to **Venkateswaran (1994)**, the economic, social, and ecological components of the solid waste management sector were mainly disregarded. This pattern of behavior had led to a number of issues throughout the industry as a whole. As a result, the author emphasized that the primary focus of urban policies had generally been characterized by a segmented approach, in which each unique problem or need is dealt with in isolation rather than adopting an approach that adopts a strategy that integrates several demands.

Puri, Kumar, and Johal conducted an investigation in order to determine whether or not there is a correlation between the management of solid waste and the presence of vector-borne diseases in the city of Jalandhar, which serves as a model for the province of Punjab (2008). For the primary research, the villages of Suchi and Warrana were chosen to participate. It was discovered that negligent practices regarding the disposal of solid waste led to risk factors in the form of foetal disorders. Malaria, dengue fever, kala-azar, fever, and diarrhea were found to be the solid waste-related vector-borne diseases that were discovered. The diseases are avoidable if appropriate disposal methods, precautions against water pollution, and prompt diagnosis and treatment are taken. It was advised that locals should be educated about health and made aware of the use of different colored dustbins. Additionally, it was suggested that citizens living in close proximity to dumping sites should get health education.

The difficulties the nation has had in coping with the effects of urbanization were outlined in the report of the **High-Powered Committee (2011)**. It had suggested a structure that would make it possible for urban local governments to fulfill their obligations in order to deliver community services to various demographics of the population.

The necessity to understand "globalization and waste management connections" was brought to light in the report that was published in 2012 by the I**nternational Solid Waste Association (International Solid Waste Association)**. The increasing connection had helped the flow of ideas and trends, and it had an effect on the governance patterns of waste management as well. It placed a strong emphasis on standardizing the regional policies in accordance with the global standards. It had been claimed that globalization is a significant obstacle for environmentally responsible management of solid waste. On the other hand, one of the essential requirements for sustainable globalization is the implementation of techniques that are acceptable for waste management.

According to the findings of the research that was conducted by **Sahib, Seshaiah, and Viswanath (2012)**, India possessed a large number of environmental laws; however, the enforcement of these laws was lax, and the respective pollution control boards lacked both funds and manpower, which were major obstacles. In addition, it was emphasized that the enforcement of environmental laws was a highly specialized field of implementation, but that this area had been given to a variety of organizations, which resulted in bad service delivery. It appears that ineffective implementation of the law is caused in part by a lack of skill, the absence of satisfactory infrastructural facilities, a poor and unimaginative understanding of the law, jurisdictional conflicts, and a lack of co-ordination among the agencies responsible for implementing the law. Additionally, the enforcement mechanism was corrupted due to the influence of some powerful industries. It was proposed that environmental laws should be adaptable in order to make modifications as and when they are necessary, and that environmental laws should draw cues from natural sciences and technology. It was determined that educating people about environmental laws and regulations, as well as providing environmental education, can play an important part in the reduction of pollution on both the individual and communal level.

Aamir and Latif (2013) conducted research on the methods of trash disposal in Malerkotla city, which they found to be contributing factors in the city's health and environmental dangers. During the process of locating dumping locations and keeping them maintained, it was found that the necessary requirements were not followed. Schools, hospitals, bus stops, and places of worship were all located in close proximity to the dumping grounds. In addition, because there was no boundary wall, stray dogs and animals littered the road with waste, which resulted in hours of traffic congestion. Ineffective waste management procedures were primarily attributed by the administration to a lack of cooperation from the local population as well as a lack of available cash.

Gopalkrishana's (2014) research shed light on the sanitation problems that India is now dealing with. The author offered the perspectives of a variety of specialists from a variety of subjects, including sociology, anthropology, social work, and engineering, in addition to rag-pickers and workers in the sanitation industry. It was brought to everyone's attention that the 360 degree publicity campaigns forced ministers and officials to brandish brooms regardless of whether or not they intended to do so. Throughout Indian society's history, the caste system has been deeply ingrained, and cleaning has traditionally been seen as the responsibility of dalits solely. In a society that is unable to provide the fundamental amenities, the question of whether or not charging excessive fines is the answer to the problem was debated. It was agreed that a lack of social will as well as misdirected governance were the two primary obstacles that stood in the way of the clean India project becoming successful.

Jones, Clench, and Harris (2014) conducted research on the political economy elements that affected the delivery of urban services as well as the key governance obstacles to do so. The research analyzed 232 sources, with 46 of them focusing on transportation, 51 on solid waste management, 43 on social housing, 6 on emergency services, 50 on water and sanitation, and 32 covering various service categories. The quality and scope of the previously published study were evaluated, as were its strengths and flaws, as were the research questions that guided the investigation.

It emphasized that policy makers, practitioners, and researchers need to identify, understand, and address the pressing challenges associated with the delivery of services in urban areas, and that governance and political economy factors were important in determining effective service delivery. In addition, it emphasized that effective service delivery was determined in large part by factors related to political economy. In addition, there was a need for new comparative research as well as empirical studies on such areas that had not been sufficiently investigated.

Vilas (2015) conducts an in-depth analysis of the legal landscape around solid waste management in India. The author traces the development of environmental consciousness back through history, namely through the history of dangerous accidents in which the general public suffered on a huge scale at both the national and supra-national level. He emphasizes that rules regarding garbage do not take a comprehensive perspective and instead are primarily focused on the various treatment and disposal options. At no point in the process is there any kind of review of how the implementation is going. In addition to this, he draws attention to the fact that very few laws address the monitoring mechanism that is necessary in order to assess the performance of government authorities and involved agencies. The fundamental components of an effective "system" for managing solid waste include compliance with the law, robust institutional mechanisms, educated manpower, improved technology, proper dumping sites, public awareness, and participation from stakeholders.

Iyer emphasized how important it is to maintain proper cleanliness **(2017)**. It can be said that the Swacch Bharat Mission had an important part to play in this regard. He emphasized that SBM is a movement for changing people's behaviors despite the fact that it is a complicated process. In different regions of the country, a variety of strategies, apps, and campaigns to promote cleanliness have been organized. It is necessary to raise people's awareness through the mainstream media, but the true key to bringing about change lies with grass-roots level motivators who are trained and incentivized to use interpersonal communication with the population they are trying to influence. Even while SBM was making progress, maintaining that progress was difficult, and both the central government and the state governments were aware of this fact. The author emphasized the importance of everyone taking an active role in contributing to the accomplishment of the mission. The Processes and Systems That Make Up the Value Chain of Solid Waste Management

In this section, we talked about case studies, which generally dealt with the various waste collection systems, treatment technologies, use of alternative technologies, various disposal practices, and waste transportation systems for municipal solid waste, bio-medical waste, industrial hazardous waste, and e-waste all over the world.

Sharloy, Ahmad, Vaishya, and Gupta (2007) conducted research on the quantitative and qualitative aspects of municipal solid waste. The features of the municipal solid waste in Allahabad city were evaluated with the help of Geographical Information System (GIS) maps for the city. They went around to various locations and gathered samples at random. They came to the conclusion that individuals' health was negatively impacted as a result of a rapid growth in the quantity of waste produced and an inability to offer daily collection service for the waste.

The research that was carried out in 2008 by **Sharholy, Ahmad, Mahmood, and Trivedi** examined the characteristics, methods of generation, collection and transportation, methods of disposal and treatment technologies that are used in SWM activities in India. Research was done on both the positive and negative aspects of the various technologies used for the treatment of SWM. Within the scope of the study, recommendations were provided to motivate relevant authorities and researchers to work toward the enhancement of the existing system in India.

In their 2009 study, **Babu, Parande, Rajalakshmi, and Volga** investigated the handling of medical and biological waste in India. Management of hazardous biomedical waste should not only be considered a social responsibility but also a legal requirement. The improper management of hospital waste is plagued by a number of challenges, including a lack of care on the part of those who operate in this field, a lack of motivation, a lack of awareness, and a cost element. In addition, there is a great deal of misinformation regarding the challenges of the safe management of biomedical waste among the people who generate the waste, the operators, the decision-makers, and the general society. In order to enhance the provision of services pertaining to biomedical waste, all levels of health care establishments have an imperative requirement for education as well as an appropriate communication plan.

Chandra and Devi (2009) brought attention to the challenges and opportunities associated with garbage management in the city of Mysore. A thorough investigation into the solid waste management topics of collection, transportation, storage, treatment, and disposal was carried out. According to the findings of the study, the current SWM system does not meet the requirements of the Municipal Solid Waste (Management and Handling) Rules, which were published in 2000.

The research that was conducted by **Zaman (2010)** had the intention of evaluating three distinct waste treatment methods using a mechanism known as life cycle assessment. The SimaPro program was used to conduct research on sanitary landfill, incineration, and gasification-pyrolysis as waste treatment methods. The research was based on the flow of inputs and outputs of materials. The SimaPro program was used to perform an analysis of the burden placed on the environment according to the various impact categories. It was determined that a waste treatment technology's efficacy could be evaluated using life cycle assessment, which is an effective approach.

The topic of **Kumar, Subbaiah, and Prasada Rao's (2010)** research paper, which was titled "Estimating the Energy Content of Municipal Solid Trash in Eluru Municipal Corporation," was focused on the process of determining the amount of energy contained in municipal solid waste. It was found that the waste-to-energy sector was an environmentally responsible way to handle the disposal of municipal solid garbage as well as the generation of energy. It has improved the financial status of the municipalities by making resources out of garbage and turning waste into resources.

Pattnaik and Reddy (2010) investigated numerous facets of trash management in Pondicherry with the goal of enhancing waste management procedures and practices. The nongovernmental organization known as Shuddham was active in the process of providing the inhabitants with door-to-door rubbish collection services. In certain wards, the collection of rubbish also included the use of independent contractors. Residents were of the opinion that their work in the removal of waste was more effective and satisfactory than that of the municipality involved in the process. However, it was discovered that there are deficiencies in the procedures that are currently being used for waste management, and these deficiencies need to be corrected.

Chen, Geng, and Fujita (2010) argued that China has just surpassed the United States as the country producing the most garbage overall. Over the past few years, both the central government and local governments in China have made significant efforts to improve garbage management. They had devised new directives and regulations with the goal of fostering international cooperation, commercialization, and the development of urban infrastructure. Therefore, the purpose of this study was to give an outline of the current situation and the issues that the government is facing in terms of trash management.

The procedures that are currently in place for the management of solid waste on Langkawi Island were the primary topic of the research that **Shamshiry et al. (2011)** conducted. The viewpoints of both residents and visitors were solicited regarding issues concerning the administration of solid waste, such as the financial value of the natural environment on the island.

The authors **Gupta, Sangita, and Kaur (2011)** reviewed the national and international scenario of e-waste as well as the threats created by e-waste and its recycling. As a result of industrialization, there is now a distinct category of waste known as WEEE, which stands for waste from electrical and electronic equipment. It was discovered that 80 percent of the electronic garbage that was produced in the United States was transferred to India, China, and Pakistan, despite the fact that many international laws had forbidden the same thing from happening. In the case of India, recycling rates for electronic garbage are quite low, coming in at just 3% of the total waste produced. The remaining tasks are carried out by workers who don't wear gloves or any other form of personal protection while they do their jobs. It was determined that such activities continue despite the existence of a variety of regulations and laws; hence, the pressing requirement at this time is to strictly apply the relevant laws.

Vermin-composting of municipal solid waste was the subject of research conducted in **2011 by Singh, R.P. Singh, P., Ademir S.F. Araujo, and Othman Sulaiman Ibrahim.** Composting made from vermin is made from urban garbage that is collected by municipalities. Compost that has been created through these processes can be utilized in agricultural endeavors. As a result, there is no need to make use of the numerous inorganic fertilizers available. Utilizing high-quality compost is another solution that may be implemented to combat the issue of degraded soil. It has been determined that composting with vermin is an effective method for dealing with municipal solid waste in metropolitan areas.

Rani, Aggarwal, and Sidhu (2012) conducted an evaluation of the facilities for the disposal of trash in Chandigarh. There are a variety of approaches to the disposal of waste, including dumping, burning, composting, grinding, and disposal into the sea, among others; nevertheless, sanitary landfilling provides a number of benefits that set it apart from these other approaches. In the study, each of the five stages of landfill development is broken down and analyzed. The waste is disposed of at a dumping facility in DaduMajra, Chandigarh, that has been in operation for the past 22 years. It is a 45-acre open disposal site. The first phase in the process of disposing of municipal solid waste in Chandigarh is the dumping of the debris, followed by the leveling of the area and then the spraying of an Effective Micro Organism Solution (EM solution).

The research that was conducted by **Joseph, Rajendiran, Renthilnathan, and Rakesh (2012)** emphasized the strategies that are required for sustainable solid waste management in Indian cities. These strategies were determined through an analysis of waste generation, collection, and disposal, as well as the regulatory framework. This study has concentrated on developing an integrated strategy for the capacity building of local bodies with the assistance of educational organizations as its primary focus. They have centralized the implementation of the integrated strategy, which is supported by the political desire to change the situation and contributes to the transformation of perceptions held by citizens as well as the development of community participation for sustainable waste management.

In their presentation, **Kaushal, Varghese, and Chabukdhara (2012)** discussed the shifting pattern that has been observed in India's waste management amounts and features over the past few decades. The research provides an in-depth analysis of the already utilized methods for estimating waste management and draws attention to limits, both of which are beneficial to the efficient management of urban garbage. It comes to the conclusion that the strategy that was described earlier is the essential component to a successful waste management plan.

Das and Bhattacharyya (2013) Gave a presentation that acted as an overall summary on the management of municipal solid rubbish in the city of Calcutta, which is located in India. For the purpose of their study, researchers looked at data collected over a period of 56 weeks, beginning in the winter of 2010 and continuing through the winter of 2011. Sweeping, collecting, transporting, and disposal are the four categories that may be used to classify all of the activities that take place within the city of Kolkata, which is comprised of three distinct municipalities. It has been suggested that a better handling system, home to home waste collection on regular pre-informed timings and scheduling by using bell ringing of musical vehicle, segregation of waste, suitable technology or combination of such technology to make use of wastes, and land filling shall be restricted to non-biodegradable, inert waste and other waste that is not suitable either for recycling or for biological processing. These recommendations were made in response to a problem that has been identified. These suggestions have already been implemented. In addition, in order to stop urban garbage from polluting the environment and posing health risks, there needs to be a collaboration between the public and private sectors in the field of waste management, and appropriate waste management techniques need to be put into place. These steps need to be taken in order to prevent urban garbage from polluting the environment and posing health risks.

Analysis of the circumstances surrounding the collection, transportation, recycling, and disposal of hazardous industrial wastes in the Khazra Industrial Park of Kerman, Iran was the purpose of the research that was carried out by Mansoorian, Yari, Rajabizadsh, and Khanjani (2013). This research was carried out with the intention of conducting an analysis of the aforementioned circumstances. In particular, the researchers were interested in learning more about the current condition of these processes. This investigation makes use of a descriptive cross-sectional research approach, with the questionnaire serving as the major instrument for data collection. Details regarding the production of industrial waste, its storage on-site, its collection, transformation, sorting, recycling, and disposal are included in the material that has been documented. According to the findings, it would appear that the Khazra Industrial Park requires not only a unified system for sorting, conveying, and collecting the garbage that has been sorted, but it also requires a transportation station that is equipped with the fundamental facilities. This is required because the unified system for sorting, conveying, and collecting the garbage that has been sorted is not sufficient. The study article written by Marshall and Farahbakhsh (2013) dissects and discusses the current paradigms of waste management practices and policies in industrialized countries. It is asserted that public health, the environment, resource scarcity, climate change, and public understanding and involvement have all functioned as waste management drivers towards the present paradigm of integrated solid waste management in industrialized countries. [Citation needed] [Further citation is required] However, there are a variety of elements that function as obstacles in developing countries. These factors include economic growth and inequality; cultural and socio-economic factors; difficulties to policy, governance, and institutions; and international considerations. As a result of this, there is a restriction placed on the ability of developing countries to implement waste management infrastructure that was constructed using methods that were found to be effective along the path traveled by industrialized countries. This analysis draws attention to the urgent requirement of devising fresh strategies of waste management that are tailored specifically for emerging countries.

The INCLEN Program Evaluation Network Study Group (2014) conducted research on the management of biomedical waste in 25 districts located across 20 states in India. The purpose of the study is to compile a record of the procedures, resources, and infrastructure that are now associated with BMW in a number of different areas. The instruments that are used by the World Health Organization have been modified so that they can be used with this particular investigation. It has been asserted that adequate management of biomedical waste does not exist on either a national or a regional scale in a number of locations in India. Interventions are necessary for expanding the capacity of the system and committing a bigger amount of resources on a priority basis. It has been hypothesized that a governance model based on accountability and responsiveness is most likely to comprise adequate processes and establish an acceptable BMWM system.

Gidde, Todkar, and Kokate (2014) conducted an analysis of the management of municipal solid waste in the city of Pune. The authors remark that municipal organizations in developing countries are unable to handle rising volumes of rubbish, which has resulted in uncollected waste lying down on highways and other public places. This is a problem because it makes it more difficult to clean these areas. By utilizing any and all audio-visual aids, the Municipal Corporation has implemented a system that encourages public awareness as well as active engagement in the process of reducing and disposing of solid trash. It is absolutely necessary to enlist the assistance of younger people, older people, community groups, institutions, consultants, and non-governmental organizations in order to accomplish the aims. In their conclusion, the authors state that environmentally responsible waste management is a necessity of the present.

In their **2014** article, **Kishore, Agarwal, Kohli, Sharma, Kamat, and Tyagi** examined the inappropriate management of biomedical waste (BMW), which posed a risk to both human health and the environment. Within the context of private nursing homes in Delhi, a cross-sectional study was carried out. Using a sampling process called random selection, 116 nursing facilities were chosen from the south and east zones respectively. The primary objective of this piece of research was to investigate the levels of awareness, attitudes, and practices that health care personnel have about the management of biomedical waste.

An investigation into the disposal of solid waste in Agartala City was provided by **Ramteke (2014)**. It was discovered that the scope of a primary collection of municipal solid waste (collection of garbage from door to door for residential areas) is significantly less than that of a secondary collection (garbage generated on roads by sweeping and cleaning activity). In addition, it is noted that the city does not have a primary garbage collection system that is adequate, reliable, and consistent with its standards. According to the Management and Handling Rules, the organization intends to acquire new vehicles in the not-too-distant future and launch new projects concerning the primary collection of waste. These plans may be found in Management and Handling Rules, 2000.

Moh and Manaf (2014) performed an analysis of the status of the home solid waste recycling policy in Malaysia as well as the issues that it faces. In Malaysia, the most significant major source of municipal solid garbage came from private residences. It was estimated that somewhere between 70 and 80 percent of the overall garbage composition had been placed in landfill sites. Although there are potential for recycling solid waste, it was determined that waste was being deposited in an open area of ground without any attempt being made to retrieve and recycle the material, leading to this conclusion.

In their **2016** study, **Gupta and Gupta** focused on the management of Chandigarh's solid waste. Lack of waste segregation at the source, lack of manpower, characteristics of waste having an impact on the turnover of processing plant, resistance of informal waste worker unions to follow law of municipal corporation, improper waste collection and segregation methods followed by rag-pickers, health problems faced by public living nearby dumping site, and limited community participation in waste management are the challenges identified in the solid waste management of Chandigarh. Therefore, it was suggested to separate waste at the point of generation; to encourage active community participation; to place an emphasis on cost recovery from waste; to identify additional sources of revenue; to involve the informal sector; to guarantee the success of the PPP model; and to dispose of any waste that remained at the landfill site successfully.

According to **Ahluwalia and Patel (2017)**, city compost made from biodegradable waste can be used as an alternative to farmyard manure. Compost has been prized for its high microbial content ever since the dawn of agriculture because it enables plants to more effectively absorb nutrients from the soil. It offers the possibility of simultaneously cleaning up your towns and contributing to improvements in agricultural productivity and the condition of the soil. It has been brought to people's attention that the market development support scheme has not performed very well because of the intricacy of the administration. Stakeholders in Waste Management: The efforts of all of the relevant stakeholders need to be united in order to achieve successful waste management. As a result, this section provides documentation of the case studies relating to the active participation of local governments, the participation of communities, the public-private partnership (PPP) model, informal rag-pickers, and educational institutions.

Weaver and Manning (1991) emphasized that during the 1980s, developing countries began to adopt the PPP approach to economic development as a strategy for growth. This action is taken in response to demands made by the International Monetary Fund, the World Bank, and other First World Donor organizations (USAID). This highlighted the dependency of such nations on the technological and financial skills of other countries in the public and commercial sectors. When considering this situation, the most crucial question to ask yourself is why the involvement of such institutions is both sensible and necessary.

According to **Onibokun and Kumuyi (1999)**, increasing the amount of public participation can be accomplished by utilizing a PPP model to bring about changes at the policy and implementation levels. Additionally, as a consequence of this, both efficiency and efficacy will be improved. The implementation of the PPP model at the regional level was significantly aided by the participation of international monetary institutions. However, under this approach, the political, environmental, and sociological components have been overlooked, and the emphasis has been placed, for the most part, on the technical and financial aspects. It was determined that the techno-financial techniques have not been successful in developing an institutional structure that is required to enable the general public to participate actively.

Vega and Beni (2003) conducted a study to investigate the methods of waste management utilized by educational institutions in Mexico. The lack of expertise necessary to support such initiatives on the part of both central and local government is one of the most significant difficulties.

Sarkar (2003) conducted research on the working conditions and challenges faced by rag pickers in the city of Delhi. The primary data was gathered through the methods of interviewing people and using questionnaires. In addition, the legal policies were analyzed in order to investigate the concerns raised by the public and the commitments made by the government in their direction. The people who picked through trash were forced to labor in deplorable conditions and were exploited. Therefore, it is necessary to address the fundamental issues that the rag pickers face, which include their awful working conditions, their exploitation, and the harassment they face on a daily basis.

A study that was conducted on the recycling markets in Delhi by **Agarwal, Singhmar, Kulshreatha, and Mittal (2004)** can be found here. In order to gain a better understanding of the social and economic circumstances of recyclers, interviews were conducted with 43 recyclers, 7 large recyclables dealers, and 15 small recyclables dealers. It was discovered that the management of solid waste is affected by an informal sector that is comprised of trash recyclers and a hierarchy of recyclable dealers. This sector plays an essential but underappreciated role in the process. The workers were exploited; they worked in unclean conditions; and they had a limited understanding of the importance of wearing safety gear. It was proposed that a more informal method of trash management should incorporate the workers. In addition, they should be provided with instruction in various skills, such as the practice of composting, in order to provide them further options for how they can make a living.

After providing health education to the general public, **Karout and Altuwaijri (2012)** carried out experimental research to investigate the public's behavior and knowledge of activities involving solid waste. A total of 320 residents were chosen at random to be split into two groups: the intervention group and the control group. Both groups were given the same questionnaire to fill out before and after the intervention. Residents who participated in health education sessions demonstrated a significant improvement in their knowledge of the issues and diseases that are spread by the accumulation of solid waste. These residents also demonstrated an improvement in their attitudes toward the management of the collection of solid waste and improved practices regarding the handling and recycling of household waste. It has been seen that a greater number of individuals are taking part in all of the activities that are being organized by the municipality, including cleanup efforts and volunteer labor.

Marconsin and Rosa (2013) analyzed and contrasted two strategies for dealing with the management of urban solid waste in Brazil: management by contract and management by public-private partnership. Both strategies were utilized there. When it comes to dealing with solid waste, it was discovered that management through a public-private partnership (PPP) was more advantageous than management through a contract. It developed waste recovery facilities, lessened the load on sanitary dumping sites, and provided a regular garbage collection system.

A study of the people who sift through trash in Greater Hyderabad was presented by **Devi et al. (2014)**. It turned out that they had an essential but underappreciated part to play in the waste management industry. They went about to various sites, gathered rubbish, and then sold it to those who ran businesses called kabri-wala. They did not take any precautionary steps before beginning the work, which put them in danger of experiencing occupational health problems. The vast majority of workers were unhappy in their positions, but they lacked the skills necessary to pursue any other line of work. The reaction of the general people toward them was unfriendly. It was proposed that they should be brought into the formal system of waste management by instilling in them a habit of wearing personal protective equipment and providing them with training in the proper use of the equipment.

Solid Waste Management and Issues in the Global Context

According to the information provided by **Abelson (1966)** in the article titled "Waste Management and Control Science," New Series, the issue of waste management is not one that can be resolved by investing more money in research and development. The study places a significant amount of emphasis not only on the technical but also on the political issues, and it makes reference to the fact that the issue of waste management is more prevalent and severe in some locations than in others. Before the technologies can be modified, there must first be new governmental policies and institutional frameworks put in place. The majority of the issues ought to be solved at the local and regional level. Additionally, the state and federal governments need to adopt additional measures in order to encourage research and development of new instrumentation. It must encourage proper data gathering and evaluation. If members of the public insisted on action being taken, the issue with waste management would be solved.

With the purpose of conducting research and development on solid waste management in the United States, **Breidenbach and Eldredge (1969)** carried out a nationwide study of community solid wastes practices in the year 1968. The goal was to identify new and improved methods of managing solid trash in an efficient and cost-effective manner, in addition to conserving natural resources by minimizing the amount of waste and vegetative materials that were produced. The writers of the paper Waste Management in the United Kingdom calculated that collection and transportation account for 70–80 percent of the cost of solid waste management. They came to this conclusion based on their research. The issue of solid waste could be remedied through the development of innovative strategies for the collection, storage, and management of garbage, as well as for the waste itself. The findings of the national study indicated that 14% of localities were collecting rubbish in distinct and mixed streams, while 12% of the population was not being served by any collection system. Therefore, advancements in the technologies used for collection and transportation would result in better services. According to the results of the survey, incinerators serve a population that is less than nine percent of the total. The problem of solid waste management could be alleviated through the use of forward-thinking methods such as raising the standard citizen's level of awareness and care for the individual, communal, and corporate waste management issues he or she faces.

In their article titled "Solid Wastes- A Resource," **Havlicek, Tolley, and Wang et al. (1969)** stated that evaluating strategies could involve complex estimation problems related to the costs associated with the purchase or leasing of equipment, the costs associated with the development of equipment, and the external costs associated with waste management. The authors stressed the importance of conducting research on the economics of laws, regulations, and private and public compensations, as well as suggested government subsidies, in order to support standard environmental quality. It is necessary to conduct an investigation into how the pricing of the various stages impacts manufacturing, processing, and disposal. They also stated that the production of solid wastes leads to the establishment of an economic theory of production and supply of solid wastes.

In the study titled "Solid Waste: A Hospital Dilemma," written by **Warren, Joseph, and Yanis in 1972**, the authors observed that patients and community members were being negatively affected by hospital wastes due to the wastes' proliferation. Compaction for dumping or burial in a sanitary landfill, incineration, shredding or grinding before compaction and final disposal through incineration or burial, and finally grinding or pulping, which reduced the waste to slurry before the final disposal, were the four methods of disposal. Compaction was used for dumping or burial in a sanitary landfill. Among these, incineration was the most effective way to get rid of items from the laboratory and the operating room. But the pollutants that were produced when particular polymers were burned with other types of plastic contained hydrocarbons, which could be harmful to public health. Incinerators did not entirely remove pathogenic laboratory and surgical wastes, especially those with water contents, and the primary by-product of the combustion of polyvinyl chloride (PVC) was hydrochloric acid. Incinerators also produced hydrochloric acid. The employment of in-facility methods of waste treatment has the potential to significantly reduce the risks to the surrounding population.

Joint manufacturing was investigated by **Lackman (1975)** as a potential economic strategy for recycling solid waste. The author believes that there is a growing attention on garbage as a valuable resource, and that this interest is pulling huge corporations and sophisticated technologies into the domain of solid waste management. The pricing issue might be solved in either of two ways, depending on whether or not the garbage was segregated before or after it was collected: either before or after the collection. If the value of new waste materials were realized, then the quantity of solid trash might be reduced significantly, which would contribute to the industry's goal of finding new sources of revenue. It was possible to bring about such a realization by putting the collaborative production model into operation. In addition, the author asserts that in the foreseeable future, trash will be dealt with in an increasingly conventional manner and will be taken into consideration in the market organization of industries. The establishment of waste management as a standard industry will have an effect on the structure of the region. It was necessary to come to terms with the potential of solid waste management and the fact that appropriate economic concepts and methods may offer a rational solution to the ever-worsening challenge of solid waste management.

According to **Ralph (1978)**, wastes that are hazardous or poisonous pose a significant threat to both the health of humans and the environment. It has negative effects on the human neurological system and is linked to an increased risk of birth abnormalities. Toxic substances continue to be present in species, especially those that are part of the food chain. These factors have a significant bearing on the lives of humans, animals, and plant life alike. As a result, there is a greater on placed on the shoulders of state and local governments to ensure that municipal solid wastes are disposed of and managed in an appropriate manner. The inclinator's lack of popularity can be attributed to the pollution in the air. In later years, the use of sanitary landfills to dispose of municipal solid waste became increasingly common. During World War II, Great Britain pioneered the use of sanitary landfills for the first time. The process of collecting and disposing of solid garbage is widely regarded as the most hazardous job in the United Kingdom. Therefore, in accordance with the Federal Occupation Safety and Health Act, a higher emphasis has been placed on the workers in question. The suggested solutions are to first do an inventory of the quantity of solid waste collection, and then to establish a coordinated area-wide solid waste strategy for the entire state. After these two steps have been completed, the strategies will have been effective. Thirdly, projections of future garbage collection should be done taking into account both the population and the economic activity of the community. Following that is an analysis of the surveillance and monitoring of wastes that are solid. In conclusion, the implementation of a schedule for the control of pollution caused by solid waste at all collection stations.

In their 1979 article "Appropriate Technology and Public Policy: The Urban Waste Management System in Cairo," **Haynes and El-Hakim** observed the failures and negative side consequences of the urban waste management system in Cairo. reveals that, from an environmental point of view, "technology" and "environment" are likely to continue as adversaries in the developing world, just as they have been in the developed world, and that the most effective ally that "environment" is likely to have is its newest offspring, "intermediate technology." Because the technologies will have large-scale indirect effects on the environment, emerging countries will be pushed to align themselves more and more with intermediate technology.

Matulich, Carman, and Carter (1979) conducted research on the interdependencies that exist between waste management and the production system. Their findings were published in Case Study of Systems Analysis of Livestock Waste Management: A Study of Large-Scale Dairying. Rather than treating waste management decisions as separate or supplementary components of the production process, a systems approach to waste management is recommended since it is expected to lead to overall output that is more efficient. The producers are responsible for managing wastes in a manner that is in accordance with environmental requirements, all while aiming to keep production efficiency at its current level. The findings of the study indicated that waste management should not be treated as a separate stage of production. Such a myopic approach may promote actions that are less than optimal because their primary motivation is to reduce the cost of trash treatment or disposal. It is possible that potential efficiencies in the system as a whole could be jeopardized if efforts are made to comply with environmental quality rules without taking into account the interdependencies that exist between waste management and agricultural production.

According to **Rutala and Felix (1983)**, healthcare providers were concerned with the right treatment of infectious waste due to aesthetic considerations and the association of hospital transmissions of illnesses with hospital transmissions. The amount of solid trash that is generated needs to be determined by the waste management program. According to the findings of the study, hospitals produce approximately 13 pounds of solid trash per patient every day on average. The heavy care units, which include the intensive care, operating room, and burn units, generated 1.6 times the amount of waste as the light care units, which include paediatrics, neurology, and general medicine, and produced two times the amount of waste as the support units, which include administrative and pharmacy services. The hospital is required to sort patient-related solid wastes into contagious and non-infected categories using containers or bags that are either labelled or colored according to their classification. Because the treatment methods for infected trash through incineration cost more money than those for non-infectious garbage, this practice would result in a reduction in the overall cost of disposal.

It is recommended that a tax on waste products be implemented as a supplementary measure to other sources of revenue. If it were utilized correctly, the technology that is currently available would be sufficient for waste management. The newly developed and groundbreaking technologies were very exciting, but they could not immediately take the place of the ones that were already in use. According to the authors, there is a pressing need to reduce the amount of waste dumped in landfills and give treatment and recovery a higher priority. **Daniels L.** provided an explanation for these (1985).

In The Canadian Experience with Privatizing Residential Solid Waste Collection Service, published in 1985 by **McDavid**, the author revealed that public and private producers receive different salaries. These distinctions, on the other hand, were what made the efficiency possible. The disparities in efficiency that were discovered were also attributed to by two other factors. The majority of private companies used automobiles with larger carrying capacities, while the majority of public companies operated with smaller crew sizes on average. The municipalities had a tendency to give private contracts out, mostly because doing so was more efficient.

According to **Khan and Bender (1987)**, the management of community solid waste was concerned with four primary functions, including collection, transportation, processing, and disposal of trash.

According to **Porter (1989)**, in 1990 the Congress of the United States passed a law that prohibited the disposal of hazardous waste in lands. In 1987, Congress created the Water Quality Act in order to clean up the water and assist regulate the harmful substances that were present at the time. Waste management developed as a response to the limited resources available to the federal government. People have reached the conclusion that they need to work together to reduce pollution in this situation. The Water Act had a direct bearing on the manner in which waste was handled. It was found that a waste management system that was both strategic and integrated, focusing on source reduction and recycling, would make a significant contribution to the management of trash.

According to **Houpt, Roddewig, and Glenn (1991)**, the collection and disposal of solid waste has traditionally been seen as falling under the purview of the jurisdictional level of local government. In the United States of America, the duty of disposal falls on the shoulders of the municipalities. The planning and management of solid waste is a subject and area that is of particularly high importance to both state and local governments. Comprehensive management of solid waste is impacted by a variety of concerns, including political, economic, organizational, financial, and management issues.

According to research conducted by **Shortlidge and White (1993)** and published in their article titled "The Use of Zoning and Other Local Controls for Siting Solid and Hazardous Waste Facilities," it was discovered that the zoning regulations were the most widely used and commonly understood form of local land use controls. Waste facilities were permitted as a matter of right in a certain zoning district, or by creating an overlay or floating zone with additional conditions for the site of the facilities, according to the regulations that governed zoning.

According to **Andrew (1994)**, in the United Kingdom, there was no Act dealing to waste management until 1975. This was the case until 1975. The Environmental Protection Act and the Town and Country Planning Act of 1990 both required extra planning clearance for the waste disposal facility before they would allow it to continue operating after the year 1990. (T&CPA).

According to **Khator (1994)**, the state of Florida passed the Solid Waste Management Act (SWMA) in the year 1988. Because of this Act, it was mandatory for each county in Florida to reach an overall recycling rate of 30 percent by the year 1994. As a consequence of this, the counties were given more responsibility for the management of solid waste. Incinerators have been put into operation, landfills have been monitored, material recovery facilities have been managed, and effective recycling programs have been implemented by the counties and municipalities. According to the findings of studies, there are two sources that contribute to the demand for expanding county services: internal sources such as population expansion and urbanization. The introduction of waste management was dependent on numerous elements, the most essential ones to consider from a management point of view being income base, jurisdiction control, and flexibility. The success of the recycling strategy in Florida can be attributed to two factors: first, the widespread cultural acceptance of recycling; and second, the enthusiastic backing of the state and local governments. Increasing public engagement and fostering public knowledge were cited as the two factors that the respondents in the survey believed to be the most critical for accomplishing recycling goals. There was very little confidence in the ability of the county government to work with the private sector in any capacity, be it through cooperation or by contracting work out.

The researchers **Miranda, Everett, Blume, and Roy Jr. (1994)** discussed the significance of unit-based pricing programs for residential municipal solid trash and demonstrated their effectiveness. According to the findings of the research, residents were being charged two different prices for the collection of their municipal solid waste under a pricing structure known as two-tier pricing. The majority of the unit-pricing programs that have been implemented can be grouped into one of three categories: bag, sticker, or can. Garbage collectors would only pick up these bags, which were uniquely tagged, when they traveled along their routes. Residents were needed to purchase a packet of stickers and then affix one sticker to each bag that was placed at the curb for collection if the system utilized stickers. The price per sticker, in addition to the price of the special bag, covered any and all expenditures connected with the collection and disposal of the bag on which the sticker was placed. In the can system, individual families purchased cans through a subscription service offered by the local municipality. The prices varied depending on the number of cans as well as their dimensions. Residents were given the flexibility to get rid of large items without having to make special requests for collection thanks to the sticker system, which offered that option. Sticker programs typically determine in advance the quantity of stickers that will be necessary for certain large or bulky goods, such as home appliances or furniture. Stickers could also be mailed to the household, but in order to participate in the bag systems, residents were forced to travel to particular sites in order to purchase the specific bags.

Within the context of an integrated waste management system, **Baetz and Neebe (1994)** created a model called mixed integer linear programming (MILP), which was able to determine optimal recycling program development levels for various recyclable materials. The modeling was carried out for a planning horizon of 25 years, which was comprised of six different time periods. The durations of these intervals were divided up in such a way that, in the short term, more precise time increments were utilized, whilst in the long term, more general time increments were utilized. The relative costs of development and operation for each of the several options led to a high level of recycling and a relatively low level of direct land filling as the predominant waste management strategy.

According to observations made by **Reschovsky and Stone (1994)** in the article Market Incentives to Encourage Household Waste Recycling: Paying for What You Throw Away, market incentives approaches involved payment systems that required households to pay quantity-based fees for waste disposal. These fees were imposed on households as part of market incentive programs. To reach an effective conclusion, the fees were aligned with the marginal increase in social expenses associated with garbage disposal. The likelihood of recycling in married homes was considerably higher than the likelihood of recycling in non-married households. People with higher levels of education had a higher likelihood of recycling in general compared to people with lower levels of education.

According to **Smith (1994),** who investigated this matter, the "Directive on Waste" issued by the European Community in 1975 defined waste as any substance that a person "disposes of or is obligated to dispose of." The term "disposal" was then defined to encompass the "transformation operations" that are required for the recycling or reuse of garbage.

In their study on the economics of municipal solid trash, **Beede and David (1995)** found that labor-intensive and informal-sector recycling businesses were, in general, extremely labor intensive and, as a result, did not show economies of scale. The consequences that the various options for managing MSW have for public health and the quality of the environment should be taken into consideration by those who make decisions. Insects, rodents, and viruses that can cause and spread diseases such as Bancroft and filariasis are more likely to breed in areas where collection and disposal techniques are not up to par. These areas are also more likely to be infested with these pests.

According to **Strathman, Rufolo, and Mildner's (1995)** findings, the price that was paid by household trash generators was typically the link in the pricing structure that was the weakest. It is vital to collect information on the fees associated with waste collection as well as the quantity of rubbish that is collected if the emphasis is placed on the point where waste is generated. If the analysis were done from the perspective of the disposal point, the pertinent data would include things like tipping costs and the amount of waste that is sent to landfills. There was a correlation between the estimates of the demand based on waste generation and disposal methods. Variations in the cost of the landfill had an immediate and direct impact on the amount that was charged for collection services when all garbage was disposed of in landfills.

According to **Goett (1998),** the primary cause of environmental contamination is the widespread absence of basic infrastructure and sanitation in the communities. He suggested increasing environmental education at the local level and organizing community-wide solid waste collection and disposal services. Goett also suggested that communities should work together to reduce waste. People at the home level need to have information about waste management as well as a balanced assessment of local practices and perceptions in order to give insight regarding environmental education. People in the community do not consider any form of production from households to be worthless or pointless; rather, they perceive these outputs as resources that can be reused. It is imperative that communities give some forms of home outputs serious consideration for their reuse as resource sources. They need to think of trash management as a sensible behavior that is "practical," "logical," and "informal." Last but not least, the communities need to recognize the distinction between public and private places. It is important that everyone in the community respects the personal property and space of others, especially in terms of their homes. It is the responsibility of adults to teach younger children about proper waste disposal and the neighborhood, so that they do not litter on the property of others. It is generally agreed upon as a societal convention that homeowners are responsible for proper trash disposal on their properties.

Local governments have a part to play in the collection and disposal of waste, as stated in Read, Phillips, and Robinson's (1998) Professional Opinions on the Evolving Nature of the Municipal Solid Waste Management Industry in the UK. However, the primary responsibility for the control of waste and how it affects the environment lies with the Secretary of State for the Environment in the United Kingdom. It was in 1998 when the book "Professional Opinions on the Evolving Nature of the Municipal Solid Waste Management Industry in the UK" written by Read, Phillips, and Robinson was released. The following is the current order of procedures for waste management in waste hierarchy: 85 percent of the rubbish that is under control is taken to landfills, and 88 percent of the space that is used for land fills is occupied by landfills. However, only 5% of home waste is recycled, and only 4% of recycled household waste is used to generate energy. Although 50% of domestic garbage has the potential to be biodegradable and recyclable, only 5% of household waste is actually recycled. Just 12% of the materials that make up municipal solid garbage are recycled or recovered in some fashion. The authors discovered two significant problems with the way the system for managing solid waste works. The first problem is that there is no clear incentive through the pricing system to either decrease the amount of rubbish produced or increase the amount of garbage that is recycled. Because of this, it is extremely challenging to put the waste management hierarchy into practice. Second, the costs of the various waste management alternatives do not adequately reflect the environmental implications of those options, which results in a distorted market that businesses are compelled to operate within. This makes it difficult for enterprises to compete in the market.

Grierson and Brown (1999) identified three defining characteristics of public-private partnerships, such as synergy, which included private sector capital, capacity, and efficiency combined with public sector policy and administrative oversight. The purpose of this combination was to meet the public sector responsibility to provide efficient, equitable, and environmentally sound municipal waste management services in small enterprises. Grierson and Brown's research was published in the journal Public-Private Partnerships. One of the distinguishing aspects of public-private partnerships was the presence of synergy. It was anticipated that both the cost-recovery and financial models would be easy to comprehend and available for public inspection. It is essential that the "willingness and ability to pay" of society as a whole is appropriately reflected in the monetary systems. It was an imperative necessity to strengthen the technical capabilities of the local authorities in order to build up their overall capability. The commercial sector needed support in recognizing and seizing opportunities in partnership possibilities in order to be able to work to the technical, environmental, and social standards that were demanded by the public sector. Additionally, in order for the private sector to operate in accordance with such norms, they will require support. In conclusion, the accountability of individual citizens and the cooperation of the general public was the single most important component.

In their article titled "Producer's Responsibility and Centralized Waste Management," **Eichner and Pethig (2000)** mention that the interdependence between product design and recycling has only received greater attention in recent years. And to be more specific, Holm-Muller (1997), Fullerton and Wu (1998), and Calcott and Walls (2000) all model "Recyclability" as a parameter of product design. The Waste Management Organization (WMO) is an organization that many nations have collaborated on to establish as a common hub for waste management. Additionally, the notion of producer responsibility has just recently been implemented in a select few nations, such as in Germany, where the "German Green Dot" system is one of the pioneering ones. According to Folz and Gile (2002), the unit-based charge on garbage that is practiced in the United States under the Pay As You Through (PAYT) Program is dependent on the amount of waste that consumers have disposed of. The program offers a number of advantages as a result of the fact that it lowers the expenses associated with the collection and disposal of solid waste in the community, lowers the amount of garbage that is produced by households, and raises the percentage of solid waste that is recycled and composted. If the amount of municipal solid garbage increased, then there would be a chance that the collection might take place every day, which would cut down on the size of the truck fleets and the number of people working in collection crews.

It has been pointed out by **Ogbonna, Ekweozor, and Igwe (2002)** that wastes are not completely pointless. They have made the observation that people are more concerned about their ability to maintain their day-to-day lives rather than "elitist" concepts like waste management. However, problems with waste management are everyone's concern, despite the fact that they are not given enough attention in practice.

Gasification is a method of waste management that **Dudley and Collins (2003)** suggest should be considered as an alternative to incineration and landfilling. Gasification is an industrial method that results in the creation of valuable by-products. Gasification is achieved through a closed-loop process that is predicated on the transformation of the solid waste's carbon content into synthesis gas. This transformation takes place at high temperatures and involves an extended residence time for the process gases. The destruction of complex organic molecules and the production of a synthesis gas that can be recovered both result from the interaction of high temperature and a prolonged residence time. The plants are responsible for the treatment and recovery of any residual acid gases and volatile heavy metals. And the acid gases are neutralized and converted into salts through the process. The waste components are processed in order to generate goods that are non-toxic. Additionally, the synthesis gases that are produced are put to use as fuel in the production of power. Additionally, this surplus of electricity is able to be traded on the open market. There is more than one variety of gasification technology available for dealing with solid waste. And according to the gasification technologies' advice, the gasification technique has been developed for use in commercial applications for more than half a century in the refining, chemical, and power industries.

According to **Tooher, Griffin, Shute, and Maddern (2005),** personnel in the industry of solid waste management are potentially exposed to a greater risk of contracting infectious diseases as a result of their employment. However, there are currently no studies that have been conducted that have documented the risk. The employees in the solid waste management business are responsible for a wide variety of tasks, some of which include collecting, truck driving, operating machinery or plants, picking and sorting debris, and working as supervisors or administrative assistants. And workers in this sector have been warned about the dangers they face on the job. There are three vaccines available to prevent diseases that have been identified as having the potential to be hazardous for employees in the solid waste industry.

Community attitudes and perceptions on ecological issues were investigated by **Toteng, Mbaiwa, and Moswete (2005)** using a social survey entitled Community Attitudes and Perceptions Towards Urban Ecological Issues in Maun and Gaborone, Botswana. This research was conducted in Botswana. Water taxes or tariffs were the finest ways of water conservation and sought tool by governmental authorities in Botswana. Botswana is a landlocked country in southern Africa. The vast majority of those who made up the 63.2% did not recycle water in their homes. And 82.8 percent were totally on board with the idea of recycling used water in order to reduce water waste. One hundred percent of persons surveyed said that they reused waste water for uses other than cooking, such as watering vegetable plants. Burning waste on site, as well as dumping it at off-site designated dumping sites and then burning it there, used to be the most common way of getting rid of household solid waste. On the other hand, the waste collection services and the infrastructure were already in place in the peri-urban areas. The dumping and burning of waste was not a sustainable or environmentally friendly practice over the long term in situations where there was an increase in the volume of waste generated. Burning could also, over the course of time, contribute to the depletion of ozone, in particular in urban areas where solid waste also included a sizeable portion of plastics and other synthetic materials that would release harmful airborne substances when burned. Because of this, inefficient solid waste disposal and management systems were not compatible with the concept of ecologically balanced urban development. They should be dissuaded through the use of alternatives that are distributed through a participatory urban planning system that is conscious of the effects that urbanization has on the natural environment.

According to **Diamond (2006),** the combination of a growing population and itinerant lifestyles eliminated the need for effective waste management. In ancient days, nature and the environment were responsible for trash management, and people produced organic garbage by simply leaving it on the ground to be broken down by microbes as they traveled from one location to another. In other words, biodegradation was the primary method of waste disposal. The ancient Minoan civilisation of Crete, which flourished between 3000 and 1000 B.C., is considered to represent the beginning of the history of waste management. The people of the Minoan civilization had the habit of storing their garbage in large pits on their land, on top of which they would layer new layers of earth at regular intervals. In addition, during the first century B.C., the powerful ruler of Rome, Julius Caesar, made an exception for garbage carts to the rule that prohibited wheeled transportation within Rome during the daytime. In the United States, the reform of the municipal trash system became a significant social movement beginning in the 1870s and concentrated on the efforts of the government. The author made the observation that large cities have developed effective solutions to severe waste management problems due to the acute problem of high density, significant volumes of trash, and a scarcity of dumpsites.

Brickwedde (2006) conducted research into the most current advancements in environmental law. In this regard, the Supreme Court of the United States of America had handed down its decisions in four separate cases involving solid waste management. The opinion of the Sixth Circuit was that the decision made by the United States Supreme Court in the case of Carbone "implicitly rejected the public-private distinction," which was the basis upon which the Second Circuit had relied. According to the decision handed down by the Sixth Circuit Court of Appeals, "the fact that Defendant acts as both a corporation and a government, as opposed to merely a government, does not conceal it's facially protectionist action from the necessary scrutiny under the Commerce Clause." The Daviess County flow control program was declared unconstitutional by the Sixth Circuit.

By conducting an analysis in solid waste management efficiency using techniques from Data Envelopment Analysis, Sarkis and Dijkshoorn (2007) were able to provide some evidence of variations in the environmental and economic efficiencies of solid waste management among small and medium sized manufacturing enterprises (SMEs) in Wales. These SMEs were responsible for producing goods and services (DEA). In order to carry out the analysis, these methods were utilized. Both policymakers and organizations benefited from an evaluation of these performance criteria as part of a large-scale study because it assisted them in gaining a better understanding of some characteristics of the efficiency of SMEs and provided some general suggestions on comparative benchmarking routes. This was the case because the study helped them better comprehend some characteristics of the efficiency of SMEs. Putting trash in landfills is currently the most effective method available in the United Kingdom for removing waste from homes and businesses. However, land filling not only takes up valuable land space but also contributes to the contamination of the air, water, and soil. Land filling should be avoided at all costs. This is accomplished by the emission of greenhouse gases into the atmosphere, such as carbon dioxide (CO_2) and methane (CH_4), in addition to the introduction of toxic compounds into the ground and the ground water. The waste legislation that derives from Part II of the Environmental Protection Act, which was passed in 1995 and applies to England and Wales, is in charge of controlling many aspects of how the environment is protected and regulated in day-to-day life. This legislation applies to England and Wales. The ability to manage wastes generated and their management in a cost-effective manner was the way that the investigators defined economic efficiency in this study as part of their inquiry into the subject matter. This was done as part of the investigators' investigation into the issue. Therefore, we can say that a corporation has high economic efficiency if it is able to manage its wastes at a cost that is relatively low on a per-unit-of-measurement basis. Only those costs that are directly linked to waste management are included in the total cost. This includes the output elements like the total amount of garbage that is generated, the amount of waste that is recycled in its entirety, and the amount of hazardous waste that is produced.

The purpose of the research that was carried out by Mabuchi, Oliveira, Lima, Conceico, and Hugo (2007) was to provide a description of the amount of alcohol that was consumed by people working in the garbage collection service in the perimeter South zone of Sao Paulo, State of Paulo, Brazil. The study titled Use of Alcohol by Workers of the Garbage Collection Service revealed that 94 percent of the workers consume some kind of alcoholic beverage, while 15 percent are considered to be dependents; 46 percent of the workers revealed that peer pressure was the main reason to initiate the habit; 67 percent of the workers had already felt some symptom as the result of the ingestion of alcohol, and 80 percent reported that they were afraid of becoming mentally ill because of the consumption of alcohol. The authors made the observation that the average daily consumption of alcohol was significantly higher than expected. It was shown that 94% of the individuals consume alcohol in some form or another, even if it is only on an occasional basis. This was found to be the case regardless of the frequency of consumption. When asked whether they had ever experienced convulsions or hallucinations while drinking large quantities of alcohol, 28% of respondents said they had, while 54% of respondents were unaware that they had acquired some mental or behavioral disorders as a result of their alcohol use. [Citation needed] Comparatively, only 15 percent of women consumed more than three glasses of alcohol per day, compared with 34 percent of men who drank alcohol four or more times each week. Another eighty percent are worried that drinking alcohol may lead to the development of a mental or behavioral disorder in them. These illnesses can include brain traumas that were caused by falls that occurred while the person was under the influence of alcohol, the panic syndrome, violent behavior, and loss of control in a range of different settings. Approximately forty-six percent of individuals have begun drinking as a direct result of the influence of their immediate circle of acquaintances. In addition to this, there are some people who drink in order to alleviate some of the tension in their lives, some who drink in order to escape their troubles, others who drink simply for fun, and others who drink because they are jobless. A little less than 61 percent of those who work in the garbage industry reported that local merchants are offering for them. Garbage workers have indicated that they are willing to demand an alcohol sponsor from a business even though that business does not currently provide such a sponsor for them. Research has also indicated that the bulk of substance use occurs among people of reproductive age. [Citation needed] It is higher among male workers, as shown by the proportion of 96.7 percent, which indicates that this is the case. And last, it has been established, based on the data that was provided in the article, that regularly consumes alcoholic beverages.

According to the findings that were presented in Managing Solid Waste through Discrete Location Analysis: A Case Study in Central Portugal by Antunes, Teixeira, and Coutinho (2008), the Municipal Solid Waste that is collected in the municipalities and transported to the transfer stations is ultimately disposed of in landfills, either directly or indirectly. This was determined by looking at the data that was collected. These facilities are of the utmost significance to the system since it is through their efforts that municipal solid garbage can be compacted to an extremely high degree before being shipped to landfills in large trucks. The technique that is now being utilized for compaction offers a decrease of sixty-five percent in the cost that is associated with transporting each individual unit.

According to Adamides, Mitropoulos, Giannikos, and Mitropoulos (2009), difficulties with Solid Waste Management (SWM) can be objectively articulated as structured technical challenges, and once these problems have been formulated, solutions can be looked for within the problems themselves. After a solution to a problem has been found, it is again presumed that it will be simple to put into action, despite the fact that the current circumstance and the social dynamics of the place under examination are not taken into account. This is done despite the fact that this presumption is made despite the fact that the problem has been identified. The complexity of policy making with regard to Solid Waste Management (SWM) does not primarily stem from the technical features of the domain of intervention or the policy-making process itself, but rather from the social dynamics of the domain of intervention. The SWM is a social issue that, in addition to the purely technical, extends to both the practical and emancipator domains of interest of the social subjects that are involved. This means that the purely technical aspect of the issue is only one of its many facets. This indicates that it is not only technical in nature.

According to the findings of Macauley's research, the imitativeness and initiatives taken by states and localities in the United States to comply with the new regulations promoted by the Environmental Protection Agency (EPA) in implementing the Resource Conservation and Recovery Act of 1976 have been the driving force behind the major shifts that have recently taken place in waste management. These changes have been brought about as a result of the Resource Conservation and Recovery Act of 1976 (RCRA) (2009). He mentioned that the

Resource Conservation and Recovery Act (RCRA) allows the federal government to provide financial assistance to the states in order to "prohibit the establishment of new open dumps and the solid waste to be either utilized for resource recovery or disposed of at sanitary landfills that meet the EPA standards." Because of this obligation, the disposal of the trash must be done in a way that is in accordance with the regulations set forth by the EPA. The Environmental Protection Agency (EPA) standardized the rules for the handling of municipal solid waste. After the rules that affected them in 1993 went into effect, a significant number of landfills that take municipal solid waste stopped receiving wastes with specified closure requirements. The landfills that were unable to comply with the standards were obliged to close down, while some of the remaining landfills have undergone renovations to ensure that they meet the requirements. In addition, it was anticipated that any new landfills would behave in accordance with the rules that had been established. The adoption and execution of the regulation had a direct impact on the trash market, which led to the formation of several market dynamics.

According to **Zotos et al. (2009)**, the goal of a sustainable and environmentally friendly policy approach must be accomplished by the local authorities. The approaches such as; fair and efficient charging of waste management services, alternative waste management systems of either a collective or an individual character, environmental bench marking for local authorities, green public procurement, hazardous waste management plans, green municipal fleets, environmental certification.

According to **Feo and Gisi (2010)**, the central part of the city displayed the most pro-environmentalist attitude, with 89.5 percent of respondents saying that it is desirable to separate municipal solid waste (MSW). According to the findings of the study, individuals in the youngest age group indicated the most favorable attitude about the environment, as well as the strongest belief in the value of sorting MSW. In terms of awareness, people who worked in offices were very aware of the centers, whereas retired people, people over the age of 65, and 74.0 percent of students were aware of the centers. The citizens' relationships with the workers varied depending on the region, the type of building, and the social characteristics of the people living there. Every single employee stated that they had been informed of complaints from members of the public. And the concerns of the general population were voiced to the regional government. 37.5 percent of the employees and 25 percent of the customers have the opinion that the public's complaint about faults in the separate collection system.

Vergara and Tchobanoglous (2012) noticed that studies and policies about waste management were beginning to adjust to new information and difficulties. Now there was a greater involvement of the public in the management of waste. The general public expressed a desire to be informed about and involved in the decision-making process regarding waste management. Particularly, households and consumers were active players. The industrial ecology (IE) was encouraging for the new framing of waste management system, and indicated a balance with the surrounding environment might be built by emulating waste management methods found in nature.

Chuokwuemeka, Onwuka, and Mary (2012) recognized the importance of environmental education, public awareness, and involvement. Enlightened dialogues, increased public understanding, and even outright opposition would encourage balanced policies and increase public commitment. People had the ability to influence the environment in both positive and negative ways. As a result, managing solid waste would be challenging without effective education, orientation, and public awareness at all levels of society. Environmental education and public participation may save money in the long run since people's attitudes and dedication to the environment will improve. The investigators discovered that individuals preferred public-private partnerships in garbage collection, treatment, and disposal. Approximately 69 percent of respondents were ignorant of the government agencies in charge of garbage management. During the course, no environmental education was provided. The trash management personnel were poorly trained. The researchers made a few recommendations, including an annual budget with a separate head for the purpose of adequate revenue allocation, implementation and monitoring, enhancement of environmental education programs and policies, public-private partnership is encouraged, government sponsors more research projects on solid waste reduction at source, collection, and efficient disposal, waste management concepts must be included in school curricula.

Kruljac (2012) remarked that a comprehensive solid waste management plan, including innovative solutions such as priority recycling campaigns and refuse collection programs, should be developed to address Curitiba's municipal solid waste challenges. To comprehend waste management programs, the author stressed the importance of understanding the history and politics of the city's urban development. The public-private partnership (PPP) with NGOs or CBOs would act as intermediaries to address solid waste management issues. Deliberative democracy structure techniques could help to improve it even further.

According to **Schindler (2012)**, the legal and informal sectors of garbage collection are connected to one another through various stages. The uncoupling of the official and informal systems would put the jobs of waste workers at risk, as well as lead to a rise in the amount of harmful emissions and ash produced by waste-to-energy plants. The collection of waste would become subject to direction competition as a result of the privatization of the industry and the installation of waste-to-energy plants.

According to **Haider and Haider (2013)**, the issue of household Solid Waste Management (SWM), which remains mostly mismanaged in urban Pakistan, is a major cause for worry. According to the findings of the National Conservation Strategy, Pakistan creates an estimated 48,000 tons of solid trash every single day, roughly 20,000 of which are produced in metropolitan areas. It was claimed that the generation rate of household solid trash in Pakistan was somewhere between 0.5 and 0.7 kilogram per inhabitant per day. The municipal officials in Karachi only retrieve half of the 7,000 tonnes of solid garbage that are produced every single day. In Pakistan, the collection of solid waste included participation from both the formal and informal sectors. In Pakistan, the vast majority of recyclable materials are not found in the solid waste that is thrown away by families. The recyclables are typically sold to people who are standing on the street. However, there are certain characteristics that differentiate homes with low incomes from households with higher incomes, such as the fact that people with low incomes sell recyclables to hawkers. The households with higher incomes give their recyclables to the domestic assistance. The authors suggested conducting a survey to develop accurate estimates of the amount of solid waste generated by the city, that local governments should work in conjunction with citizen groups to ensure that waste collection services are made available in all neighborhoods, that private sector entrepreneurs should be encouraged to develop businesses for waste collection and management, and that local and higher tiers of government should educate citizens about sustai through the media. Lastly, but most crucially, the courses that are taught at the college and university level need to incorporate the research and statistics that are produced by local case studies.

According to **Guerrero, Maas, and Hogland (2013)**, waste management is influenced by technological, environmental, financial, socio-cultural, institutional, and legal enabling factors. Awareness, expertise, and equipment are the three most crucial components for waste separation. Moreover, the time required to collect waste from service users is significantly influenced by the availability of waste transportation infrastructure and the condition of the road. Service customers and service providers should have outstanding cooperation and coordination. In the surveyed regions, all 22 cities reported the home practice of open rubbish burning. The researchers conducted a correlation analysis between recyclables collection and a number of city factors and discovered that citizens must be informed about the advantages of recycling, primarily how to sort waste, and should then be involved in the design of programs, particularly recycling campaigns. It was also determined that if local authorities cared about solid waste concerns and gave them priority, they should promote more efficient waste collection and management solutions.

According to **Poldnurk (2014)**, the Organized Waste Collection Scheme (OWCS) has been implemented gradually by municipal administrations in Estonia. The purpose is to increase organizational and administrative efficiency by minimizing administrative overhead; administrative efficiency will be influenced by flexibility. Ineffective waste management in Macedonia is the result of a lack of financial resources to invest in current technology. In addition, no landfills had been constructed and the necessary services were not in place to facilitate the polluter-pays approach. The survey indicated that only six of the twenty-three towns spent additional funds on awareness initiatives. In the absence of awareness-raising activities, community members remained unaware. Awareness of solid waste disposal legislation improved waste management services. The research found that community members who were knowledgeable about waste disposal regulations were more happy with solid waste management. Other findings included the fact that waste management prices are transparent, the components of garbage collection and treatment expenses were collected separately, and as a result, individuals were driven to sort their waste and utilize public waste stations or collection sites. Regional unification of the public network of trash stations and pickup locations. Supervision was crucial to the effectiveness of trash management; the municipality gave quick feedback for supervisory and procedural acts. If the debtors failed to pay, legal action would be taken against them.

According to **Jones and Spadafora (2014),** the municipal solid waste industry is a highly unglamorous company that has been disregarded by business and economic historians as well as management experts. Jones and Spadafora (2014) gave this explanation. But it was mentioned in a significant new comparative study of the garbage industries in Germany and the United Kingdom following World War II that was carried out by Stokes, Koster, and Sambrook. The authors concentrated their attention on the for-profit waste management industry. In the twenty-first century, practically all professions, particularly sanitary engineers, became aware of the repercussions of garbage. The specialists all arrived to the same conclusion, which was that improper waste management may result in considerable environmental harm, whereas recycling could make a big contribution to the maintenance of a healthy ecosystem. There was a concerted effort made by entrepreneurs to integrate social concerns into their businesses. During the nineteenth century, horse-cart carriers and peddlers, and following 1970, the growth of major corporations that were vertically integrated in their waste management operations. According to the findings of research conducted by worldwide waste management corporations in the latter part of the twentieth century, the private sector's reluctance to embrace recycling activities was likely caused by the profitability of land filling. Late in the nineteenth century and early in the twentieth century saw the rise of a large number of German, Danish, and other European entrepreneurial firms that were expressly dedicated to making a profitable business out of conserving valuable resources and returning them to productive use in order to maintain public sanitation and emerging environmental sustainability. These firms were primarily focused on making a profit by returning valuable resources to productive use. The separation of waste materials and their subsequent recycling was pioneered by environmentally conscious elite groups comprised of engineers, natural scientists, and socially underprivileged individuals. These practices are still utilized, albeit in more developed forms, in recycling facilities today.

According to the findings that were published by **Lohri, Camenzind, and Zurbrugg (2014)** in the article titled "Financial Sustainability in Municipal Solid Waste Management – Costs and Revenues in Bahir Dar, Ethiopia," the amount of money spent on transportation accounts for the largest portion of the annual cost. Several potential solutions were suggested; however, in order to properly evaluate them, a more comprehensive study with more accurate cost reduction projections was required. The private service provider and their primary concern was the price associated with waste collection and transportation. A more complete picture of the SWM system would be possible with the help of an analysis of the costs and benefits incurred by all official and informal stakeholders (full cost accounting), as well as the inclusion of topics like the costs associated with environmental protection. The primary activities were successfully outsourced, which resulted in significant improvements regarding the cleanliness of the city. Because of the successful networking and fund-raising efforts of the private company in Bahir Dar, it was able to gain access to loans from several financial institutions.

Solid Waste Management: Indian Scenario

In his paper 'Public–Private Partnerships in Solid Waste Management Economic and Political Weekly,' **Venkateswaran (1994)** highlighted that the growing population put pressure on the public sector to provide basic facilities and infrastructure in metropolitan areas. Due to a lack of funding, staff, and efficient technology, municipal administrations were unable to provide sectoral services. According to the author, around 30% of rubbish is not collected on a daily basis. There are significant intra-city variances in terms of services supplied. Basic services and jobs were identified as two of the most pressing demands of metropolitan areas. The urban strategies had become fragmented, with each issue treated as an individual issue rather than as part of an integrated development strategy. Today, vast amounts of municipal rubbish are strewn across the highways, but no effective effort has been made to reorganize and exploit it. Household and commercial rubbish, street sweeping, building and demolition debris, hospital waste, and industrial waste are all collected in metropolitan areas. The amount of garbage produced by any metropolitan center varies according to population size, degree of industrialisation, and consumption pattern. Large-scale enterprises separate their garbage, whereas small-scale industries contribute waste to municipal rubbish. Likewise, hospital garbage is managed separately from normal waste. While being transported to the dump, it must be typically separated from common rubbish. However, in practice, this is quite rare. It is estimated that 40-70 percent of collected garbage is organic stuff. Composting might thus be considered resource recovery, with organic manure created and used in public parks, individual houses, and by farms. In addition, when compared to other developing countries in the South East Asia region, India has the largest per capita trash creation in large cities but the lowest in small cities. Recycling businesses offer significant prospects to the Indian economy. Furthermore, certain diminishing raw materials, such as wood pulp for paper or petroleum for plastics, could be created through an efficient waste management process. Recycled dry waste creates organic compost, which can be used to replace chemical fertilizers; this manure feeds the soil and enhances fertility.

According to **Shaw Annapurna (2005),** local political authorities and public society must be active partners in trash disposal. Because basic infrastructure and services are vital to health, urban governments have a significant impact on low-income households. It is obvious that NGOs cannot provide infrastructure services throughout the city. However, non-governmental organizations (NGOs) can prioritize healthcare, education, and revenue generation over environmental infrastructure services.

According to **Srinivasan (2006)**, municipal bodies in India are relinquishing direct responsibility in solid waste management. As a result, shifting toward public-private partnerships is a solution to their incapacity to adequately manage conservancy operations. The author focuses on private sector involvement in SWM, which provides effective solutions to Urban Local Bodies (ULB) in SWM. Community participation is the best solution to address the shortcomings of SWM and is the optimal paradigm for environmentally sustainable garbage disposal. In active governance, civil society activities are transforming the connection between people and the state. In SWM, civil society organizations outperform community-based organizations and NGOs. The failure of CBO projects is due to the voluntary nature of segregation and composting on a broad scale. There was no way to encourage the system on self-willed individuals. Another problem was that the CBO office bearers were community members with whom they had relationships, therefore some procedures, such as segregation or collecting membership fees, could result in awkward circumstances. The participation of private agencies in SWM in Chennai city appeared to have resulted in some good adjustments in terms of neighborhood cleanliness levels. It was also discovered that cleanliness levels were greater in higher-income neighborhoods. Cleanliness was maintained by private agencies in lower-income settlements. Indeed, it was pointed out that private organizations served well in lower income settlements as well as higher income areas. There was equity in private management organizations where garbage collection rates were imposed based on the income level of the people.

Jibril, Ibrahim, Dodo, and Suleiman (2012) looked into the need for a new, strong institutional and legal framework for the proper management of solid waste on Malaysian university campuses.

Schindler, Demaria, and Pandit (2012) say that there are different stages that link the formal and informal waste collection sectors. Taking the formal and informal systems apart makes it harder for waste workers to make a living. It also leads to more toxic emissions and ash from waste-to-energy plants. Due to privatization and the building of plants that turn trash into energy, collecting trash would become a competitive business.

Hodges (2013) says that the Tamil Nadu Pollution Control Board (TNPCB) is very important to the way waste management rules are put into place in Chennai. Because of the rules about biomedical waste, hospitals and clinics couldn't use it well. And what was done to keep medical waste from getting mixed up with other trash?

Hodges claims that (2013), The Tamil Nadu pollution control board's (TNPCB) rules on biomedical waste are very important to the way waste management rules are carried out in Chennai. Biomedical waste was a bad asset for hospitals and clinics because of the way it was regulated. And what was done to keep medical waste from getting mixed up with other trash?

Chatri and Aziz (2012) found that most of the trash picked up in India is biodegradable trash. And these biodegradable wastes have a wide range of uses, as the amount of recyclable non-biodegradable material went up from 13% to 27% between 1996 and 2005, while the amount of biodegradable waste went up from 42% to 48% at the same time. All of this shows that India has a huge chance to recycle and compost its municipal waste, as long as it becomes a habit to separate trash at its source.

People's Participation in Community Development

Mayo and Craig (1995) say that the word "participation" is a way to promote both sustainable development and development that puts people first.

Kahn and Bender (1985) say that each group member's participation in the traditional spirit of self-help is what leads to collective participation. Collective participation is a form of self-help that aims to bring about changes in the community as a whole.

Adams (1990) says that instead of collaborating and working together, people use campaigning and mild conflict. People work against the slow actions of the people in charge to get what they want and need. A key sign that a community is becoming more self-reliant is that people can take effective steps to take control of their own lives.

Self-directed participation has a higher level of participation than the other three types: leader-directed participation, joint-participation, and externally directed participation. Self-directed participation is similar to authentic participation in that people have more control over it. As Oakley says, participation is an important part of any activity (1989).

Household Waste Generation

According to Koushki, Alhumoud, and Al-Duaij (2004), the rate of trash creation is low in nations that have low incomes. This finding is supported by other research. The amount of garbage that is produced by each family in Kuwait City is 7.1 kg on average, with larger households producing more garbage than smaller ones. There is a correlation between a person's level of social and economic position, as well as their level of education and money, and the amount of waste that they produce. According to Abel, those who have higher incomes and higher levels of education also produce more waste (2007). According to Qu et al. (2009), the size of a household and the economic level of the home have no direct effect on the amount of garbage that is produced per person on a daily basis. And research shows that households with higher levels of education are less likely to produce a lot of waste. Workers in the Municipal Solid Waste Management Industry Face Dangerous Occupational Health Problems

Workers in the field of municipal solid waste management face dangers to their health as well as the possibility of being injured on the job. The workers' lives are in some way directly impacted by the emissions as well as the toxins that are included in the materials. The most significant dangers to public health are posed by discarded medical materials and toxic waste from manufacturing facilities. According to Cointreau-Levine S., all of these factors contribute to a significant number of health issues for them while they are at work (2006).

According to the findings of Tooher, Griffin, Shut, and Maddern (2005), municipal personnel who are exposed to waste are put in a number of dangerous situations. Because of the nature of their work, they deal with a wide range of health issues. Tetanus, the Hepatitis B virus (HBV), and the human immunodeficiency virus (HIV) are three of the most common diseases that can be spread by direct touch, as well as through water and the air. Utilizing innovative technologies for the management of waste, reducing the emissions of contaminants, modifying the ways in which people work, and donning protective gear are some of the ways in which the dangers can be reduced.

According to research done by Cointreau-Levine and colleagues in 1998, the vast majority of waste in underdeveloped nations is deposited by hand and stored in sealed containers. Therefore, workers are in constant and direct contact with the pollutant. In less developed countries, on the other hand, waste is collected in garbage cans fitted with covers and sealed plastic bags.

According to the findings of Athanasiou and colleagues (2010), employees who pick up trash using large weights experience significant joint discomfort, musculoskeletal problems of the neck, shoulders, and arms, as well as low back pain.

Workers in India's Municipal Solid Waste Management Sector Face Dangers to Their Occupational Health It has not been identified whether or not workers who deal with municipal solid rubbish pose a health risk as a result of their occupation. This is because it has not been determined whether or not garbage is hazardous to human health. There is essentially no data available on the health and accident implications in countries with high incomes, but there is no data at all in countries with low or intermediate incomes. India is a developing nation that does not do comprehensive study on issues relevant to health and accident scenarios, as stated by Porta, Milani, Lazzarino, and Forastiere. They claim that this is due to India's status as a developing nation (2009). According to Furedy (1990), the labor of collecting waste in Hyderabad is significantly influenced by gender considerations, in addition to social, economic, and environmental variables. Furthermore, Furedy states that these elements all play a role. He is likewise of the opinion that these many circumstances have an important impact. Women in the workforce are more prone to being injured by the hazards that they encounter on the job. Some of the workers have expressed dissatisfaction with the fact that they are not provided with the necessary protective gear and apparel to use. Women who participate in the labor force share a similar sense of discontent with the way things are currently. According to the findings of a report that was compiled by the State Planning Board of the Government of Kerala in 2008, the problem has worsened as a result of high consumption patterns, high levels of per capita solid waste generation, and a decrease in the amount of land that is available for waste management. All of these factors have contributed to a reduction in the amount of land that is available for waste management.

Solid Waste Management Challenges

In their 2007 work titled "Environmental Audit of Municipal Solid trash Management," Ramachandra and Bachamanda expressed their belief that municipal solid waste management is a significant problem as a direct result of the expansion of economic activities and the rate of urbanization. The government has taken the effort to find a solution to this problem that is both safe and hygienic. The audit reveals that only 49 percent of the existing bins are covered by the storage function; only 17.5 percent of the business areas have community bins for the collection of wastes; and 94 percent of door-to-door collection has been adopted in the residential regions. On the other hand, the rate of segregation at the moment of collecting is lower than three percent. The authors brought attention to the fact that the informal sector is responsible for the majority of garbage recycling activities. There is an urgent requirement for stringent monitoring of the garbage disposal. The precautions taken to protect workers' health and safety in the workplace fall short of expectations. Regular public awareness programs as well as training for those who will be working with the public are desperately needed.

According to Nuryani, Maas, Yuwono, Karibun, and Kusumo's point of view, the implementation of effective waste management is currently hampered by a number of challenges, including those that are economic, social, cultural, and technological in nature. These challenges have become restrictions (2003).

According to Jain (2007), urbanization directly leads to the development of trash, and the improper handling of waste causes health hazards and contributes to the degradation of the urban environment. Refuse from households, non-hazardous solid waste discarded by industrial, commercial, and institutional establishments, market waste, yard waste, and street sweepings are all considered to be examples of municipal solid waste (MSW), which is defined as waste that is collected by municipal authorities for the purpose of disposal. Market waste and yard waste are also included.

According to Rajput, Prasad, and Chopra (2009), the vast bulk of the wastes that are produced by a typical urban civilization are comprised of wastes such as garbage, hazardous wastes, rubbish (packaging materials), wastes from building and demolition, leaf litter, and so on.

According to Dimphal (2012), the growing rate of urbanization in India is going to present urban areas with a significant problem in terms of the management of solid garbage. The situation is only going to get worse in the years to come; it is projected that the quantity of waste generated in the year 2025 will be twice as much as the amount generated in the year 1997.

The waste that is produced in metropolitan areas of India is considerably different from the waste generated in other developed nations. In addition, biodegradable wastes account for the majority of India's manufacturing. According to the findings of a number of research, the amount of biodegradable garbage produced decreases as income levels increase. This, however, does not appear to be the case in India; during the same time period that saw an increase in the proportion of recyclable non-biodegradable material from 13 percent to 27 percent between 1996 and 2005, the same period also saw a simultaneous increase in the proportion of biodegradable waste from 42 percent to 48 percent, as Chatri and Aziz explain (2012).

Despite the fact that solid waste management requires a significant amount of labor, only two to three workers per thousand residents are assigned to provide services, and urban local bodies spend between seventy-five and two hundred rupees per person, each and every year. This is a pittance when compared to the magnitude of the problem, as Kumar and Gaikwad explain (2004).

The aviation industries are investigated by Pitt, Brown, and Smith with relation to their contribution to the generation of trash, which is thought to have adverse impacts on the environment (2002). Phillips, Read, Green, and Bates (1999) highlight the fact that one of the primary focuses of a waste strategy that is guided by the need for sustainable development is not simply how to get rid of the waste that is produced or even how to recycle it, but rather how to cut down on the amount of waste that is produced in the first place. This is one of the central focuses of a waste strategy that is guided by the need for sustainable development. Sreenivasan (2001) came to the conclusion that the production of trash by mankind is unavoidable, provided that the manipulation of the chemical environment does not persist.

The United Nations Environment Programme – Division of Technology, Industry and Economics (2006) has published an article on its website titled "Municipal Solid Waste Management." This article goes into great detail regarding waste reduction and materials recovery with sound practices for cities of developing countries. The paper provides an explanation of sound technical choices such as collection, transfer, and street sweeping, as well as the economic, institutional, and legal components of sound practices.

In the article "Solid Waste Management in Dhaka City," written by Islam (2006), the author emphasizes that the success of a community-based program is primarily dependent on identifying and addressing the needs of the community, and that the sustainability of the project is dependent on involving the community in the process of cost-recovery and cost-sharing. According to the author, non-governmental organizations have the potential to play a significant role in the dissemination of education, as well as the introduction of novel ideas, technologies, and information.

Weitz, Thorneloe, Nishtala, Yarkosky, and Zannes (2002) state that the management of trash is an essential component of municipal organizations. They underline that the criteria for garbage collection, recycling, transportation, and disposal all play a role in determining the required number of recycling bins.

According to Palnitkar (2002), non-liquid waste products that result from home, trade, commercial, agricultural, and industrial operations, as well as those that result from public services, are regarded to be examples of solid waste.

Agenda 21 was an action plan for the 1990s and well into the twenty-first century that was developed at the Earth Summit in Rio de Janeiro in 1992 (the United Nations Conference on

Environment and Development). Its purpose was to elaborate strategies and integrated programs to halt and reverse the effects of environmental degradation and to promote environmentally sound and sustainable development in all countries. UNCED (1992).

In the paper, Brugmann (1994) makes the observation of who can deliver sustainability. Reforming municipalities and mandating environmentally responsible development go hand in hand. The Earth Summit that took place in Rio in 1992 produced Agenda 21, which contained a plan of action for cities to improve both the quality of their urban infrastructure and their ability to be environmentally sustainable. Included in the recommendations are the institutionalization of a participatory approach as well as the improvement of the urban environment through the promotion of partnerships with social organizations for the purpose of increasing environmental awareness.

According to the findings that Ghassemi, A. (2002) published in the handbook of "Pollution control and waste minimization," the legal requirements of solid waste treatment are not so feasible to use at the user site. On the other hand, fewer complications arise when compared to air and water pollution. Singh and Balasubramanya (1977) note that when wastes are mixed together, it can cause a variety of problems. Before disposing of the segregation leads, it is important to understand its compatibility with other materials, such as how large acidic wastes can be utilized to neutralize waste with a high pH. According to research conducted by Sujauddin et al. (2008), the amount of garbage that is produced is proportional to the number of people living in a household, their degree of education, and their monthly income.

According to Ekere, Mugisha, and Drake, gender, the influence of peers, the amount of the household's land, the location of the household, and participation in an environmental group all have a role in how garbage is utilized and separated in households (2009). According to Hazra and Goel (2009), the transfer and transport practices are negatively impacted because of faulty bin collection systems, poor route planning, and a lack of knowledge about collection timings.

One good factor that contributes to the improvement of the system of waste management is support from local authorities. Both Zurbrügg et al. (2005) and Scheinberg et al. (2010) highlight that high rates of recovery charged being connected with tipping at the disposal locations. The value chain, as well as the beneficial reuse of garbage, is dependent on the high pricing of disposal. According to Gonzalez-Torre and Adenso-Diaz (2005), certain communities have evolved strong recycling habits due to social pressures, as well as altruistic and regulatory considerations. These aspects are discussed in connection to recycling. The proximity of the recycling bins to one another is another factor that plays into the pattern of waste disposal. The scientists also highlighted that individuals who make it a routine to regularly visit the bins for disposal are more likely to recycle at the domestic household level.

According to Minghua et al. (2009), governments need to promote the establishment of collections centers for recycled materials and raise the level of professionalism displayed by recycling centers and businesses in their waste management operations.

Several authors have pointed to additional problems that contribute to ineffective waste management, such as a lack of adequate financial support for recycling projects and the development of infrastructure. According to Nissim, Shohat, and Inbar (2005), Matete and Trois (2008), and Asase, Yanful, Mensah, Stanford, and Amponsah (2009), the lack of environmental control systems and evaluation of the real impact of waste management are the major factors affecting the environmental aspects of waste management in the economies of the majority of developing countries. These factors are also mentioned as being the major factors affecting the environmental aspects of waste management in developed countries.

Because of budgetary considerations, municipal governments have been unable to effectively manage solid waste. Sharholy Ahmad, Mahmood, and Trivedi are of the opinion that the involvement of the private sector is a factor that could improve the efficiency of the system. This belief is based on the fact that the huge expenditures required to provide the service and the improper use of economic instruments have hampered the delivery of proper waste management services. Additionally, the unwillingness of service recipients to pay for the service, coupled with limited resources and a lack of financial support, indicate that the involvement of the private sector is (2007). Vidanaarachchi, Yuen, and Pilapitiya (2006) make the observation that it is commonly believed that the duty and obligation of waste management is with the local authorities. As a result, the general population is not expected to contribute in any way. The effectiveness of waste management is directly proportional to the role played by municipal authorities as well as the participation of the general public. Contributions to the solution of the problem of waste management include socio-cultural factors such as people's engagement in decision-making, community awareness, and social apathy. The authors Guerrero, Mass, and Hogland (2013) discuss the difficulties associated with the management of solid waste in developing nations. The authors describe the reasons for this as an increase in the generation of garbage, a load on the budgets of the local authorities, and a lack of knowledge on the part of both the authorities and the general public.

Workers in the waste industry have poor motivation since their profession is associated with having a low social position. Management of solid waste is not given a high priority by the local leaders. in contrast to the activity of other municipal departments. In addition to this, Asase et al. are of the opinion that the individuals responsible for collecting rubbish do not have adequate training or skills (2009).

According to the findings of the research conducted by Thanth and Matsui (2013), the composition of municipal solid waste has a direct impact on the products and benefits offered by various waste treatment solutions. The utilization of incinerations, the expenses of investment and operation, and waste treatment all contribute to a reduction in the emission of greenhouse gases in the city of Vietnam.

City planners all around the world are working to find solutions to the challenging problem of managing municipal solid waste. According to Obirih-Opareh and Post, the challenges that emerging countries face may be broken down into three categories: urbanization, inadequate planning, and a deficiency in sufficient resources (2002). In their study, Buenrostro et al. (2001) incorporated the data that were gleaned by observing a representative sample of families as well as their patterns of trash production.

It has not been possible to conduct an effective analysis of the generation of municipal household garbage in developing countries. It has been calculated that the rate of household solid waste generation in Kathmandu city is 161.2 grams per capita per day (g/c/d). This indicates that there is a problem with the quality of in-household solid waste generation in general and in developing nations in particular. According to Dangi, Urynowicz, Gerow, and Thapa, the majority of the waste that is collected contains both organic and toxic materials (2008).

According to Khurshid et al. (2011), a direct factor that drives migration is the diminishing number of options for a sustainable existence in the low-paid agricultural sector. In addition, by the year 2021, it is anticipated that about half of the population will be residing in urban regions. The pattern of consumption is also one of the factors that is contributing to the rise in the quantity of garbage produced.

India generates approximately 1.5 lakh MT worth of waste every single day, with waste generation per inhabitant in cities ranging from 0.2 to 0.6 kilograms3 (MoUD, 2014).

For the first time, it was made abundantly clear in Article IV of the "Municipal Solid Waste Management Rules, 2000" that the private sector was encouraged to participate in the delivery of services. This prompted a number of players to investigate the possibility of developing profitable projects through PPPs. The participation of citizens, on the other hand, is not stated in the statute in an unambiguous manner. In addition, credible information on the extent of community participation in PPPs in SWM is not available in the public domain to the requisite degree in order to explain why this is the case. Zurbrugg, Drescher, Rytz, Sinha, and Enayetullah (2004).

Mohan, Sinha, and Lal (2016) investigate the engagement of private participation in the Imperial Tobacco Company of India Limited (ITC) in India. ITC is a market leader in the Indian paperboard and packaging business in addition to being one of the leading companies in the fast-moving consumer goods industry. ITC is well-known for its agribusiness and is recognized as the world's greenest luxury hotel network by the hospitality industry. It has adopted the "Triple Bottom Line" performance method, which means that it contributes to the country's economic, environmental, and social capital. This technique used by ITC has enabled them to achieve first place globally, with a favorable impact on carbon emissions, water quality, and the recycling of solid waste. Over six million people are able to make a living off of the company, the vast majority of them belong to more marginalized social groups in the country. In 2007, ITC launched a scheme called Wealth out of Waste (WOW). This program's goal is to promote recycling as a habit among homes, corporations, and other facilities so that trash can be reduced through more effective source separation. The existing program is currently being put into action in the cities of Hyderabad, Gurugram, and Coimbatore.

Suggestions for Solid Waste Management

A survey on household solid waste management with special reference to a Peri-Urban area (Kottawa) in Colombo was conducted by Warunasinghe and Yapa (2016), and they published their findings in the article A survey on household solid waste management with special reference to a Peri-Urban area (Kottawa) in Colombo. In the article, the authors came up with a few suggestions for effectively managing waste, including the fact that 28 percent of respondents believe What We Can Learn From Successful Projects

Chatri et al. (2012) investigated and evaluated the performance of the eight Service Level Benchmarks (SLBs) for SWM that were specified by the Ministry of Urban Development. They found that the SLBs performed around average (MoUD). The 28 ULBs performance showed that none of the benchmarks accomplished. but the benchmark for the redressal of complaints has just a small performance. Only 48 percent household covered, 17 percent of cost recovery accomplished, 32 percent of waste recovery vs the desirable standards of 80 percent . In the bench mark it was expected of 90 percent in the case of service charges collection from the households, however the performance is only 31 percent .

Zurbrugg, Drescher, Patel, and Sharatchandra (2004) investigated the "Municipal Solid Waste (Management & Handling) Rules, 2000" that were established by the Government of India. It placed the duty of waste management squarely on the shoulders of urban local bodies (ULBs). Despite the fact that the Act placed an emphasis on "recycling before disposal." It was discovered that 94% of the garbage that was collected was disposed of in an improper manner, which led to the contamination of both the surface water and the ground water as well as the air.

Despite the fact that solid waste management is labor intensive, the "Municipal Solid Waste (Management & Handling) Rules, 2000" stipulate that only two to three workers per one thousand residents are assigned to the task of providing services, and that ULBs spend an average of seventy-five to two hundred rupees per person, per year. It is the opinion of those that providing services related to the management of solid waste should take into account the possibility of forming partnerships with business and civil society organizations (Kumar & Gaikwad, 2004).

With the assistance of the non-governmental organization SWaCH and the participation of the informal waste collectors, also known as rag-pickers, the Pune Municipal Corporation (PMC) has implemented various methods and technologies of waste management. As a result, 56% of the waste is separated, and 80% of it is processed. The PMC has developed energy plants and composting units in various places of the municipality in conjunction with various private suppliers. In addition, the PMC has, through many conversations and deliberations, decreased the costs connected with the destruction of the environment. This is a model based on partnerships. People are encouraged to voluntarily pay service charges, which has resulted in a reduction in the burden of cess collection in PMC. This is significant because the collection of service charges is one of the most significant challenges faced by other municipalities in India, as discovered by PEARL. The Stree Mukti Sanghatana (SMS), a Mumbai-based non-governmental organization (NGO), which is covering 10000 households of Mumbai city by organizing 3,000 waste pickers, and the Exnora Green Pammal (EGP), a non-governmental organization (NGO), which has started a waste collection program in Pammal town of Kancheepuram district, Tamil Nadu, with informal waste pickers, are two other examples of civil society organizations that are assisting municipalities As a result of this, 994 MT of rubbish is collected from residences on a monthly basis. With the strong support of the ULBs, these two models have encouraged and enforced the collection of service fees as well as the obligation of households toward trash management (PEARL, 2015).

The Ahmedabad Municipal Corporation (AMC) has developed a comprehensive master plan for the city of Ahmedabad, and they've enlisted the help of several stakeholders in the process. The expansion of the human population and forecasts of the amount of waste produced have been given a lot of attention. The corporation is responsible for the development of public health bylaws, which include the establishment of standards and norms for SWM procedures. The first mobile court in India has been formed in the city of Ahmedabad to deal with cases involving violations of rules pertaining to health and sanitation (Urban Management Centre, 2012).

According to Susila, Anand, Elwin, and Sujatha (2018), the utilization of technology results in a reduction in the amount of time required as well as the amount of fuel consumed. This is due to the fact that the trucks visit just the specified bins that send messages to the driver. The implementation of technology makes cleaning a less laborious and time-consuming procedure by requiring fewer vehicles and reducing the amount of manual labor required. This is of immediate advantage to the administrative authorities since it lessens the burden of financial costs associated with people and gasoline. This ensures that the city continues to maintain its high standards of cleanliness and hygiene.

Suba et al. (2019) have proposed using a combination of sensors and Raspberry pi to perform real-time monitoring of the garbage level in garbage bins and detection of the level of the trash reaching the threshold value level. This would be accomplished by applying the monitoring system. This program would assist in informing the workers about the filling of the bins with rubbish and would help to detect any plastic bottles that might be present in the garbage cans. Using an image processing technology, the biodegradable wastes and the non-biodegradable wastes would be separated from one another. The smart bin application would help to decrease personnel and others. The state of the smart bins is going to be determined with the help of ultrasonic sensors, and the database is going to be updated at predetermined time intervals. The temperature sensor that was used was a DS18B20, and a pic cam was used to collect images of bottles and other types of plastics that were mixed together in the waste. Research Void Areas

a researcher who specializes in research made the observation that the recent public policies and the expenditure of money on research do not contribute to the solution of the problem of waste management. There is a need for very robust institutional arrangement, and the problems could be remedied by the decentralization of newly developed instrumentation.

b. According to the findings of a survey conducted by the government in the United States, the management of solid waste has been unsuccessful. The author is of the belief that the problem might be resolved, provided that every citizen raised his or her awareness of and concern for the community in which they live.

b. It is necessary to conduct research into the cost of disposing of solid waste at various phases, including production, handling, and disposal. According to the findings of the researcher, investigations into solid waste will stimulate the development of novel hypotheses regarding the generation and distribution of solid waste.

d. Wastes from hospitals need to be managed appropriately in order to avoid endangering the general population's health. The researcher made this observation during their work.

e. The vast majority of the publications that were examined focused on the waste management system; nevertheless, there is a requirement for research into the duty of civil society towards efficient waste management.

f. In the year 2000, the Municipality Solid Waste Management Rule was passed into law in India; however, it has not been adequately implemented. In light of the MSW Rule 2000, there is a pressing need for a shift in policy.

g.

The findings of the worldwide studies on trash management point to the necessity of developing locally tailored solutions for waste management. Cities in less industrialized countries are trying to improve garbage management by privatizing the process in an effort to keep up with the times. The engagement and cooperation of the public and the private sectors is essential at this juncture.

h.

It has come to light that several models from all over the world have been implemented for the management of municipal solid garbage.

i. There has not been any research conducted on the lifestyle choices and the health of the women who work in waste collection.

j. There have not been any studies conducted on the residential separation and collection of municipal solid trash, as well as the opinions and levels of awareness of people and workers.

Conclusion

The management of waste is the most pressing problem facing the majority of developing economies. As a consequence of this, the study researcher has realized that waste management has been performed since the very beginning of human history. The amount of waste produced concurrently expands at a dizzying rate alongside the rapidly expanding economy. As a result, there is a requirement for adequate technological adaptation in conjunction with the development of civic consciousness among the people living in the community and the active participation of the government. The research scholar has investigated the information that is available relating to the factors that are influencing the system by reading a variety of research articles that have been published on the subject of waste management in prestigious worldwide and national journals from 1966 to 2013. The vast majority of the publications that were examined focused on the waste management system. Despite this, further research is required to investigate the duty of civil society toward efficient garbage management. Although the Municipality Solid Waste Management Rule was passed into law in India in the year 2000, it has not yet been effectively implemented. In light of the MSW Rule 2000, there is a pressing need for a shift in policy.

Chapter 3

Solid Waste Management in Gurugram District

3.1 Introduction :

One of the richest states in India, Haryana has a land area of 44,212 km2 (17,070.3 sq. miles), making it one of the largest states in the country. On November 1st, 1966, it was formally established as a state under the Union of India. For administrative purposes, the state is broken up into four different divisions: the Ambala division, the Rohtak division, the Gurgaon division, and the Hisar division. The country is divided into 116 blocks, 21 districts, 47 sub-divisions, 67 tehsils, and 45 sub-tehsils. There are a total of 81 cities and towns as well as 6,759 villages in the state of Haryana. One of the districts that make up the Gurgaon division is called Gurgaon.

Because of its proximity to Delhi, the city of Gurugram, which is located in the state of Haryana and is included in the National Capital Region (NCR), has had significant population growth during the past ten years. It is said that the city of Gurugram was named after Dronacharya, a prominent guru (teacher) who appears in the Indian epic the Mahabharata. As a result of the land being handed to him as Gurudakshina by his followers, the Pandavas, it eventually became known as Guru-gram, which eventually evolved into Gurugram over the course of several centuries. The city is an exceptional example of a township where the state's desire to involve the private sector in urban development has been effective, and it serves as a model for other municipalities to follow. However, the government has not been able to keep up with the expansion that has been led by the private sector and has not been successful in developing first-rate civic infrastructure. The city already has more than 40 malls lining its skylines, and even more are in the planning stages, so it is well on its way to becoming known as the "mall capital" of India.

3.2 HISTORICAL BACKGROUND

Since the time of the Mahabharata, the district of Gurgaon has been inhabited by people. It is thought that the name of the district comes from Guru Dronacharya, who appears in the Indian epic known as The Mahabharata. Dronacharya was the instructor of both the Pandavas and the Kauravas. In Hindu mythology, the village is said to have been presented as a gift, or gurudakshina, to Guru Dronacharya by his students, the Pandavas. As a result, the village became known as Guru-gram, where guru refers to a teacher and gram refers to a village; however, over the course of time, the name evolved to become Gurgaon. Another possible explanation for the origin of the name Gurgaon is that it is a combination of the words "gur," which refers to a type of jaggery, and "gaon" (village).

During the time that Akbar was in power, the district was divided among the subas of Delhi, Rewari, SuharPahari, and Tijara. It remained in a troubled state as a consequence of fighting between surrounding chiefs when the Mughal Empire collapsed, and this continued until 1830 A.D., when the majority of it came under the sovereignty of the British by the treaty of Surji-Arjungaon with Sindhia. First to occupy the town was a cavalry detachment that was stationed there to keep an eye on the army of Begum Samru of Sirdhana. Their primary cantonment was in the village of Jharsa, which is located around 1.5 kilometers to the south-east of the town of Gurgaon.

The British divided the region into parganas, and several petty chiefs were awarded jagirs (land grants) in exchange for the military services they provided during the occupation of the region. These jagirs were eventually reinstated, at which point they were placed under the direct administration of the British. The most recent significant shift took occurred in the year 1836 A.D., following which the district did not undergo any other changes until the rebellion in 1857. In the year 1858 A.D., it was moved from the north western provinces to the Punjab. Gurgaon, Ferozpur Zhirka, Nuh, Palwal, and Rewari were the five tehsils that were established when the district was reorganized in the year 1861.

Since the turn of the 20th century, the demographic make-up of the Gurgaon district has seen a number of shifts, which can be summed up as follows:

During the years 1901 to 1911, there was not a single significant change.

Between the years 1911 and 1921, Ballabgarh was one of the three tehsils that made up the district of Delhi at the time. In the year 1912, a portion of this tehsil was relocated to the district of Gurgaon. Ballabhgarh was given its current status as the sixth tehsil in the Gurgaon district after its formation into its current form.

1921-1931 was another decade that saw no significant change take place.

1931–1941: The district of Gurgaon and the state of Uttar Pradesh had only minor changes as a result of the action of rivers (pertaining to rivers).

Between the years 1941 and 1951, nine of the district's villages, including Shahjahanpur, were moved from the district to the state of Rajasthan as part of the Provinces and States Order of 1950. However, the district gained territory as a result of the merger and transfer of

Pataudi State, as well as two villages from Rajasthan and seventy-eight other villages from The Patiala and East Punjab States Union (PEPSU).

Between the years 1951 and 1961, as well as between 1961 and 1971, the district's boundary remained unchanged in any way.

In 1972, the Rewari tehsil was moved from the Gurgaon district to the Mahendergarh district after being removed from that district.

In 1974, thirty-four different villages were removed from the Palwal tehsil.

The Gurgaon district was further divided on August 15, 1979, resulting in the formation of a new district called Faridabad. Within this new district, the tehsils of Gurgaon's Ballabgarh and Palwal were combined.

As a result, the Gurgaon district is made up of nine blocks, which are referred to as Tauru, Nuh, Pataudi, Nagina, Punhana, FerozpurZhirka, Sohna, Gurgaon, and Farrukh Nagar. These blocks were established on August 15, 1979.

2005: After splitting Gurgaon and Faridabad on April 4, 2005, Mewat was established as a separate district. This occurred exactly forty years after the establishment of the state of Haryana, which took place on November 1, 1966. There are six different blocks that make up the Mewat district: they are called Nuh, Taoru, Nagina, Ferozpur Jhirka, Punahana (from Gurgaon), and Hathin (Faridabad).

At the moment, the district of Gurgaon is made up of four blocks, which are called Gurgaon, Farrukh Nagar, Patuadi, and Sohna.

3.3 Location and Demographic Characteristics of the Study Area

On August 15, 1979, the district of Gurgaon that exists today was established, and it is made up of the four blocks of Pataudi, Sohna, Gurgaon, and Farrukhnagar. It is the district in Haryana that is the farthest to the south. The district lies between 27 degree 39' and 28 degree 32' 25" latitude, and 76 degree 39'30"and 77 degree 20' 45" longitude. It shares a border with the district of Rohtak and the union territory of Delhi to the north of its area. The Faridabad district is located to the east of it. The neighboring states of Uttar Pradesh and Rajasthan may be found along the district's southern border. The municipality of Rewari and the state of Rajasthan can be found to the west of it. The town of Gurgaon is located approximately 32 kilometers (km) from New Delhi, the capital city of India.

The ratio of area to density

Since the district of Gurgaon has had its borders constantly redefined and redrawn, the territory that falls under its jurisdiction has been subject to ongoing territorial shifts. In its current configuration, the Gurgaon district encompasses an area of 1254.62 square kilometers (not including Mewat). When Mewat is taken into account, the total area of the Gurgaon district increases to 2753.61 square kilometers, representing 2.84 percent of the total land area of the state of Haryana. Gurgaon District has a population density of 717 people per square kilometer, although the state of Haryana only has 478 people per square kilometer (for the year 2001)

Table 3.1 General features of Gurgaon district

Name of the Block	Geographical area
Gurgaon	34543
Farrukh Nagar	29681
Pataudi	27552
Sohna	33686
Entire district	125462

Source: DDA, Gurgaon

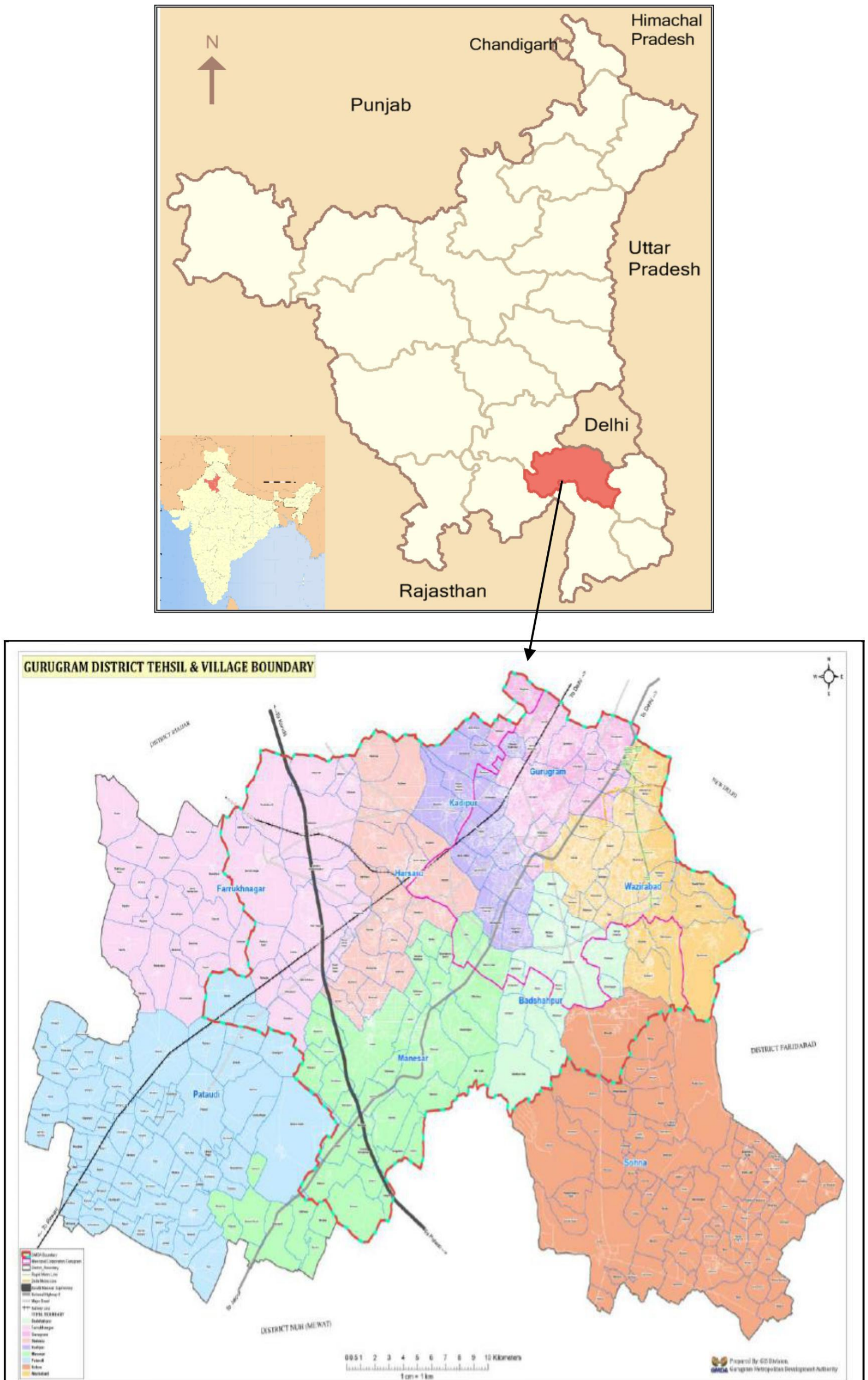
Administrative Division

The Deputy Commissioner acts as the Administration's Chief District Officer in their respective districts. A Sub-Divisional Magistrate who is in charge of a sub-division provides him with assistance. In addition to being the nodal person for Disaster Management in the District, the Additional Deputy Commissioner is in charge of the District Rural Development Agency, which is responsible for the overall development of the District. The District head of each development department is responsible for overseeing the sectoral development of their respective departments. The District has been broken up into the organizational structure of the District, which can be found depicted in table 3.2, in order to facilitate both a general and a developmental perspective.

Table 3.2: District Organizational Structure

Assembly Constituencies	Sub Division	Tehsil	Sub-Tehsil	Blocks	No. of Villages Tehsil - Sub Tehsil wise	Municipal Corporation/ Committee /Council
1. Gurugram 2. Pataudi 3. Badshapur 4. Sohna	1. Gurugram 2. Pataudi 3. Badshapur 4. Sohna	1.Gurugram 2.Manesar 3.Pataudi 4.Sohna 5. Farrukhnagar 6. Wazirabad	1. Garhi-harsaru 2.Kadipur 3.Badshapur	1. Gurugram 2. Pataudi 3. Sohna 4. Farrukhnagar	Tehsil- 1. Gurugram-14 2. Manesar- 39 3. Pataudi-68 4. Sohna-60 5. Farrukhnagar-40 6. Wazirabad-20 Sub Teshil- 1.Garhi harsaru-17 2.Kadipur-16 3 .Badshapur-17	1.Municipal Corporation, Gurugram 1.Municipal Council, Sohna 1.Municipal Committee Farrukhnagar 2.Municipal Committee, Haily Mandi 3.Municipal Committee, Pataudi

Source: District Revenue Office Gurugram



Source: GIS LAB, HARSAC, Gurugram

Map : 3.1 Study Area Gurugram District

Transport Network

Road Network : During 2010-11, total length of metallic roads in the district is 717 km. All villages in district are well connected with metallic roads; thus indicating 100% road connectivity for villages.

Table 3.3: Major Roads in Gurugram

National Highway	
1	NH-8
2	NH-236
State Highway	
1	Gurugram Sohna Nuh Alwar- SH 13
2	Jhajjar Farraqnagar Gurugram- SH 15 A
3	Gurugram Rewari Narnaul Singhana- SH 26
4	SH-28
State Expressway	
1	Delhi Gurugram Expressway (from Dhaula Kuan till Manesar)
Major District Roads	
1	MDR-13
2	MDR-131
3	MDR-132
4	MDR-133
5	MDR-135
6	MDR-136

Source: PWD (B&R), Gurugram

Rail Network

The overall length of the railway line in the district is 55 kilometers, and the district is home to 10 different train stations, including Gurugram, Sultanpur, Garhi Harsaru, Inchhapuri, Patuadi Road, Patli, Taj Nagar, and Basai Dhankot Railway Station, among others. In addition, the narrow gauge railway line that once connected Farukh Nagar and Garhi Harsaru has been replaced with a broad gauge railway line.

Metro Rail Network

In addition, there is an excellent connection between Gurugram city and the National Capital Region thanks to the metro train services. Because Gurugram is an IT hotspot in the Delhi/National Capital Region, a significant number of individuals commute to and from the city each day for work-related reasons. On June 21, 2010, the Delhi Metro Rail

Corporation (DMRC) began its operations to the Millennium City in order to facilitate travel that was free of hassles and to improve connectivity within Delhi and Gurugram. The Chhatarpur metro station on the yellow line of the DMRC provides a connection between Gurugram and Delhi. An elevated arrangement may be found along the entirety of the Chhatarpur-Gurugram road. The length of the yellow line, from beginning to end, is approximately 45 kilometers, and it is one of the busiest lines.

3.4 Physiography & Demography

The district of Gurugram is characterized by an undulating plain that is dotted by extensions of the Aravalli Mountains. The Aravali mountain ranges have an offshoot that runs across the western half of the district and continues further to the north-east, where it meets Delhi, the nation's capital. These craggy outcrops make up a portion of one of the nation's oldest mountain ranges. The hillocks are cut through by rivers that are fueled by rain. Gurugram Plain and Sohna Undulating Plain with Aravali Offshoots are two sub-parts that can be sub-divided into the district based on their respective topographic characteristics. The Gurugram Plain encompasses the entire territory of Pataudi tehsil as well as the northern and northwestern portions of Gurugram tehsil. The entirety of the region is made up of flatlands. The Sahibi Plain in the Rewari district is remarkably similar to the surrounding area. The Sohna Undulating Plain, which includes offshoots of the Aravali Mountains, spreads over a portion of the Gurugram tehsil. The entirety of the region is comprised of rocky terrain that originates from Aravali Offshoots. The result of these landforms is a succession of ridges with level tops. Only a small portion of the land is being used for agricultural purposes. The undulating topography of the region can be attributed to the offshoots of the Aravali hills. Because of the rocky sections, the inadequate soil cover, and the roughness of the surface, there is very little cultivation.

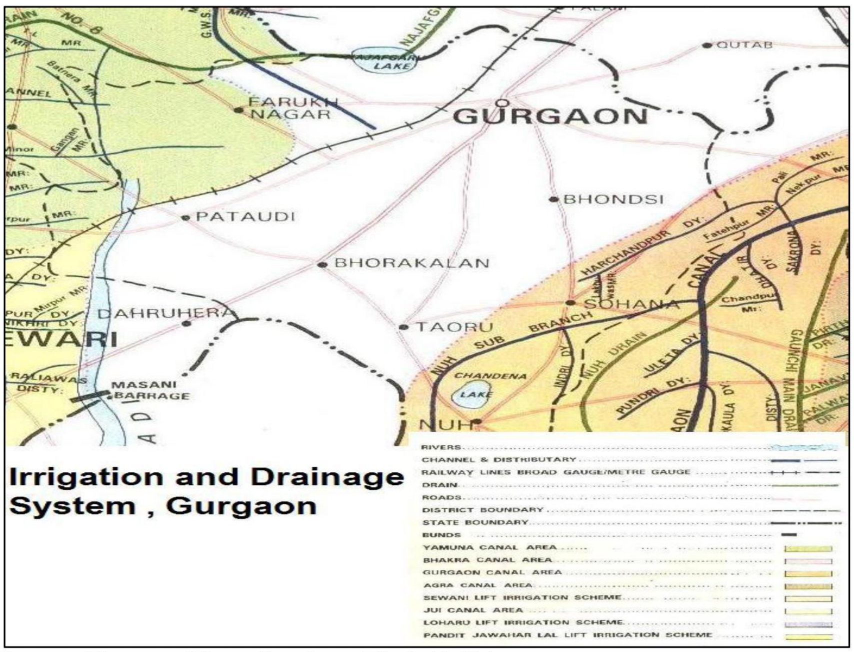
Topography

The height of the region, measured in meters above the level of the mean sea, ranges from 190 to 280. The geography of the area is both uneven and varied due to its combination of hills on the one hand and depressions on the other, creating an irregular character. Both the western and eastern boundaries of the district are formed by ridges: the western boundary is the Firojpur Jhirka-Delhi ridge, and the eastern boundary is the Delhi ridge. The Aravalli hills continue in this direction to the north with these hills. As a result of winds blowing from the south-west, the north-western portion of the area is dominated by sand dunes that are oriented in a westward direction.

Drainage Pattern

The drainage pattern of the District is characteristic of the arid and semi-arid regions in which it is located. It is made up of a number of significant depressions and streams. The majority of the streams have a tendency to converge towards inland depressions rather than flow into Yamuna, which contributes to the extraordinary complexity of the drainage. The significance of Najafgarh Lake as a depression in the level of the district in this region can not be overstated. Both the Sabi and the Indrori are significant seasonal streams that flow through the area.

Fig 3.1: Irrigation & Drainage System, Gurugram



Source: Yamuna Water Services, Circle Delhi

a. Natural Resources

Main Water bodies in Gurugram:

- **Damdama Lake, Gurugram:-**

  Nestled in the lap of the Aravali Hills, Damdama Lake is one of the best places to visit in Gurugram with family, friends or alone. This water body spreads across an area of 3000 acres, which makes it one of the largest lakes in Haryana. It was formed in 1947 as a result of the construction of a dam by the British for rainwater harvesting.

- **The Lost Lake, Gurugram:-**

  The Lost Lake, another one of the popular lakes in Gurugram, is a tranquil water body located in a secluded spot. A lovely jungle trail leads to this hidden gem. Surrounded by thorny trees, the lake makes for a wonderful destination for short picnics.

- **Sultanpur Lake, Gurugram:-**

When it comes to having a good time in Gurugram, visitors often recommend that they spend some time at Sultanpur Lake. It is situated inside the boundaries of Sultanpur National Park, which is home to about two hundred and fifty different kinds of avian life. This refuge is frequented by over a hundred different kinds of migrating birds over the winter months. This lake is a fantastic location for observing both of these beautiful bird species.

Availability of water resources

The present level of groundwater is 33.24 meters, which means it can supply nearly half of Gurugram's water requirements. The remaining water is Yamuna water that has traveled down canals and been treated at various water treatment plants. Daily water consumption in the city is estimated to be 184 million liters.

Forest coverage

The district include the forest ranges of Gurugram, Sohna, and Pataudi, all of which are supervised by respective Range Forest Officers. These ranges are administered as a part of the Gurugram Forest Division, which is overseen by the Deputy Conservator of Forests who is based in Gurugram. The district is part of South Forest Circle, and Gurugram is where the circle's headquarters are located. Before roughly the year 1930, the region lacked any woodlands whatsoever. It wasn't until after the country gained its independence that dedicated efforts to expand the amount of land under forest cover were made. In the year 1950, the Forest Department received ownership of all of the road strips. In a similar fashion, canals, railway strips, and flood protection bunds were all eventually converted into forest land after having previously been used for flood control. The amount of land that is covered by woods can be broken down into two categories: private and state. Private woods include both those that are owned by corporate entities and those that are owned privately by people. There are three classifications for the state forests: reserved, protected, and unclassified.

The majority of woodlands are either in private ownership or are managed by panchayats. These natural woodlands are home to a variety of plant and animal life, including species such as Khairi (Acacia Senegal), Dhouk (Anaogeisus pendula edgew), Dhak (Butea monosperma), Papri, (Holopetelea integrifolia planch) Rounj, (Acacia leucophloea) Inderjo, (Wrightiatincloria) Chamror (Erhe Both shisham and neem can be found growing in the plains and hillsides. Kikar is a plant that is native to the plains. Tannin may be extracted from the bark of this tree. Shisham, Neem, and Kikar are three trees that can be used to make important products, including timber, firewood, and agricultural equipment. The most recent trend in the growth of forestry is the planting of eucalyptus trees in plains, along roads and canals, and along the edges of agricultural areas. Firewood and pulp wood for the paper industry are both use for kit. The Forest Cover Index for 2019 reports that Gurugram has a forest cover of 9.2 percent of its total geographical area. Of this total, there are 33.7 square kilometers of fairly dense forest, 82.5 square kilometers of open forest, and 17 square kilometers of scrub land. In 2017, it was estimated that there were 83 square kilometers of open forest, 34 square kilometers of fairly dense forest, and 17 square kilometers of scrub.

Table No. 3.4

FOREST TYPES IN GURUGRAM DISTRICT, 2010-11

Sr. No.	Type of Forest	Area (Sq. Kms.)
1	Reserved Forests	2.2
2	Protected Forests	15.9
3	Unclassed Forests	0.2
4	Forests under section 38 of IFA, 1927	2.4
5	Forests under section 4&5 of LPA, 1900	68.3
Total Forest area 88.9		

Source: Haryana Forest Deptt. (Overview) Panchkula, 2011

Soil

The predominant soil type in Gurugram is loamy sand soil, which accounts for around 84.2 percent of the city's total geographical area and covers 101 thousand hectares. Alluvium can be broken down into its component parts: silt, sand, gravel, clay, and kankar.

Sand Dunes

The prevalent wind conditions in this region cause strong winds to carry sand and silt, which forms dunes, from the neighbouring region of Rajasthan to this area. In general, the heights of these sand dunes range from three to six meters, but they may be seen throughout the entire region. However, they are more noticeable in the region that is between Pataudi and Farukhnagar and Garhi Harsru. The sand in the dunes is typically very finely sorted and can range in grain size from very fine to medium. It is composed of quartz, ferromagnesian minerals, microscopic flakes of mica, and small particles of kankar. The sand is loose, and the dunes are constantly moving their places in response to the direction in which the wind is blowing.

3.5 Demography

Population

Table 3.5 presents the population of the district broken down per tehsil, along with the proportion of rural to urban residents for each category. Table 3.6 presents a number of additional features of population distribution, including the distribution of people living in urban and rural areas, the distribution of people according to gender, the population of people aged 0 to 6, and the literacy pattern among the population.

Table 3.5: Tehsil-wise Population

Tehsil	Rural	Urban	Total
Pataudi	78638	41342	119980
Gurugram	67299	909863	977162
Sohna	111674	53839	165513
Manesar	93148	23455	116603
F.Nagar	121326	13501	134827

Source: Census 2011 (P)

Table 3.6: Population Details of District

	Total	Male	Female
District Population	**15,14,085**	**81,7274**	**6,96,811**
Rural Population	4,72,085	2,51,520	2,20,565
Urban Population	10,42,000	5,65,754	4,76,246
0-6 Age Group Population	**1,98,299**	**1,08,591**	**89,708**
Rural Population	66,381	36,950	29,431
Urban Population	1,31,435	71,362	60,073
Literate Population	**11,11,042**	**6,39,969**	**4,71,073**
Rural Population	3,29,009	1,95,928	1,33,081
Urban Population	7,82,499	4,44,042	3,38,475

Source: Census 2011(P)

Population Growth and Density

The population of the district increased by 73.93 percent between the years 2001 and 2011, compared to the population increase of 44.64 percent between 1991 and 2001. The population of rural areas increased by 15.82 percent from 2001 to 2011, while the population of urban areas increased by 236.45 percent during the same time period. In 2011-12, the population density of the district was 749 per square kilometer, but in 2001-2002, it was just 626 per square kilometer.

Sex Ratio

The district has a sexual ratio of 853, but the ratio of sexually active children aged 0 to 6 is only 826. In metropolitan regions, the child-to-female ratio is 842, whereas the child-to-male ratio in rural areas is only 797.

Education

The Management Development Institute (MDI), the Institute of Technology and Management University (ITM University), the Indian Institute of Law, the State Bank Training Academy, the Fertilizer Development Institute, the Potash Research Institute, the Gurgaon Institute of Dental Sciences, Dronacharya College of Engineering, Apeejay College of Engineering, the Institute for International Management and Technology (IIMT), which is in collaboration with the Gurgaon Institute of Dental Sciences, and a number of other highly regarded educational institutions can In addition to these institutions for higher education, Gurgaon is also the location of a large number of boarding schools and day schools.

Table: 3.7
Educational facilities in Gurgaon district

Schools	Numbers
Primary Schools	432
Government Senior Secondary School	53
Government High School	58
Government Middle School	74

Source: www.Gurgaon.gov.in

The following table presents a comparison of the literacy rates of India, the state of Haryana, and the district of Gurgaon for the years 2001 and 2011. It is clear that the literacy rate in Gurgaon is significantly lower than the literacy rate for the state of Haryana in both the year 2001 and the year 2011. This is the case for both males and females in the population of Gurgaon.

Table 3.8 Literacy rate

Year	Region	Total	Male	Female	Rural	Urban
2001	Gurgaon	62.91	76.17	47.78	57.79	82.42
	Haryana	67.91	78.49	55.73	63.19	79.16
	India	64.84	75.26	53.67	58.74	79.92
2011	Gurgaon	84.4	90.3	77.6	81.10	85.94
	Haryana	76.64	85.4	66.8	72.74	83.83
	India	74.04	82.14	65.46	68.91	84.98

(Source: Census of India,2001, Administrative Atlas, www.education.nic.in, http://www.census2011.co.in/census/district/225-gurgaon.html)

Literacy rates by tehsil are presented in Table 3.8 for the whole population of Gurgaon district, as well as for males and females separately. Literacy rates for men are significantly higher across the board in all of Gurgaon's tehsils, regardless of whether one is looking at rural or urban areas of the city.

Table 3.9
Tehsil-wise literacy rate of Gurgaon district for 2001

Tehsil	Rural			Urban		
	Total	Males	Females	Total	Males	Females
Pataudi	74.45	87.73	60.11	74.55	83.82	64.28
Gurgaon	77.28	87.63	64.89	86.09	91.38	79.92
Sohna	69.61	83.35	53.98	75.22	84.53	64.72

(Source: Census of India,2001, Administrative Atlas)

The average literacy rate in the district is 84.40 percent, with the male population having a literacy rate of 90.30 percent and the female population having a literacy rate of 77.60 percent. The literacy rate of the rural population is 81.10 percent (males have a 91.31 percent literacy rate, and females have a 69.63 percent literacy rate), whereas the literacy rate of the urban population is 85.94 percent (male- 89.82 percent and female- 81.33 percent).

Land Use and Land Cover

Table 3.10: Land Use and Land Cover Pattern

Land Use/ Cover	Area (Ha)	Percentage
Built –up	22567.1326	18
Agriculture	85000	67.78
Forest	2381.55	1.90
Wasteland	15190	12.11
Water Bodies	199.3174	0.16
Others	62	0.05
Total	125400	100

Source: Department of Revenue & Disaster Management, Gurugram

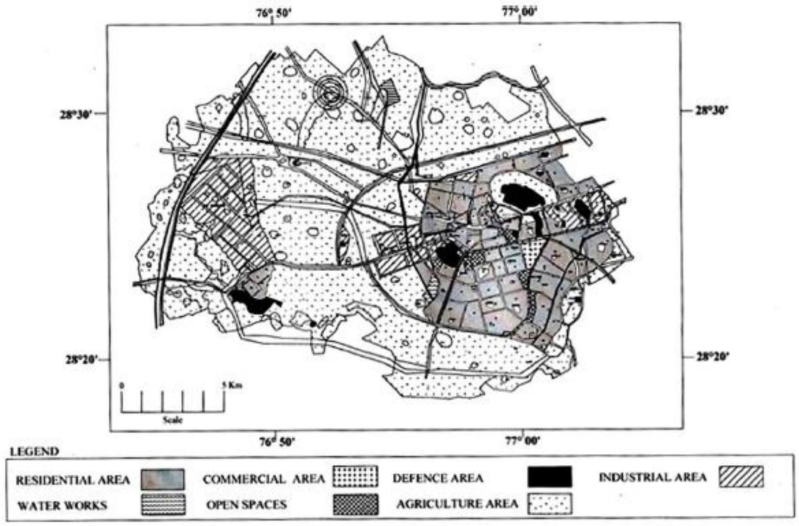


Fig. 3.2. Land use pattern in 2011 in Gurugram city.

Climate

The monsoon winds bring rain and humidity to the semitropical region that Gurugram is located in. The city experiences four distinct seasons: summer, winter, fall, and spring, with the monsoon season beginning at the end of summer. In addition, the city is subject to a fifth season: the monsoon. The data on the climate conditions that was obtained from the meteorological lookout station in Gurugram reveals that the mercury starts to rise at a consistent pace from the end of the month of February until the month of May. This trend continues until the end of the year. The months of May and June are the warmest months in Gurugram because the daily temperature can reach as high as 40 degrees Celsius on average, while the daily temperature can only drop to about 25 degrees Celsius on average. The average maximum temperature shifts as a result of the fact that the daylight hours during the month of May are even hotter than those during the month of June.

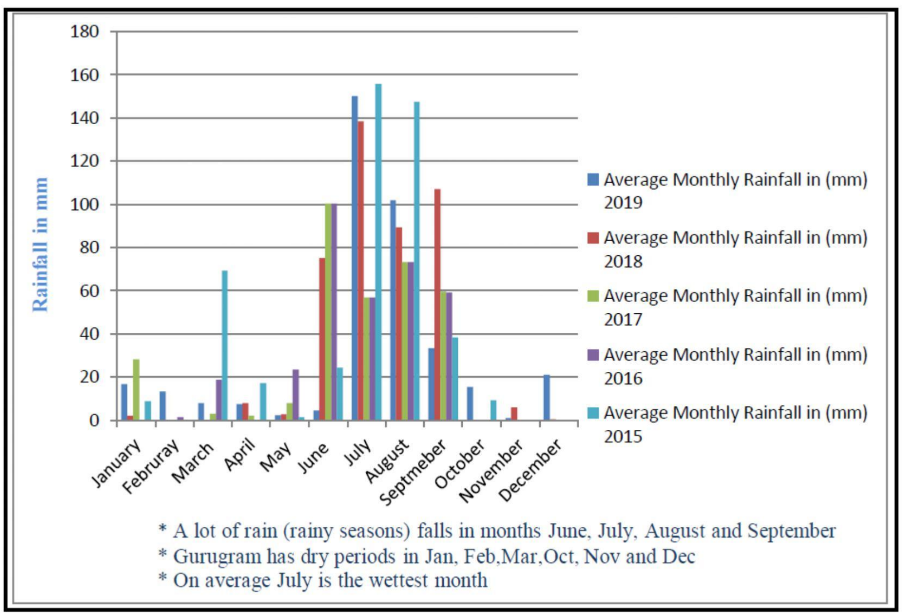
Temperature

During the months of May and June, the average daily maximum temperature is approximately 41 degrees Celsius. Temperatures in June might reach 45 degrees Celsius or even higher. The usual daily maximum temperature during the winter season in January is 21 degrees Celsius, while the minimum temperature is between 3 to 4 degrees Celsius. The months of May and June experience the highest average temperatures, while the month of January is the coldest.

Rainfall

The air is usually dry in the region, with the exception of the monsoon, the scorching summer, and the freezing winter. It should be noted that the average annual rainfall for the five years, i.e. 1995-99, 1996-2000, and 1997-2001, was 665.2, 628.4, and 560.1 mm respectively, and that it increases towards east. The monsoon season accounts for approximately 77% of the total yearly precipitation that is received in the district. In an average year, the rainfall in the Gurugram district comes to roughly 596 millimeters and is spread out over 28 days. The south-west monsoon typically begins in the final week of June and lasts until the end of September. It is responsible for around 85 percent of the total yearly precipitation. The months of July and August have the highest average rainfall. Thunderstorms and western disturbances are responsible for 15 percent of the yearly rainfall that falls during the months that are not associated with the monsoon season.

Graph. 3.1: Month wise Distribution of Rainfall (in MM) in District Gurugram



Source: Revenue & Disaster Management Department, Gurugram

Occupation

During the 2010-2011 fiscal year, there were around 135601 people registered in organized sectors. There are approximately 22704 people working in the public sector, and there are approximately 112897 people working in the private sector. There were approximately 6937 retail stores and 1182 commercial entities registered as housing a total of 123069 and 106344 individuals, respectively. There are also approximately 3661 persons employed in hotels and restaurants.

Industries

There are 10 significant accident hazard units in the Gurugram district. Additionally, the neighborhood is home to a number of factories and other production facilities. The municipality features an industrial model township (IMT) at Manesar on National Highway 8, which is home to a variety of companies including ready-made clothes, packaging, and vehicle manufacturing, among others. Udyog Vihar is an industrial estate in the district. It is situated on National Highway 8 and is home to a variety of enterprises, including electrical, pharmaceutical, auto parts and components, and readymade garments. In the year 2010, there were around 1712 factories registered in the district. The neighborhood is home to a diverse range of major industries, including those related to engineering, chemicals and pharmaceuticals, plastics, rubber, leather, textiles and garments, electronics, handlooms, and information technology, among others. Table 3.11 is a listing of the various industries that fall within these categories.

Table 3.11: Industries in Gurugram

Type of Industry	Name of Industries
Engineering	Maruti Udyog Limited, Hero Honda Motors Limited and their ancillaries, Delbhi, Denso, Atlas, Tubes, INCAL,Fuels
Chemical & Pharmaceuticals	Ranbaxy Laboratories, Dhanuka Pesticides, Morepen Laboratories, etc.
Plastic & Rubber	Machinp Plast, Enkey India, Cosco India etc.
Leather & Leather Products	Worldwide Leather, Oasis Leather etc.
Textile & Handloom	Terry Soft, Gupta Carpet Limited
Readymade Garments	DCM Benetoon, Pearl Global Limited, Orient, Craft Limited, GIVO, Dheer Global etc.
Food Processing & Agro Based	Prefetti India Limited, Babino Agro & Food Industries Limited
Electronics, Electrical & Telecommunication	Alcatel Network Systems Limited, Bharti Telecom Limited, Shyam Telecom Limited. HFCL, Kongsung, Durocell etc.
Information Technology	Motorola, Siemens, GE Capital, Hughes,IBM, TCS, HCL Technologies, Bectel, Tellabs, Silicongraphics etc.

Source: http://Gurugram.gov.in/hsidc.htm

ECONOMIC PROFILE

Gurgaon district has been around since the time of the Pandavas, but it wasn't until the liberalization of the Indian economy in the 1990s that its true potential was realized. This is despite the fact that Gurgaon has been around for so long. Since that time, the district of Gurgaon has seen an extraordinary amount of expansion across the board in terms of development, particularly in terms of urbanization and the formation of industrial development. Gurgaon district has experienced tremendous industrialisation and growth as a direct result of its advantageous location on the national highway that connects Delhi and Jaipur, as well as its closeness to the nation's capital city of Delhi and the Indira Gandhi international airport.

Table 3.12 Employment profile

Work Profile	Total	Rural	Urban	Male	Female
Total Worker	629658	51106	118598	41517	214481
Main worker	464644	35669	107947	35996	104677
Marginal Worker	165014	15436	10651	55210	109804
Total Non-Worker	1030631	78022	250406	47127	559357
Work Participation rate	37.9 %	39.6 %	32.1 %	46.8 %	27.7 %
Source: Census 2001					

The work profiles of workers in the Gurgaon district are presented in Table 3.11 below. In comparison to urban Gurgaon District, the rate of people actively participating in the labor force is significantly higher in rural Gurgaon District (39.6 percent) (32.1 percent). In addition, the rate of male employment participation is higher than the rate of female employment participation (46.8 percent) (27.7 percent).

The industrial sector and agricultural sector, both essential to the expansion of the economy, are discussed here.

Agriculture

Agriculture is by far the most important industry in the Gurgaon district. The soils of the region have a coarse texture, an alkaline chemical reaction, and a low phosphorus content. The use of underground water, which is typically brackish in composition, serves as the primary source of irrigation in the region. The urgent need for these waters has led to a subsequent increase in salinity and a solidification of the water. Irrigation of the uneven fields has become quite simple thanks to the implementation of spray irrigation systems, and the district as a whole has made great advancements in agricultural production as a result of these systems. The agricultural expansion of the region is capable of being pushed even farther if the farming system is diversified toward the production of fruits and vegetables and if inputs are managed in an effective manner.

Agricultural land use

During the 2006-2007 growing season, sowing took place on 78280 hectares of the total 125307-hectare land area that makes up the district. Only 2,600 hectares of land in the district are used for forested purposes, while 100 hectares are used for permanent pastures, and 39,724 hectares are used for non-agricultural purposes. The cropping intensity was measured at 154.3 percent as of March 2007, and it is possible to raise this number with more efficient use of water.

Crops of importance and types grown in the Gurgaon district

Rice and bajra are the two most important crops grown in the fields during the kharif season. Wheat and mustard are two of the most important crops harvested during the rabi season. The ber, aonla, guava, and bael are the horticultural crops that are most optimally adapted to the climatic and agricultural circumstances of the district. The district is also home to the cultivation of a variety of vegetable crops, including, but not limited to, cucurbits, okra, carrot, radish, cauliflower, chilli, brinjal, pea, leafy vegetables, tomato, onion, and others.

Culture

Culture can be defined as the traits and knowledge of a specific group of people. These qualities and knowledge might include things like language, religion, food, social behaviors, music, and the arts, among other things.

Language

The people of Meos speak Mewati, which is a subdialect of the Rajasthani language spoken in the region's north-eastern corner. Ahirwati, another sub-dialect of north-eastern Rajasthani, is spoken in the areas of the district that are predominantly inhabited by members of the Ahir tribe. On the other hand, Braj Bhasha, a dialect of the Hindi language, is spoken in the areas of the district that are inhabited by members of the Jat tribe. Both English and Hindi are utilized in their official capacities.

Food Practices The inhabitants of the district rely heavily on roti and pulses as their primary sources of nutrition (wheat, bajra, etc). People also have a strong preference for milk and goods manufactured from milk, such as curd, lassi, chass, and white butter made at home. Because of the high rate of urbanization, the more urban areas of the districts have a great deal of shopping malls and places to dine. Because of this, residents of the city of Gurugram enjoy both fast food and the various other types of cuisine (Chinese, South Indian, Punjabi, etc.) that can be found in these establishments.

Clothing Men typically dress in a long kurta and payjama, a shirt and pants, or a kurta-dhoti combination. Shirts and pants are also common. In many areas, the kurta-salwar suit is more common than the traditional sari and blouse that most women wear. During the colder months of the year, certain articles of apparel, such as sweaters, coats, shawls, and mufflers, are required to be worn.

Melas and other types of festivals

Holi, Janamashtami, Dussehra, Diwali, and Shivaratri are just some of the traditional Hindu holidays that are observed throughout the region. Some of the most significant fairs in India are hosted in the Gurugram region, including the mela Chhat Bhadon or Baldev Chhat and the mela Masani Mata or Sitla Mata ka mela. Aside from this, the city of Gurugram also hosts a large number of gatherings and celebrations around the time of Christmas and the New Year. The cultural traditions are undergoing a transition toward a more contemporary style as a result of the city's fast urbanization and its close proximity to Delhi.

3.5 Solid waste management (SWM) in Gurugram District

Solid waste can be defined as unwanted solid components that are produced by domestic units, commercial enterprises, trade centers, industries, agriculture, institutions, public services, and mining activities. The characteristics of garbage shift depending not just on the time of year but also on the location where it was created. The Central Public Health and Environmental Engineering Organization, which is the technical wing of the Ministry of Urban Development, has categorised solid waste into fourteen different categories based on the source, origin, and type of trash. These categories are as follows: Domestic waste, municipal waste, commercial waste, institutional waste, garbage, junk, ashes, bulky waste, street sweepings, dead animals, construction and demolition debris, industrial waste, hazardous waste, and sewage waste are some of the types of waste that fall under this category (CPHEEO, 2000).

The gathering, sorting, transportation, processing, and disposal of trash are the components that make up a solid waste management (SWM) system.

TABLE 3.13: Applicable Acts and rules for solid Waste management in India

National acts and rules for solid Waste management
Municipal Solid Waste (Management and Handling) Rules, 2000
The Bio-Medical Waste (Management and Handling) Rules, 1998
The Plastic Waste (Management and Handling) Rules, 2011
E-Waste (Management and Handling) Rules, 2011
Batteries (Management and Handling) Rules, 2001
The Environment (Protection) Act, 1986
EPA - Rule and Implementation Information for Standards of Performance For Municipal Waste Landills
EPA - Non-Hazardous Waste Regulations
EPA Municipal Solid Waste Landfill Regulations
The Water (Prevention and Control of Pollution) Act, 1974
The Water (Prevention and Control of Pollution) Rules,1975
The Water (Prevention and Control of Pollution) Cess Act, 1977
Water (Prevention and Control of Pollution) Cess Rules, 1978
The Air (Prevention and Control of Pollution) Act, 1981
The Public Liability Insurance Act, 1991
The National Environment Tribunal Act, 1995
The National Environment Appellate Authority Act, 1997

Source: (Centre of Environment and Development, 2012)

The 2016 Solid Waste Management Rules have been formally notified by the Ministry of Environment, Forest, and Climate Change of the Government of India. According to Rule 15 of the Solid Waste Management Rules, 2016, the role of local bodies has been specified. Furthermore, according to Rule 16 of the aforementioned Rules, the HSPCB shall implement these Rules through local bodies. The Honorable National Green Tribunal had issued several orders in relation to the effective implementation of the Solid Waste Management Rules, 2016, and on December 22nd, 2016, the Principal Bench of the Honorable National Green Tribunal issued a judgment in Original Application No. 199 of 2014 filed by Mrs. Almitra Patel in relation to solid waste management. In addition, the Honorable National Green Tribunal had, in its decisions dated August 31, 2018, formed an Apex Committee, a Regional Committee, and a State Committee in order to ensure the successful execution of the aforementioned Rules. In addition, a District Level Monitoring Committee (DLMC) has been established in Haryana in accordance with an order from the Honorable National Green Tribunal dated: 16.01.2019 in O.A. No. 606/2018.

In cities and towns across India, the general public, local authorities, and business groups are becoming increasingly concerned about the management of municipal solid garbage.

This worry is on the rise. The problem is getting worse in metropolitan areas as a result of quick leaps in population expansion, which is linked with rapid strides in economic growth, which encourages the consumption of goods and, as a result, the generation of garbage. The government of India has launched a number of programs in an effort to enhance the current procedures for the management of solid waste in the country by utilizing new technology.

The Government of India's Ministry of Environment, Forest, and Climate Change (MoEF&CC) has issued Solid Wastes Management Rules, 2016 (SWM rules, 2016) for the purpose of ensuring the waste is managed in a manner that is both sustainable and scientific. These rules mandate the separation of waste at its point of origin in order to facilitate "cleaner composting," "recycling, reuses and reduce," and the final disposal of inerts in SLF. This Solid Garbage Management Rule, 2016 makes it mandatory for urban local bodies, including municipal authorities, to limit the types of waste that can be buried in landfills to non-biodegradable inert waste and other wastes that cannot be recycled or put through biological processing. Keeping this in mind, the guidelines also make it illegal to dispose of the part of the waste that is biodegradable in landfills.

One of the Indian cities with the most rapid population growth is Gurugram. Residents of the city face a significant increase in the risks to their health and sanitation as a result of the city's rapid growth and increased population as a result of increased residence. As a result, proper waste management is of the utmost significance.

Since the beginning of the twenty-first century, proper management of solid waste has been a subject of significant importance. Even Nevertheless, the existing waste management systems are failing under the stresses brought on primarily by unchecked urbanization. The approaches to waste management that have been implemented in industrialized countries have either very limited relevance or none at all for the local characteristics that exist in developing countries, particularly in India. The quantity of municipal solid waste that is produced in Haryana has also significantly increased as a result of the recent population boom there. The current state of waste management is marked by a number of issues, the most prominent of which are open dumping, burning, low collection coverage, irregular collection services, low collection coverage, low collection coverage, open dumping, and the management and control of informal waste picking or scavenging activities. An integral part of integrated waste management is the establishment of a system that allows for the secure and dependable disposal of solid waste over the long term. The primary goal is to lessen the amount of solid trash that is produced in such large quantities in the Gurgaon Faridabad Cluster as well as the health problems that are associated with it.

In the Indian state of Haryana, the city of Gurgaon may be found within the National Capital Region of New Delhi. It has a total land area of 1258 square kilometers. According to the census completed in 2011, its total population was 0.88 million. Within the Municipal Corporation of Gurgaon, there are a total of 35 wards and 4 zones. The following is a list of the wards that fall under each of the 4 zones:

- Zone 1: Ward no 8, 12, 19, 21, 22, 23, 24, 11, 20
- Zone 2: Ward no 1, 3, 4, 5, 6, 13, 14, 15, 16, 17, 18, 2, 7,9,10
- Zone 3: Ward no 29, 31, 32, 34, 35, 33
- Zone 4: Ward no 25, 26, 27, 28, 30

In this regard, the Municipal Corporation of Gurgaon, which is the designated ULB for the Gurgaon Faridabad cluster, has the intention of obtaining environmental clearance from the Ministry of Environment, Forest, and Climate Change for the expansion of the Integrated Municipal Solid Waste Management Facility (IMSWM Facility) along with the waste to energy plant from 15MW to 25MW for the Gurgaon and Faridabad ULB's at Bandhwari village, which is located in the Gurgaon district

TABLE- 3.14 EXPECTED WASTE GENERATION DETAILS OF GURUGRAM

SN.	ULB	Population projection for 2015	Waste Generation in 2015 (TPD)	Population projection for 2025	Waste Generation in 2025 (TPD)	Population projection for 2035	Waste Generation in 2035 (TPD)
1.	Gurugram	997785	449	1340940	603	1802111	810

Source Segregation

Waste shall be segregated by waste generators into two fractions – wet fraction (green container) and dry fraction (blue container). The details of the waste to be dumped are provided in Table no. 3.15.

TABLE 3.15: WASTE BIN FOR SOURCE SEGREGATION OF WASTE

Wet Waste (Green Bin)	Dry Waste (Blue bin)
Food wastes of all kinds, cooked and uncooked, including eggshells and bones, flower and fruit wastes including juice peels and house plant wastes, soiled tissues, food wrappers, paper towels	Paper, cardboard and cartons, Containers and packaging of all kinds, excluding those containing hazardous material, compound packaging of all kind, Rags, rubber, wood, discarded clothing, furniture, Metals, glass (all kinds), Inert, house sweeping,

Primary Collection

Primary collection refers to the process of collecting waste from households, markets, institutions and other commercial establishments and taking the waste to a storage depot/ transfer station. Primary collection may be accomplished through the use of containerized push carts/tri-cycles, small mechanized vehicles, compactors and/or tipping vehicles.

Figure 3.3: Collection and Disposal of Solid waste

For Gurgaon Faridabad Cluster, a combination of tricycles and light commercial vehicles with hydraulic tipping containers is proposed.

FIGURE- 3.4 VEHICLES & EQUIPMENT TO BE USE FOR COLLECTION & TRANSPORTATION ACTIVITY

Mini Tipper

Portable

Refuse Compactor

Hook Loaders

Secondary Storage

Bins with capacities of 1.1 cum, 3 cum, and 4.5 cum are used in the existing waste management system in both Gurgaon ULB and Faridabad ULB. Given the current state of affairs, it is possible to suggest that bins with these capacities be placed in appropriate locations, as designated by the respective ULBs.

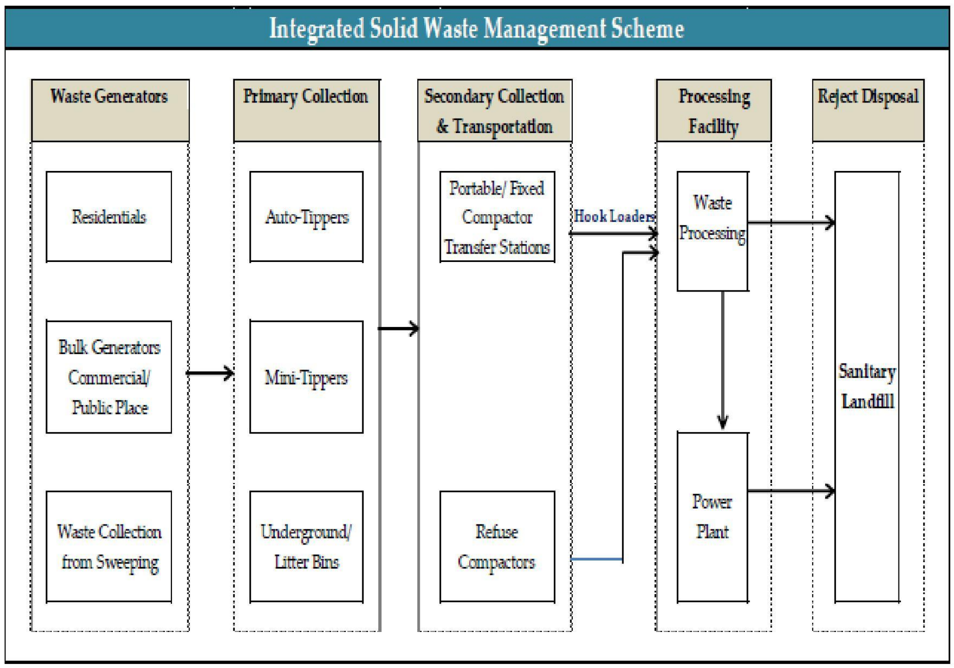


Figure 3.5 Integrated Solid Waste Management Scheme

The following design parameters were taken into consideration during the development of this concept, which was done so with an eye toward a design span of 20 years:

• Adherence to the Solid Trash Management Rules of 2016 in regards to the collection, transportation, treatment, and disposal of waste

• Offering collection of garbage at the source, from door to door, in a separated manner through the implementation of a two-bin system (for wet waste and dry waste).

• The implementation of a secondary trash collection and transportation system that is both effective and efficient.

• Implementing the waste reduction strategy known as the "4Rs," which consists of reducing, reusing, recycling, and recovering waste products. As a result, a system was designed for the recovery of recyclables at the Processing facility and for the reuse of trash through composting of waste food and other waste green waste.

• Final disposal in the scientifically constructed sanitary landfill of only rejects and inerts, with an endeavor to dispose of no more than 15–20 percent of the total quantity of trash generated at the landfill.

The current situation in regard to the management of solid waste

One of the Indian cities with the most rapid population growth is Gurugram. Residents of the city face a significant increase in the risks to their health and sanitation as a result of the city's rapid growth and increased population as a result of increased residence. It produces 1,350 metric tons per day of rubbish that is considered to be municipal solid waste. The Municipal Corporation of Gurugram, also known as MCG, is the highest authority in the city when it comes to the planning and management of trash. In terms of its functional responsibility, the MCG is solely accountable for the garbage that is produced inside the confines of its municipal territory. Existing land in Bandhwari hamlet on the Gurugram–Faridabad Road is going to be used for the Waste to Energy Plant that is going to be built there. The Bandhwari Water Treatment Plant site encompasses around 30 acres of land. The State of Haryana, MCG, and MCF have all joined together to form a Concession.

On August 14, 2017, an agreement was reached with M/s Ecogreen Energy Gurugram, Faridabad Private Limited for integrated solid waste management in the Faridabad and Gurugram cluster. The Ministry of Environment, Forest and Climate Change (MoEF&CC) has given environmental clearance for the Bandhwari dump site as of the 01.11.2019. M/s Ecogreen has submitted a new application to the MoEF&CC, requesting that the capacity of the waste-to-energy facility be increased from 15 MW to 25 MW. On the Bandhwari dump site, legacy garbage is now being treated (bio mined) in accordance with the direction given by the Honorable National Green Tribunal of New Delhi in OA 514/2018. In order to accomplish this, tens of thousands of metric tons (MT) of garbage have been processed into distinct fractions of RDF, compost, and inert.

The following are some of the most important issues with solid waste management: Resources, systems, and capability for the development of solid waste treatment and disposal.

Expenses for both capital expenditures and operations and maintenance, but not comparable or matching revenues

Education on the significance of implementing sustainable waste management techniques, particularly with regard to garbage sorting.

a policy framework for operationalizing public-private partnerships (PPPs) in municipal solid waste management and contract competence

The phenomenon known as "Not in my backyard," land acquisition is a major difficulty in solid waste management projects and is a major cause of delay, particularly in processing and landfill facilities.

Expertise in the relevant technologies and institutional frameworks.

Principles Directing the Implementation of the SWM Strategy

The establishment of a working framework, in addition to the defining of the roles and responsibilities held by the many stakeholders.

• Place a greater emphasis on civic involvement by encouraging participation in the process of awareness generation from nongovernmental organizations (NGOs), women's community groups, ward committees/sabhas, area sabhas, and so on.

Strategy for Solid Waste Management Establishing an Institutional Mechanism at the State Level to Support Planning, Technical, Financial, and Implementation Promoting PPP (Public-Private Partnership) Investments for Developing Treatment and Final Disposal Facilities at the Regional Level Using a Cluster-Based Approach

Operations Concerning Waste in Gurugram

One of the Indian cities with the most rapid population growth is Gurugram. Residents of the city face a significant increase in the risks to their health and sanitation as a result of the city's rapid growth and increased population as a result of increased residence. It produces 1,350 metric tons per day of rubbish that is considered to be municipal solid waste. The Municipal Corporation of Gurugram, also known as MCG, is the highest authority in the city when it comes to the planning and management of trash. In terms of its functional responsibility, the MCG is solely accountable for the garbage that is produced inside the confines of its municipal territory. Existing land in Bandhwari hamlet on the Gurugram–Faridabad Road is going to be used for the Waste to Energy Plant that is going to be built there. The Bandhwari Water Treatment Plant site encompasses around 30 acres of land. The State of Haryana, MCG, and MCF have all joined together to form a Concession.

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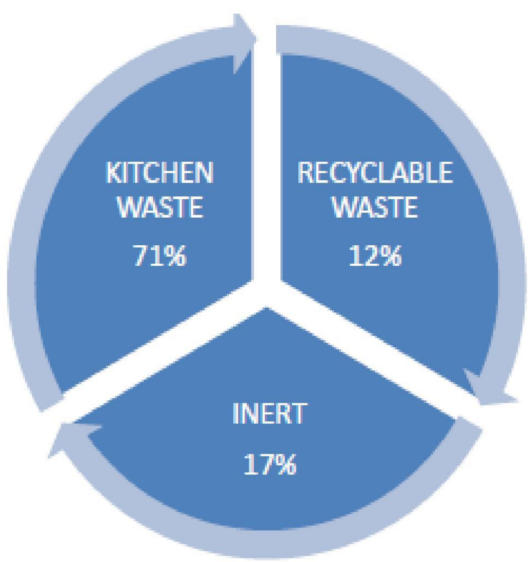
Table No. 3.16 Waste Generation in Gurugram district

Sr. No.	Zones in Gurugram	Waste generated
1.	Zone I & II Khekri Dhaula Toll to Old Railway Road on left (Zone I) and right (Zone II). Zones I and II comprising 122 colonies. The door-to-door collection is being currently undertaken by one contractor while street sweeping is being undertaken by multiple contractors.	370 TPD (Zone 1) 230 TPD (Zone 2)
2.	Zone III (Star Mall, Sector 31 towards Delhi upto MCG limits)	310 TPD
3.	Zone IV (Star Mall, 31 towards Jaipur uptoKherki Dhaula Toll Tax)	190 TPD

Source: Municipal Corporation, Gurugram

Figure No. 3.6 CHARACTERISATION OF WASTE IN GURUGRAM



Source: Municipal Corporation, Gurugram

In addition to MCG, multiple agencies, such as the Haryana Urban Development

Authority (HUDA) and the Haryana State Industrial and Infrastructure Development Corporation (HSIIDC), as well as private colonizers like DLF and Unitech, are responsible for the operational management of the solid waste sector. MCG has, over the course of the past year, taken over the majority of the HUDA sectors' responsibility for waste collection and disposal. As a matter of fact, 55 percent of rubbish is collected from places in Old Gurugram that are managed by MCG, while 25 percent of waste is collected from HUDA sectors 1 to 57. The remaining portion comes from the private colonies located in the Udyog Vihar sector 37, such as DLF and HSIIDC region. Any plan for solid waste management (SWM) will involve collecting and storing garbage at its point of origin, transporting waste to facilities for treatment or processing, treating waste with an eye toward possible resource recovery, and finally disposing of collected waste. Up until recently, waste processing and the correct disposal of garbage at its final destination did not receive a lot of attention in Gurugram. This is especially true for the waste that comes from municipalities (MSW). The majority of the available funds are spent not on the treatment or processing of municipal solid waste or on its secure disposal at the end of its life, but rather on its collection, transportation, and final dumping on land. Recently, there has been a lot of focus placed on the correct processing of solid waste in order to recover materials and safely dispose of those materials. When garbage is treated in an appropriate manner, the load that is placed on landfills is significantly reduced. The majority of waste management activities in Gurugram include contracting with private companies for tasks like garbage collection and cleaning the streets. Through the use of service contracts, the authorities delegate work responsibilities to contracting agencies. At the time that a contract is about to expire, tenders are put out for consideration. The vast majority of the collection process for trash is done by hand (recently, mechanical sweeping has been introduced for main roads and markets). At the transfer stations, the people who collect recyclables also perform an unofficial but significant amount of rubbish sorting. Community bins, waste containers, and dumper placer containers are the three distinct varieties of transit points that are now in use. Large dumpers collect the debris from these locations and transport it to the Bandhwari solid waste treatment plant as well as the landfill site. At the Bandhwari landfill site, the solid waste processing plant is now inoperable due to maintenance issues. A portion of the garbage is generally thrown on the sides of the roads and in vacant plots or fields as well. Only a very minute fraction of garbage is actually processed and recycled. Brooms, rubbish bins, wheelbarrows, tricycles, refuse collectors, dumper trucks, tractors, earth mover machines, manually pulled rickshaws, and sanitation employees are all components of the waste management system. On October 2, 2017, as part of the Swachh Bharat project, the Ministry of Consumer Goods released a mobile application called "Swachh Map" for sanitation. At the moment, applications such as Swachh Haryana App, Swachhta App, and Sameer Portal, amongst others, are being utilized for the purpose of resolving concerns lodged by citizens in a timely manner.

(i) Solid Waste Management

Sr. No.	Urban Local bodies	No. of Wards	No. of Households	Population	Solid Waste Generated per day
1	Municipal Corporation, Gurugram	35	421032	Approx. 1925000	Approx. 1350 TPD
	Municipal Corporation, Manesar	7 ZONE	Approx 125000	Approx. 350000	Approx 250 TPD
2	MC, Farukhnagar	13	6925	17065	10 TPD
	MC, Haily Mandi	15	7060	22498	10.25 TPD
	MC, Pataudi MC, Sohna	15 21	4591 13471	22856 59719	8.0 TPD 60 TPD
3	Nagar Panchayats (Town area Councils)	NA			

a. Current status related to solid Waste management

Sr. No.	Local Bodies	No of Village panchayats / Blocks	No. of Households	Population	Solid Waste Generated per day
1	MC, Farukhnagar	13	6925	1706	10 TPD
	MC, Haily Mandi	15	7060	2249	10.25 TPD
	MC, Pataudi MC, Sohna	15 21	4591 13471	2285 6	8.0 TPD 60 TPD
2	Village/Gram Panchayats	166	1,13,91	33446	71Mt/day

A. Status of Bandhwari landfill site:- A drone survey was carried out on April 3, 2021, and the results make it abundantly evident that the height of the dumpsite has been lowered from 40 meters to 36 meters in recent times. On the map of the landfill site, the reclaimed land takes up an additional area that is approximately 2.1 acres in size. In addition, by the end of the following quarter, additional cycles of bioremediation will have been finished. Additionally, it is anticipated that the height of the trash will be reduced even further, and this process will be followed continually.

B. Status of Waste to Energy (WTE) Plant- The Ministry of Environment, Forestry, and Climate Change has given their approval for the establishment of an integrated WTE facility. The Haryana State Pollution Control Board has also granted consent to establish (CTE) in order to move forward with the development of a 15 MW Waste to Energy (WTE) Plant in the Bandhwari neighborhood of Gurugram. The process of treating waste left behind from previous generations will go concurrently. It is anticipated that the building of the WTE plant would be finished by the month of October in 2023. Concessionaire has already put their signature on the Power Purchase Agreement, and it has been delivered to the Haryana Power Purchase Centre (HPPC). The accumulation of legacy and fresh trash will no longer be a concern after building of the WTE has been finished. This will allow for the processing of MSW at a rate of up to 2500 TPD.

Precautionary measures taken to prevent ground water contamination and leachate treatments:-

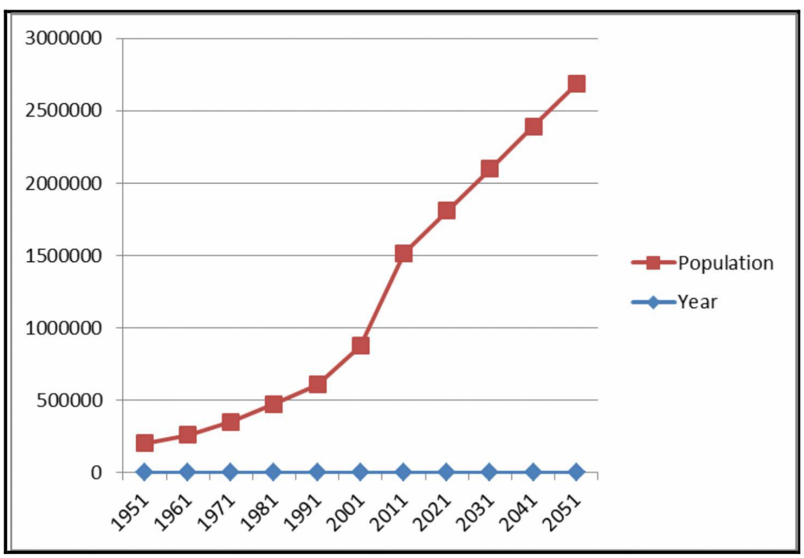
The MCG has taken the necessary steps to collect all of the leachate that has been produced as a result of the laying of perforated pipe grids and the construction of leachate ponds that are lined with geotextile and HDPE liner for the purpose of water proofing. The leachate that has been held is first processed in leachate treatment plants, and then it is delivered to the Behrampur STP for the disposal process to be completed. Treatment of leachate is now being done at a capacity of 550 KLD in three DTRO facilities, as well as one Dissolved Air Flotation (DAF)-based treatment plant.

As a result of the city's rapid population growth over the past decade, the amount of solid trash it produces has increased by a factor of two. According to the non-governmental group Gurgaon First, the amount of solid garbage that is produced in Gurugram on a daily basis is 650 metric tons (MT). A day's worth of garbage produced by a family of four weighs slightly more than 2 kilograms. To until point, the city's waste management strategy has consisted of a centralized method. Over ninety percent of the waste that is in a mixed state is taken to the landfill located in Bandhwari. As a result of the malfunctioning treatment facility at Bandhwari, the trash pile has developed into a hazard both to management and to public health. Contractors with active service contracts with the authorities are responsible for the collection and disposal of waste in the Bandhwari area. The main authority for garbage management in Gurugram is Municipal Corporation Gurugram, which is also responsible for dividing the city into its four zones. It has a total of 3,648 sanitary personnel on staff, including both permanent and temporary employees.

Since the beginning of the 21st century, Gurgaon's population has been quickly expanding. In the year 2000, the city has a lot of undeveloped areas, green spaces (agricultural lands), and waterbodies where water may easily infiltrate; however, as the years passed, the city continued to grow, depleting natural drainages lines and lakes. The current population estimate of Gurgaon, which takes into account urban areas, the existing town, and 17 villages that are surrounded by existing urban. The population is expanding at a pace of 5 percent per year as a direct result of people moving to the city in pursuit of employment opportunities. The Arithmetic Projection method is used to provide predictions for the population of Gurgaon for the years 2021, 2031, 2041, and 2051. (according to census 2011). As a result of the new developments in the area, the local population will begin to increase, which will, in turn, have a beneficial effect on both the area's physical and social infrastructure.

Table 3.17 Population Projection of Gurugram (1951-2051)

Year	Population	Increment	Annual Growth Rate
1951	201727		
1961	259655	57928	3%
1971	348151	88496	3%
1981	471695	123544	4%
1991	606791	135096	3%
2001	874695	267904	4%
2011	1514432	639737	7%
		2,91,570	5%
Population Projection	AP	GP	Incremental increase
2021	18,06,002	21,59,016	19,78,067
2031	20,97,573	30,77,954	26,13,766
2041	23,89,143	43,88,017	34,21,529
2051	26,80,713	62,55,679	44,01,356

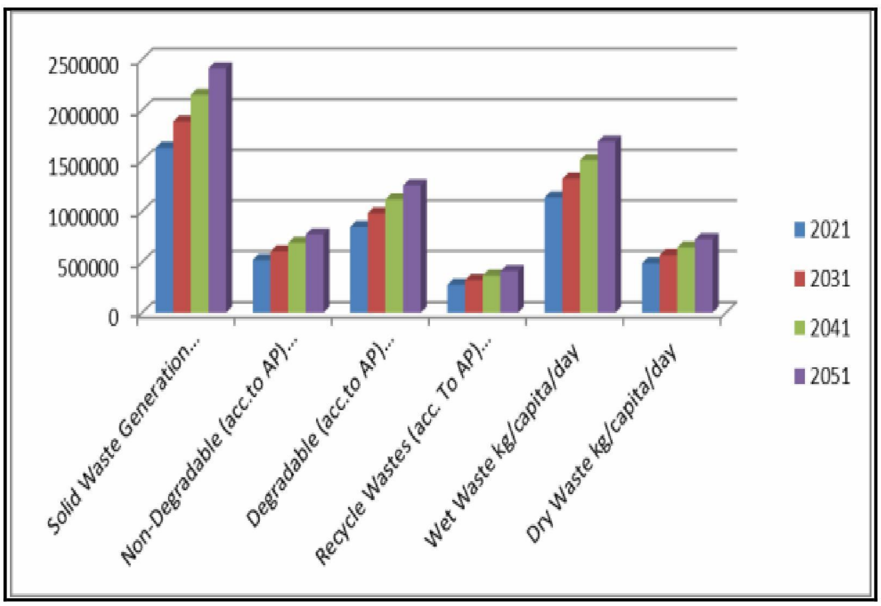


Graph 3.2: Population Growth Projection 2021-2051

Due to the fact that Gurgaon is becoming a center for employment, the city's population is projected to skyrocket during the next five years, as indicated in the Population Growth Projection 2021-2051. This will result in an increase in the amount of garbage produced at a rapid rate. More land is going to be needed in order to accommodate the growing population, as these individuals will need somewhere to live in addition to having their needs met.

Table 3.18 Estimation of Solid Waste Management in Gurgaon

Year	Population Projection (Acc. To Census 2011	Solid Waste Generation (acc. to AP) kg/ capita/ day	Non-Degradable (acc. to AP) kg/capita/day	Degradable (acc. to AP) kg/ capita/ day	Recycle Wastes (acc. To AP) kg/ capita/ day	Wet Waste kg/ capita/ day	Dry Waste kg/ Capita/ day
2021	1806002	1625401.8	520128.576	845208.936	276318.306	1137781.26	487620.54
2031	2097573	1887815.7	604101.024	981664.164	320928.669	1321470.99	566344.71
2041	2389143	2150228.7	688073.184	1118118.924	365538.879	1505160.09	645068.61
2051	2680713	2412641.7	772045.344	1254573.684	410149.089	1688849.19	723792.51



Graph 3.3: Waste Generation in Gurgaon in next 5 decades

In the course of our research, we have attempted to quantify the amount of solid trash that is produced in Gurgaon. In the most recent few decades, there has been a tremendous increase in the amount of garbage that has been generated. According to the Ministry of Housing and Urban Affairs (MOHUA), the amount of solid garbage generated per capita per day ranges from approximately 0.5 to 0.9, and the amount of solid waste generated per day totals 147,613 metric tonnes. According to estimates provided by the Planning Commission, urban India will produce 2,763,422 tonnes of trash each day by 2021. As a result, according to the findings of our research, we have determined that the mean value for the generation of solid waste in Gurgaon on a per capita, per day basis is 0.9, and this value is growing at a pace of 1.3 percent each year.

After that, we segmented the generation of solid waste into three categories: biodegradable wastes, nonbiodegradable waste, and recycled waste. These three categories will account for 52 percent, 32 percent, and 17 percent, respectively, of the total amount of solid waste that will be produced in Gurgaon over the next five decades. The creation of solid trash then accounts for seventy percent of the total.

Transformation of waste into Usable Products:

The disaster that is unfolding in India's waste management has grave repercussions for the country's ecology, economy, and public health. Our primary goal is to reduce the amount of garbage produced while simultaneously developing technology and solutions that can turn any waste into valuable products. This involves efforts to foster a circular economy by making industries more resource efficient and cleaner in their production, as well as efforts to enhance resource recovery and recycling in order to create cities free of landfills.

The growth in the city's population, together with the improvement of people's lifestyles, has led to an increase in the output of solid waste in both the urban and the rural parts of the city. The majority of the solid waste produced in rural areas is of a biodegradable type, whereas the garbage generated in metropolitan areas is composed of a greater number of non-biodegradable components, such as plastics and packaging. In spite of this, the appalling mentality regarding solid waste and the handling of it is shared by both of these industries. The universally adopted method of "keeping garbage out of sight" is the practice that is most frequently adhered to.

In practice, the most effective way to handle solid waste is through management, which typically entails the accurate sorting of garbage into its various components and the scientific recycling of all of those components. Solid waste management, also known as SWM, is a term that is commonly used and can be defined as the application of techniques to ensure an orderly execution of the various functions of collecting solid waste, transporting that waste, processing that waste, treating that waste, and disposing of that waste (Robinson, 1986).

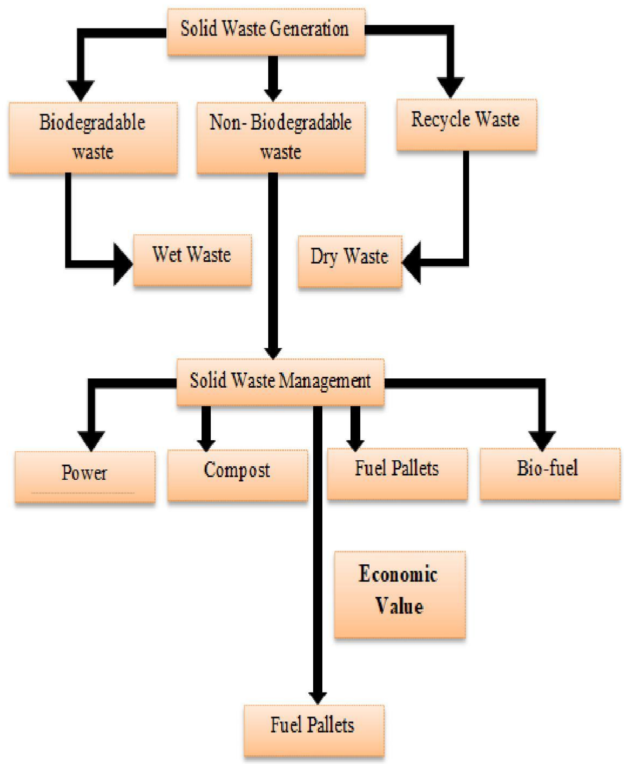


Figure No. 3.7 Sustainable Solid Waste Management

Within the framework of Sustainable Solid Waste Management, we have separated these types of waste into four distinct management approaches, namely Power, Compost, Fuel Pallets, and Bio-fuel, respectively.

1. Power: The combustion of municipal solid waste (MSW) and many other wastes results in the production of corrosive flue gases, which attack boiler components such as super heater tubes. The typical procedure for transforming the energy contained in trash into electricity involves first producing steam in a boiler, which is then fed into a turbine and generator set.

2. Composting is another approach that can be used to treat municipal solid waste. Composting is a biological process in which the organic element of rubbish is allowed to disintegrate while the conditions are carefully managed. Microbes are responsible for the breakdown of organic waste, which can result in a volume reduction of up to fifty percent.

3. Fuel Pellets: The pelletization of municipal solid waste entails the processes of segregating, crushing, mixing high and low heat value organic waste material and solidifying it to produce fuel pellets or briquettes. These products are also referred to as Refuse Derived Fuel (RDF), Process Engineered Fuel (PEF), or Solid Recovered Fuel. 4. Solid Recovered Fuel: (SRF).

4. Biofuel: A dilute-acid process was the initial step in the process of transforming municipal solid waste into biofuels. The hydrolysis of starch was the primary goal of this procedure, and the resulting hydrolysate contained glucose as one of its components.

Apathy on the part of the general public, a lack of municipal will to become financially self-sufficient through municipal taxation, and a complete lack of administrative control on the final stage of waste management, which includes the disposal and processing system, are all factors that contribute to the inefficiencies of the current solid waste management system. Dumping waste is the sole approach that is beneficial to the urban local body because it does not require any additional action. The dump to dump yard practice, which is becoming an increasingly common trend, cannot maintain the function. Due to the fact that land is a valuable resource, it is imperative that integrated policies and technologies be implemented in order to reduce land consumption. The process of reclaiming different parts of India's dump yard and implementing SWM in order to achieve the zero waste city designation has begun. This city has also achieved the designation of zero waste city thanks to recycling, composting, and ultimate power generation.

Compared to the 530 metric tons per day that the city of Gurugram has been producing since 2011, it is expected to produce roughly 1980 metric tons per day of solid trash by the year 2051. If Gurugram does not proceed toward the creation of satellite towns that are equipped with waste management facilities, it will not be able to handle this volume of solid waste with the facilities that are now in place and with the land that is available for disposal sites. In order to achieve financial sustainability, socio-economic, and environmental goals in the field of waste management, it is necessary to conduct a systematic analysis of the strengths and weaknesses of the community as well as the municipal corporation. Based on the findings of this analysis, an efficient waste management system can be developed with the participation of various stakeholders in the Gurugram district. All of these ideas have been made in respect to India, and the only way any of them will be successful is if everyone of us personally feels the duty of keeping the environment clean.

Chapter No. 4
Data Analysis, Results and Findings

4.0 Introduction

The data was collected from selected wards and sectors of Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 & Zone 2 and Municipal Corporation, Manesar (Nagar Nigam) Zone 1 & Zone 2. Five separate interview schedules were prepared for sanitation workers, households of the selected wards, personnel responsible for waste management administration, vendors (hotel, street vendors/ vegetable and fruit stalls, saloons, slaughter shops, and poultry), and for elected ward members of the (MCG) and MCM.

The study covered areas such as the socio- economic and cultural profile of the sanitation workers, challenges faced by them, and the facilities provided by the government for the welfare of the waste collectors. The study also encompassed the household respondents' participation in the waste management process in the wards.

Based on the objectives, interview schedules were developed for community members. Individual members from the household level were selected for the household survey. Community dwellers are direct contributors and are affected from the solid waste, hence, the study emphasized on people participation and their involvement from both the selected wards.

The next segment of waste generators was the vendors from small business settings such as hotel, street vendors comprising of both vegetable and fruit stalls, saloons, slaughter shops, and beauty parlours.

The administrative officials are recruited and deputed for the post to mitigate the issue of waste management in the limits of (MCG) and MCM. In fact, they are responsible for effective waste management administration. These officials are also a part of the study.

The researcher developed an interview schedule for the elected members of the (MCG) and MCM to know their role and participation on waste management generation in the wards. The main purpose of this was to assess the nature and magnitude of the solid waste collected in the zones of Gurugram district. The major issues which are the bottlenecks to solve the issue of Solid waste management in Gurugram district..

The data collected from the study area of the two zones of (MCG) and MCM is tabulated broadly and categorized as - 1. Sanitation workers views on solid waste management, 2. Residents participation in Solid waste management, 3. Entrepreneurs / Vendors participation and views on solid waste management, 4. Administrative staff participation in solid waste management, and 5. Elected representatives participation in solid waste management.

Results And Discussions

4.1 Sanitation workers participation and views on management of solid waste.

Table 4.1.1: Personal Demographic Profile of Sanitary Workers of MCG and MCM Gurugram

Sl. No.	**Demographic details**		**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
N = 50 (Per cent)				
1	Gender	Male	14(56)	7(28)
		Female	11(44)	18(72)
2	Religion	Hindu	22(88)	24(96)
		Muslim	3(12)	0(0)
		Christian	0(0)	1(4)
3	Age (in yrs.)	20-29	6(24)	7(28)
		30-39	12(48)	8(32)
		40-49	6(24)	6(24)
		50-59	1(4)	4(16)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.1.1 presents detailed information about demographic profile of the sanitary workers. About 72% from MCM and 44% from MCG are female sanitary workers, and 56% from MCG and 28% from MCM are male sanitary workers. A study by Furedy (1990) in Hyderabad found that waste collection work is determined by social, economic, and environmental aspects and greatly involves gender issues. Women workers are more vulnerable to the working conditions. They are not provided with protective measures and equipment was the complaint lodged by some of the workers. The women workers were also not happy about the situation.

In the current investigation, it was discovered that the vast majority of sanitary personnel belonged to the Hindu religion (88 percent), and that 96 percent of them were locals from both of the wards. In the MCM, approximately 12% of the population is Muslim, whereas only 4% of the population in the MCG identifies as Christian. In its purest form, religious faith is viewed as a potent agent capable of bringing about meaningful change through the transmission of ecologically responsible behaviors and mentalities to subsequent generations of people who share the same religious beliefs (Foltz et al., 2003).

The table throws light on the age of the respondents. It is clear that as many as 48% and 32% respondents were in the age group of 30-39 yrs. from both (MCG) and MCM, followed by 24% and 28% were in the age group of 20-29yrs, 24% each were in the age group of 40-49yrs and 16% and four per cent were in the age group of 50-59yrs.

Chankya et al., 2009 explains that women play several roles in the households as the income and expenditure of the family is managed by her, and caring for members in the family along with doing household chores. Waste handling has become an easy and important source of income, especially for urban poor women.

Table 4.1.2: Literacy Level of Sanitary Workers of MCG and MCM Gurugram

Education	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
N = 50 (Per cent)		
Illiterate	11(44)	15(60)
Up to 5th Standard	7(28)	6(24)
Between 6th - 9th std.	6(24)	3(12)
SSLC	1(4)	0(0)
PUC and above	0(0)	1(4)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Education is an integral part of an individual's life. It is important because education gives knowledge and skills to accomplish life tasks. It is important for all ages, and there is no limit for it. In the present study, Table 4.1.2 shows that majority 60% and 44% respondents from both (MCG) and MCM are illiterate, 28% and 24% studied up to 5th standard, 24% & 12% studied between 6th to 9th standard, and four per cent each completed 10th standard from MCG and PUC from MCM. The table indicates that many illiterate respondents opted for waste collection as their profession. Kaveri (2010) has found that in comparison to men, women are mainly engaged in waste activities as it requires lower level of education and skill and limited physical activities.

Sanitation workers have very low education background and shows that the dropout rate of their own children could be high. Many literatures have observed that the continued practice of untouchability is one of the reasons for dropout rate among children, which leads them to take up sanitation work. Due to this, they are poor and have low standards of living (Navsarjan, 2016).

Table 4.1.3: Housing Pattern of Sanitary Workers of MCG and MCM Gurugram

Pattern of Housing system		**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
N = 50 (Per cent)			
Classification	Own	7(28)	0(0)
	Rented	13(52)	25(100)
	Leased	5(20)	0(0)
Type of House	Kuccha	17(68)	14(56)
	Pukka	8(32)	6(24)
	Not mentioned	0(0)	5(20)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.1.3 provides data on the classification of house and type of house of the sanitary workers. A majority of the respondents live in rented house, i.e., 52% from MCG and 100% from MCM. The remaining respondents, i.e., 28% own their house and 20% live in leased house in MCG.

Further, the table enumerates on the type of house of the sanitary workers. A majority of 68% and 56% live in kuccha house, 32% and 24% in pukka house, and the 20% from the MCG could not mention in what type of house they live in.

Table 4.1.4 Information about Ration Card of MCG and MCM Gurugram

Information about Ration Card		**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
N = 50 (Per cent)			
Own a ration card	Yes	22(88)	15(60)
	No	3(12)	10(40)
Type of ration card	BPL	16(64)	10(40)
	APL	3(12)	0(0)
	Antyodaya	3(12)	5(20)
	Does not have a ration card	3(12)	5(20)
Reasons for not having a ration card	No identity cards	3(12)	11(44)
	Do not know how to apply	0(0)	15(60)
	Not applied for ration card	0(0)	6(11)
	Recently migrated	0(0)	8(4)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Ration card is an official document that is issued by the state governments of India to households that are eligible to purchase subsidized food grains from the Public Distribution System (PDS) in accordance with the National Food Security Act. Ration card is very important for the marginalized people in India because it is an official document. There are three distinct kinds of cards that can be obtained from the government. Ration cards designated as Above Poverty Line (APL) are distributed to households that, according to the Planning Commission's estimates, have incomes that are higher than the poverty line. About fifteen kilograms of food grain is distributed to each of these homes. Ration cards designated as Below Poverty Line (BPL) are distributed to households that are considered to be living in poverty. Food grains ranging from twenty-five to thirty-five kg are distributed to these homes. The Antyodaya (AAY) ration cards are given to the "poorest of the poor" households in the country. The food grains totaling thirty-five kg are distributed to these households.

From Table 4.1.4, it is clear that majority of the respondents have a ration card, i.e., 88% sanitation workers from MCG and 60% from MCM. Considering both the wards, 12% and 40% workers respectively from zone 1 and 2 of MCG and respondents of MCM do not have a ration card, and are not availing the services of the Public Distribution System.

With regard to the type of ration cards used by the workers, 64% have Below Poverty Line cards, 12% Above Poverty Line cards, 12% have Anthyodaya cards, and 12% do not have ration cards in zone's of MCG, and in the Zone 1 and 2 of MCM, 40% have Below Poverty Line cards, 0% Above Poverty Line cards, 20% have Anthyodaya cards, and 20% do not have ration cards. Hence, majority are availing of the services of the Public Distribution System.

Table 4.1.5: Household Electric Items used by Sanitary Workers of MCG and MCM Gurugram

Household Items	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG		**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM	
	N = 50 (Per cent)			
	Yes	**No**	**Yes**	**No**
Television	25(100)	0(0)	23(92)	2(8)
Mobile phones	25(100)	2(8)	23(92)	2(8)
Refrigerator	11(44)	14 (56)	1(4)	24(96)

Washing machine	2(8)	23(92)	0(0)	25(100)
Four wheeler vehicle	2(8)	23(92)	0(0)	25(100)
Two wheeler vehicle	6(24)	19(76)	6(24)	19(76)
Mixer grinder	13(52)	12(48)	23(92)	2(8)
Household gas connection	17(68)	8(32)	22(88)	3(12)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Household goods are items used within the house. These include tangible and moveable goods in living rooms, dining rooms, kitchen, bedroom, and other rooms used for comfort of living.

Various household goods such as television, mobile phones, refrigerator, washing machines, four wheelers, two wheelers, mixer grinder, and household gas cylinder connections are owned by the sanitary workers. It is clear that all the respondents from zone's of MCG and 92% from Zone 1 and 2 of MCM own a television, followed by mobile phone for their recreation. Around 44% from zone's of MCG and four per cent from the Zone 1 and 2 of MCM have a refrigerator. Mixer grinder (52% and 92%) and household gas cylinder connection (68% and 88%), are common household goods utilized by the sanitary workers. About 24% respondents from both the MCG and MCM own two wheelers, and eight per cent respondents from zone's of MCG own four wheelers, followed by washing machine.

Hence, it is evident that sanitation workers are intact with the technology and have made their life comfortable by using electronic gadgets and household items.

Table 4.1.6: Respondent's Choice of profession in MCG and MCM Gurugram

Choice of Profession	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N = 50 (Per cent)	
Hereditary	3(12)	1(4)
No other job opportunity	15(60)	15(60)
Lack of skill to avail other jobs	7(28)	3(12)
Migration	0(0)	6(24)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Selection of profession should be by choice and there are many reasons to choose a profession. Professional choice determines the source of livelihood. Table 4.1.6 indicates the choice of profession by the workers. A majority of 60% each (both Nagar Nigam) respondents opined that since they did not get any other job opportunity to earn, they joined as sanitation workers, around 28% and 12% workers chose the profession due to lack of skill to avail other jobs, lack of education, lack of training, etc., 24% respondents from West zone opined due to migration opted for this profession, and 12% and four percent as a hereditary job Many respondents are not highly literate and lack skill training. Hence, the management should consider skill training programmes to improve the professional efficiency of the workers in the proper disposal of waste.

Table 4.1.7: Professional Satisfaction among sanitation workers of MCG and MCM Gurugram

Professional Satisfaction	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
N = 50 (Per cent)		
Yes	15(60)	16(64)
No	10(40)	9(36)
Reasons for professional dissatisfaction		
Foul smell in working environment	0(0)	1(4)
Health hazards	0(0)	1(4)
Low salary	0(0)	2(8)
No dignity of labour	2(8)	1(4)
No other job option	8(32)	4(16)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Professional satisfaction or job satisfaction is a measure of a worker's contentedness with the job, whether they like the job or individual facts of the job, which includes the nature of work or supervision. Job satisfaction can be measured in cognitive (evaluative), affective (or emotional), and behavioural components.

With regard to job satisfaction, Table 4.1.7 highlights that 60% and 64% of sanitation workers from zone's of MCG and Zone 1 and 2 of MCM, respectively are satisfied with their profession. Although, they are satisfied with their profession, they are not happy with it due to the following reasons, 4% mentioned due to foul smell in working environment and health hazards, 8% due to low salary, 12% specified no dignity of labour, and 32% from zone's of MCG and 16 % from Zone 1 and 2 of MCM mentioned that due to no other job option they had taken up the profession.

Table 4.1.8: Awareness about Occupational Health Issues

Health Issues	**Awareness on occupational health issues N = 50 (Per cent)**			
	Yes		**No**	
	Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
Fever	16 (64)	24(96)	9(36)	1(4)
Skin diseases	11(44)	9 (36)	14(56)	16(64)
Cough	5(20)	6(24)	20 (80)	19(76)
Headache	6(24)	6(24)	19(76)	19(76)
Breathing problem	3(12)	3(12)	22(88)	22(88)
Blood pressure	3(12)	4(16)	22(88)	21(84)
Back pain	5(20)	3(12)	20(80)	22(88)
Diabetics	2(8)	1(4)	23(92)	24(96)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Occupational health issues occur at workplace because of the nature of the work carried out. These include cuts, broken bones, sprain, and loss of limbs, hearing problems due to noise, vision problems, touching or swallowing unsafe substances, illness due to exposure to radiation, exposure to germs and infectious diseases, and many more. Occupational disease is a condition that manifests itself over time as a direct result of the working environment. Occupational illness is a condition that the Occupational Health and Safety Act defines as a condition that results from exposure in a workplace to a physical, chemical, or biological agent to the extent that the normal physiological mechanisms are affected and the health of the worker is impaired. This definition comes from the Occupational Health and Safety Act.

There are various occupational hazards associated with waste handling. Skin and eye infections result from direct contact with waste and from infected wounds, and intestinal infections due to flies in the wastes. This occupation causes serious impact on health. It is evident from the above data that the majority of the respondents are aware about the occupational health hazards of the profession. A majority 96% of the solid waste collectors from the Zone 1 and 2 of MCM, and 64% from zone's of MCG were aware about fever as part of health issues. Besides fever, other health issues such as skin disease, cough, headache, breathing problem, blood pressure, back pain, and diabetics were not known by the waste collectors as acquired through the profession. Such as skin disease 64% from Zone 1 and 2 of MCM and 56% from zone's of MCG, Cough 80% and 76%, headache 76% each, breathing problem 88% each, blood pressure 88% & 84%, back pain 80% & 88%, diabetics 92% and 96% respondents were not aware of the health issues acquired through occupation respectively. According to a study that was conducted by Cointreau and Levine (2006) in India, 89 percent of people from Bombay and 15 percent of people from Calcutta experienced issues with their eyes. The majority of those who complained of eye difficulties described having a burning sensation, redness, and itching in their eyes.

Table 4.1.9: Recreation in Daily Life

Recreational Activities	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N = 50 (Per cent)	
Watching television – Daily	17(68)	13(52)
Going for movies – Weekly	3(12)	2(8)
Using substances – Daily	2(8)	0(0)
Watching television with substance consumption	1(4)	7(28)
Any other	0(0)	1(4)
Recreation – Nil	2(8)	2(8)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The stressful and often hazardous nature of the work puts a strain on the employees of the sanitation department. Because of this, they have a significant desire for leisure time. People's mental and physical health are both improved when they participate in recreational activities. It is possible that a person's health will deteriorate if they do not take breaks from their employment. The nature of a recreational activity need not necessarily be one that involves movement. Stress can be alleviated at work through the use of activities that are emotionally and psychologically connected. The health benefits of recreation, particularly those that take place outside, are numerous. Taking some time out of your day to reflect and get to know yourself better can help restore a sense of equilibrium and boost your self-esteem, directly lowering your levels of anxiety and sadness.

The sanitation workers find their recreation for daily life. As many as 68% and 52%

workers in zone's of MCG and Zone 1 and 2 of MCM watch television as part of their daily recreation, 12% workers from zone's of MCG and 8 per cent workers from Zone 1 and 2 of MCM go to movies on a weekly basis, 8% from zone's of MCG consume substances daily four percent and 28% respondents from respective zone consume substance while watching television, four per cent from Zone 1 and 2 of MCM indulge in other types of recreation activities, and 8% each from respective zone do not have any other type of recreation facilities/recreation.

Table 4.1.10: Duration of Work per Day

(Sanitary Workers of MCG and MCM Gurugram)

Duration of working (in hours)	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N = 50 (Per cent)	
0-2	2(8)	0(0)
2-4	4(16)	0(0)
4-5	2(8)	0(0)
5-6	5(20)	0(0)
6-7	6(24)	0(0)
7-8	4(16)	18(72)
8-10	2(8)	7(28)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Duration of working is an index of work- life balance. Work- life balance is determined by the duration of working hours, and directly impacts on the health and relationship among family members, and improves work performance.

It is evident from Table 4.1.10 that 16% and 72% respondents are working 7 to 8 hours per day, eight per cent and 28% respondents from both the Nagar Nigam work 8 to 10 hours per day, 24% from zone's of MCG work for 6 to 7 hours per day, 20% for 5 to 6 hours per day, 16% 2 to 4 hours per day, and eight per cent each work for 4 to 5 hours and 0 to 2 hours per day. As per the Factories Act, 1948, every adult is permitted to work for not more than forty-eight hours in a week and not more than nine hours a day. Hence, it is evident that majority of the sanitation workers are working eight to ten hours per day, and in the Zone 1 and 2 of MCM, workers are working more hours than in the zone's of MCG.

Table 4.1.11: Income of the Respondents

Monthly income (in Rs.)	Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG	Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2 MCM
	N = 50 (Percent)	
<5000	3(12)	0(0)
6,000-10,000	15(60)	9(32)
11,000-15,000	5(20)	12(48)
16,000-20,000	1(4)	0(0)
21,000-25,000	0(0)	2(8)
26,000& >	1(4)	1(4)
Refused to answer	0(0)	1(4)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Income is a vital part of an individual's life. Without money no one can survive in this world it is very important to have cash inflow in day- to-day life. It is possible to improve the income gradually and an individual can lead a desirable lifestyle. Table 4.1.11 presents the monthly income of the sanitation workers. It is evident that many respondents earn between Rs. 6000 to 10,000 from both the Nagar Palika i.e., 60% from zone's of MCG and 32% from the Zone 1 and 2 of MCM. As many as 20% and 48% earn between Rs. 11,000 to 15,000 in the respective wards, eight per cent earn between Rs. 21,000 to 25,000 in the Zone 1 and 2 of MCM and four per cent in zone's of MCG earn between Rs. 16,000 to 20,000, 4 per cent respondents each from both the Nagar Palika earn Rs. 26,000 and above, 12% from zone's of MCG earn below Rs. 5000, and four per cent from the Zone 1 and 2 of MCM refused to disclose their monthly income.

Table 4.1.12: Other Sources of Income

Other sources of income	Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG	Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2 MCM
	N = 50 (Per cent)	
Yes	9(36)	4(16)
No	4(16)	21(84)
Other sources		
Coolie	1(4)	0(0)
Daily wages	6(24)	0(0)
Driver – Car/Truck	0(0)	2(8)
Florist	0(0)	1(4)
Insurance agent	1(4)	1(4)
Street vendor	1(4)	0(0)
Refused to answer	16(64)	21(84)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The sanitary workers are not depending on their monthly income for their livelihood, as they have other sources of income because their salary is not satisfactory to meet their daily needs. Along with their occupation, they engage in other sources of income About 36% and 16% respondents from both the Nagar Nigam have other sources of income and a majority do not have any other source of income. Most of the sanitary workers work for a restricted duration and the remaining hours are free, hence have chosen other work such as 24% from zone's of MCG work as daily wage earners, four per cent each work as coolie and street vendor from zone's of MCG, respectively, eight per cent from the Zone 1 and 2 of MCM work as drivers, four per cent respondents each from both the Nagar Palika work as insurance agents, and 64% and 84% from both the zones did not respond.

Table 4.1.13: Other Welfare Benefits Received by Sanitation Workers

Other Welfare Benefits	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG		**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM	
	N = 50 (Per cent)			
	Yes	**No**	**Yes**	**No**
Yearly Bonus	6(24)	19(76)	0(0)	25(100)
Provident Fund (PF) deduction	19(76)	6(24)	16(64)	9(36)
Employees State Insurance (ESI)	14(56)	11(44)	14(56)	11(44)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Labour welfare guarantees workers personal safety and motivates them to give best performances. The unorganized sector workers are less paid, hence, they are unable to meet their basic needs. Table 4.1.13 shows that a number of respondents are not part of the welfare measures of the Municipal Corporation. With regard to annual bonus, a majority of 76% and 100% respondents from zone's of MCG and Zone 1 and 2 of MCM had not received the annual bonus. As much as 76% and 64% from both the Nagar Palika had been accorded with Provident Fund (PF). Employees State Insurance is a comprehensive social security scheme for workers for medical contingencies such as sickness, maternity, death, and other disablement due to employment injury and occupational diseases. In the study, 56% each from both the Nagar Palika had availed ESI from Municipal Corporation. Apart from Employee State Insurance Scheme, there is provision of Atal Pension Scheme and Pradhan Manthri Suraksha Insurance for all citizens of India. There is need for more propaganda about these schemes to the most vulnerable communities. However, it is evident that the Employees State Insurance is the only welfare scheme benefited by the workers in both the wards, beside PF.

Table 4.1.14: Savings Habit among Sanitary Workers

Saving habit	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N = 50 (Per cent)	
Yes	15(60)	7 (28)
No	10(40)	18(72)
Type of Savings	**N = 50 (Percent)**	
Daily	2(8)	0(0)
Weekly	4 (16)	3(12)
Fortnightly	1(4)	0 (0)
Monthly	8(32)	2(8)
Refused to answer	10(40)	20(80)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Savings is the portion of total income, which is not spent on current expenditure. It is necessary to cope with unpredictable incidents in an individual's life. Savings leads to financial security, and provides safety during emergencies. Savings helps to build wealth in the long- run.

Table 4.1.14 explains the saving habits of the sanitary workers. The table depicts contradictory results between the Nagar Palika. Respondents from zone's of MCG have give priority to savings, i.e., 60%, and only 28% respondents had the habit of saving in the Zone 1 and 2 of MCM.

Further, the table enumerates types of savings, wherein majority of the respondents had not answered on the types of savings, i.e., 40% and 80% from both the Municipal Corporation. About 32% respondents saved on monthly basis, 16% on a weekly basis, eight per cent on daily basis, and four per cent on a fortnightly basis from zone's of MCG. With regard to Zone 1 and 2 of MCM, only 12% and eight per cent respondents had the habit of savings on a weekly and monthly basis.

From the table, it is evident that the respondents are aware of savings and have developed this habit however there is need for financial literacy. Financial literacy programmes can be organized through public sector banks.

Table 4.1.15: Membership in Associations

Member of Association	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N = 50 (Per cent)	
Yes	22(88)	25(100)
No	3(12)	0(0)
Type of Association		
Self Help Group	3(12)	4(16)
NGO working for sanitation workers	0(0)	0(0)
Union	22(88)	21(84)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Membership in a professional association plays a crucial role in protecting the interests of its members. In the study, majority 88% respondents from zone's of MCG and 100% from the Zone 1 and 2 of MCM had a membership in an association. Membership in trade union in the working premises and Self Help Group run by various NGOs would help the members to meet their social, economic, and cultural needs. Self Help Groups are groups of people who mutually support each other. They mobilize the members for mutual benefit. The motto of the scheme is socio-economic-political development as well as holistic development of an individual. Self Help Groups reduce social inequalities and disparities. In the study, 88% and 84% respondents from both the Municipal Corporations had a union membership, whereas only 12% and 16% respondents had Self Help Group membership in both the Municipal Corporations.

Table 4.1.16: Sanitary Workers Views /Perception on Public's Awareness on Solid Waste Collection

View of Sanitary Workers on Public	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG			**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM		
	N = 50 (Per cent)					
	Yes	**No**	Don't know	Yes	No	Don't know
Aware of solid waste collection	17(68)	7(28)	1(4)	12(48)	12(48)	1(4)
Civic consciousness among the public	10(40)	15(60)	0(0)	9(36)	16(64)	0(0)
Support through segregation of waste	19(76)	6(24)	0(0)	6(24)	19(76)	0(0)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

It is the fundamental duty of each citizen to know where the collected waste has been transported and the way it is managed. Table 4.2.1 depicts the views of sanitary workers on public attitude towards solid waste. A majority of 68% sanitary workers from zone's of MCG and 48% from Zone 1 and 2 of MCM opined that the public are aware of solid waste collection. About 60% and 64% respondents from both the Municipal Corporations opined that the public lacked civic consciousness. As much as 76% sanitary workers from zone's of MCG and 24% from the Zone 1 and 2 of MCM were supported by the households, who segregated the waste.

On the whole, the rate of public awareness with regard to collection of waste and management and civic conscious among public was high. The support given through segregation of waste at the collection point itself was higher in zone's of MCG than in the Zone 1 and 2 of MCM from the point of view of the sanitary workers. In the zone's of MCG public is much aware about waste management and supportive for the effective management of waste.

Lackman (1975) rightly pointed that there is need for the realization of the potential of solid waste management, and that proper economic concepts and tools can provide a rational approach to the escalating problem of solid waste management

Table 4.1.17: Sanitation Workers Opinion on Public Support for Effective Waste Management

Support given by public to sanitary workers	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG			**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM		
	N = 50 (Per cent)					
	Very good	Good	Poor	Very good	Good	Poor
	2(8)	17(68)	6(24)	2(8)	9(36)	14(56)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Public participation increases capabilities at the community level, and it encourages social responsibilities. It is a collaborative problem solving method with the aim of achieving acceptable decisions.

Table 4.1.17 reflects the sanitary workers opinion about public support to their daily work. A majority of 68% workers from zone's of MCG opined that the support received is good compared with the Zone 1 and 2 of MCM where only 36% sanitary workers responded. As many as 56% and 24% from the Zone 1 and 2 of MCM and zone's of MCG sanitary workers viewed the support as poor, and eight per cent respondents from both the Municipal Corporations opined that the support received in both the Municipal Corporations is very good.

The engagement of the general public in the management of solid waste is essential at this point in time because efficient management of solid waste is impossible without their cooperation. Individuals have a moral obligation as well as a social responsibility to care for the communities in which they live and to ensure that they are kept clean. The administration is responsible for waste management, but the onus also falls on the individual members of the community to do their share. The efficiency of the workers who clean up after the public helps to be improved by public support.

According to the opinions of Grierson John and Brown Ato (1999), the most significant factor in the successful management of solid waste is public collaboration and the responsibility of the general people.

Table 4.1.18: Sanitation Workers Opinion on Knowledge on Waste segregation at Public level

Knowledge on waste segregation	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N = 50 (Per cent)	
Yes	19(76)	6(24)
No	6(24)	19(76)
Different Elements on Waste Segregation		
Public does not know the importance of segregation	5(20)	3(12)
Public is not bothered about sanitation workers	2(4)	3(12)
Public does not follow waste management rules	8(32)	9(36)
Public not interested in	4(16)	1(4)
Public does not have time for segregation	7(28)	10(40)
Public not bothered about the sanitation of the ward	4(16)	4(16)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

In ancient days, human beings used to discard their household wastes such as kitchen waste, trash and other worthless or defective unused items by digging a pit or burying it. It was useful in those days with the usage of items. The population was relatively small, and the production of waste was less. Due to industrialization, the waste generation methods have changed. Consequently, managing waste has become a very challenging task for all.

Waste segregation is compulsory as per the Solid Waste (Management and Handling) Rules, 2000. Segregation includes separation of waste into dry and wet waste; waste segregation makes the work easier to handle later. Bio-degradable wastes such as vegetables, fruits, flowers, and leaves, and non-bio degradable wastes such as plastics, paper, glass, metal, tetra pack covers, aluminium foils, etc. If the wastes are not segregated it will mix up in the landfills, and generate toxics and contaminate the under-ground water and the whole environment. Mainly methane gas has been produced, which leads to climate change. Waste segregation protects the health of the waste collectors.

Table 4.1.18. shows the sanitation workers perception regarding waste segregation by the public at the primary collection point. With regard to segregation in the zone's of MCG, 76% of the respondents shared that there is proper waste segregation done at the primary collection point and 76% respondents of the Zone 1 and 2 of MCM mentioned that waste was not properly segregated. Hence, there is waste segregation practices followed in the less waste collection Ward then the maximum waste collection Ward.

The table further gives reasons for not segregating waste at the collection point. About 36% of West zone and 32% of zone's of MCG public is not segregating waste because they are not following the municipal solid waste management rule, and 40% of respondents from Zone 1 and 2 of MCM and 28% from zone's of MCG expressed that the public does not have time for waste segregation. On the whole, through the responses, it was noted that waste segregation is poorly followed in the Zone 1 and 2 of MCM in comparison to zone's of MCG. About 20% respondents viewed that the public in the zone's of MCG does not know the importance of waste segregation, then also 76% of respondent viewed that publics support waste segregation.

Table 4.1.19: Sanitation Workers Opinion on Various Aspects

Sanitation workers Opinion on different aspects	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG		**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM	
	N = 50 (Per cent)			
	Yes	No	Yes	No
Public aware of waste collection	5(20)	20(80)	5(20)	20(80)
Public satisfaction of the work done	18(72)	7(28)	17(68)	8(32)
Public respect towards waste collection community	21(84)	4(16)	16(64)	9(36)
Sanitary workers reduction in health risk through waste segregation at source level	19(76)	6(24)	22(88)	3(12)
Need of more publicity about waste segregation for public	9(36)	11(44)	18(72)	7(28)
Waste segregation benefits sanitary workers	21(84)	4(16)	21(84)	4(16)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.1.19 presents the opinions shared by sanitation workers on various aspects. The table explores opinions with regard to public awareness on waste collection and segregation. A majority of 80% each sanitary workers from both the Municipal Corporations opined that the public is not aware of waste collection. About 72% and 68% respondents from both the zones opined that the public is satisfied with their work. As much as 84% and 64% sanitary workers are happy with the respect received from the public About 76% and 88% sanitary workers from both the Municipal Corporations viewed that segregation of waste has to be done at the source level, otherwise it will lead to health risk. Direct handling of solid waste leads to acquiring various types of infections and chronic diseases among the waste collectors. Domestic and organic waste poses serious threat to the health of sanitary workers. Sanitation workers are address numerous occupational health issues such as back pain, eye allergies, asthama, tuberculosis, and muskulator diseases. About 36% and 72% respondents viewed that the public needs more sensitization and awareness on segregation of waste Inadequate waste segregation is an environmental challenge associated with waste management process. Waste segregation at source and use of proper waste processing methods of separation of recyclable materials play a key role. Though methane extraction and thermal treatments are considered as major opportunities for energy generation, the key to success is proper waste segregation at the source level (Sunil et al 2017). As many as 84% each of the sanitary workers opined that waste segregation at the source level is benefits the sanitary workers. On the whole, the sanitation workers are looking forward to public participation and involvement in the process of waste management.

Table 4.1.20: Sanitary Workers Knowledge on Method adopted in Waste Management

Method adopted in waste management	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG		**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM	
	N = 50 (Per cent)			
	Yes	**No**	**Yes**	**No**
Waste segregation at household level	1(4)	0(0)	1(4)	0(0)
Using separate bins for dry and wet waste	1(4)	0(0)	0(0)	0(0)
Don't know	21(84)	2(8)	23(92)	1(4)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Sanitation workers are the right personnel to explore the methods used to manage waste at the collection point. Door- to- door collection process is followed to achieve the technical management of waste. It is clear from the table that majority of the respondents from both the Municipal Corporations, i.e., 84% and 92% do not know the methods adopted to manage waste at the household level. This shows that they are only focused on waste collection, rather than on segregation and disposal methods. Today, due to globalization and technological development, various technologies have been adapted by developed countries. There are good references of the best practices followed in Israel, Singapore, and other countries. Unsanitary landfilling and open burning of wastes are conventional methods of waste management, whereas various other options available for the disposal of sustainable municipal solid waste are recycling, aerobic composting, small scale biogas/biomethanation, Refuse Derived Fuel(RDF), and Waste to Energy Combustion (WTE). In the Indian scenario, composting and small scale biomethanization are best for treating organic wastes. Informal recycling is an integral part of solid waste management in India due to the efficiency of the supply chain in Indian cities as explained by Annepu (2012).

Table 4.1.21: Extra payment by Public to Sanitation Workers

Generous payment	Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG	Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2 MCM
	N = 50 (Per cent)	
During festivals	10(40)	10(40)
Few Households	1(4)	1(4)
Shops occasionally	1(4)	0(0)
No payment	13(52)	14(56)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Sanitation workers contribute tremendously to keep the environment clean. Their standard of living is very poor because they have chosen this occupation due to many reasons such as lack of skill for other jobs, migration, extreme poverty, and others. The salary and bonus paid by the authorities is not sufficient for their day- to- day life. In Table 4.1.21, it is shown that as many as 40% each respondents had received extra payment by the public during festival, four per cent each respondents from both the Municipal Corporations had received payment from few households, another four per cent from zone's of MCG had occasionally received cash from shops, and 52% and 56% from both the Municipal Corporations had not received any type of payment for their work.

Table 4.1.22: Sanitary Workers Perception on Public Awareness about Segregation of Waste into Different Bins

Public awareness about segregation of waste into different bins	Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG	Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2 MCM
	N = 50 (Per cent)	
Yes	16(64)	13(52)
No	9(36)	12(48)
Advantages of propaganda on Waste Segregation		
Helps sanitation workers	1(4)	0(0)
Supports waste management by Gurugram Metropolitan Development Authority (GMDA)	1(4)	0(0)
Effective implementation of municipal solid waste management rules	0(0)	3(12)
To encourage waste segregation practices at primary level	4(12)	12(48)
Strict implementation of Municipal Solid Waste Rules by MUNICIPAL	4(12)	3(12)
Sanitation Workers don’t know	16(64)	7(28)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

It is important to know the awareness level of the public as part of participation in municipal solid waste management. Sanitary workers observe the level of public awareness on waste segregation while collecting the waste.

Awareness about proper segregation of waste at the waste generation point smoothen the waste management process. Public awareness and participation are critical components in the waste management process. Each individual must have knowledge of waste management because it is the result of human activities. Without awareness about proper waste segregation, the best waste management plan becomes questionable.

Table 4.1.22 presents the level of public awareness about proper waste segregation. It has been shown that more than half of 64% and 52% sanitary workers in both the wards opined that the households are aware of segregation of waste into different bins and 36% and 48% sanitary workers from both the Municipal Corporations opined that the public does not know about waste segregation.

The following table provides an additional rundown of the benefits of waste management propaganda: The opinions of around 64 percent of respondents from zones of MCG were that the general public is unaware of the benefits of waste segregation, and the opinions of approximately 28 percent of respondents from Zones 1 and 2 of MCM were that this was the case. Approximately 48 percent of respondents from Zone 1 and 2 of MCM and 12 percent from zone's of MCG believed that the Gurugram Metropolitan Development Authority (GMDA) should encourage the waste segregation at primary level, 12 percent each from both the Municipal Corporations were of the opinion that GMDA should strictly implement waste segregation practice through Municipal Solid Waste Rules, and 12 percent sanitary workers from Zone 1 and 2 of MCM stated that the GMDA should impose stricter penalties for those who did not properly separate their waste

According to the findings of a study conducted in Israel by Daskal et al. (2018), municipal authorities are responsible for the collection, storage, and disposal of garbage. Waste management laws and regulations are drafted by Israel's Ministry of Environmental Protection (MoEP), which is responsible for environmental protection. In Israel, during the past twelve years, eighty percent of the municipal solid waste has been dumped in landfills, and the country's recycling rates have been dismal, in spite of regulations, with the implementation of policy and regulations, and the monitoring of the progress toward achieving goals. Even though there are several restrictions, this does not guarantee that garbage will be properly treated or that waste management will improve. The appropriate infrastructure, which will make it possible to accomplish one's objectives, is essential to one's level of success.

Table 4.1.23.: Capacity Building Training Attended by Sanitary Workers

Training attended / Type of training attended	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG		**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM	
	N = 50 (Per cent)			
	Yes	**No**	**Yes**	**No**
Training attended	25(100)	0(00)	25(100)	00(00)
Types of training attended				
Waste segregation at primary source	19(76)	0(00)	15(60)	0(00)
Waste disposal methods	2(8)	0(00)	0(00)	0(00)
Occupational safety measures	4(16)	0(00)	10(40)	0(00)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.1.23 indicates the training attended by the respondents tenure. All the respondents in both the Municipal Corporations have attended training i.e., 100%. Further the table depicts the type of training attended. It seems that 76% and 60% sanitary workers from both the Municipal Corporations had attended training on waste segregation at primary source, eight per cent respondents from zone's of MCG had attended training on waste disposal methods, and 16% and 40% attended training on occupational safety measures from both the Municipal Corporations. This data shows that the sanitary workers also involved in trainings conducted by the Municipal Corporations depicts the management is more focused on waste segregation methods.

In their study of the economics of municipal solid trash, Beede N. and David E. (1995) showed that the labor-intensive collection and processing of recyclable materials may be found all throughout the developing world. The amount of waste that is managed and the number of specialist people or machines that are utilized may both contribute to an overall decrease in the expenses associated with municipal solid waste management. Because the informal sector for recycling requires an unusually high amount of labor, there is a need for alternatives to improve both the quality of public health and the health of sanitary workers.

Table 4.1.24.: Expected Support from MUNICIPAL CORPORATIONS of GURUGRAM AND MANESAR

Support expected from Municipal Corporations	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N = 50 (Per cent)	
Yes	7(28)	25(100)
No	18(29)	0(0)
Expected welfare facilities from Municipal Corporations		
Supply of food and health checkups – Free of cost	1(4)	2(8)
Salary hike	18(72)	13(52)
Free housing facility	1(4)	2(8)
Application of latest equipment, vehicles, and technology	1(4)	0(0)
More information about safety measures	0(0)	3(12)
More publicity about segregation	4(16)	5(20)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

It is human tendency to have expectations; likewise, the sanitary workers are also expecting support from Municipal Corporations to lead a better life. In Table 4.1.24, it is seen that 28% from zone's of MCG and 100% from Zone 1 and 2 of MCM are expecting support for self as well as for effective implementation of waste segregation. Further the table gives a clear idea on the expected welfare facilities by the Municipal Corporations. As much as 72% and 52% from both Municipal Corporations are expecting hike in salary at least once a year to lead a better life since the cost of living is so high in Gurugram. About 16% and 20% look forward to more publicity about segregation wherein 12% from the Zone 1 and 2 of MCM said that the Municipal Corporations must take the initiative to disseminate more information on safety measures, followed by eight per cent from the Zone 1 and 2 of MCM and four per cent respondents from zone's of MCG opined free housing facility and four per cent and eight per cent expected supply of food on a daily basis and regular health check-ups free of cost. The respondents' work begins early in the morning, and hence, it is a challenge for them to prepare food early. With regard to health check- ups, since the cost of living is high, it is difficult to spend money on health check-ups and medication. Hence, it is a prior expectation of the sanitary workers from the Municipal Corporation management. About four per cent respondents from zone's of MCG are expecting application of latest equipment, technology, and vehicles to manage waste effectively.

Table 4.1.25: Major Health Issues faced by Solid Waste Collectors

Major Health Issues	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N = 50 (Per cent)			
	Yes		**No**	
Skin allergies	13(52)	18(72)	12 (48)	7(28)
Tuberculosis	4 (16)	11(44)	21(84)	14(56)
Asthma	5 (20)	13(52)	20(80)	12(48)
Frequent fevers	7(28)	21(84)	18(72)	4(16)
Arthritis	5(20)	14(56)	20(80)	11(44)
Eye allergies	9(36)	12(48)	16(64)	13(52)
Daily headaches	9(36)	16(64)	16 (64)	9(36)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Health is wealth. If an individual has good health, his productivity will increase. The individual can contribute more for the development of the nation. The solid waste collectors (household workers) are addressing various health issues; they are extremely vulnerable to chronic diseases. The Gurugram city sanitation workers are suffering from skin allergies, tuberculosis, asthma, fever, arthritis, eye allergies, and daily headaches. As many as 52% and 72% from both the Municipal Corporations suffer skin allergies. Loading of waste manually without the use of protective measures is dangerous to the health of the workers (Naveen & Sivapullaiah, 2016). Heavy weightlifting during waste collection leads to major joint pains. Musculoskeletal disorders of the neck, shoulders, and arms along with low back pain are addressed by the waste collection workers (Athanasiou et al., 2010). On the whole, it was observed that skin allergies, frequent fevers, and daily headaches are the major health issues addressed by the Municipal Corporations solid waste collectors.

The other diseases were not common among the respondents such as tuberculosis (84% and 56%) and eye allergies (64% and 52%). Few of the diseases had contradictory results between the zones such as 80% respondents from zone's of MCG never had asthma, and 52% respondents from the Zone 1 and 2 of MCM had Asthma. About 84% from the Zone 1 and 2 of MCM had frequent fevers and 72% from zone's of MCG never frequent fever. About 80% respondents from zone's of MCG never had arthritis and 56% had arthritis in the Zone 1 and 2 of MCM. About 64% each, from zone's of MCG never had headaches daily, and from the Zone 1 and 2 of MCM had headaches.

Table 4.1.26: Sanitary Workers Expectations from State Government

Expected support from State Government	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG		**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM	
	N = 50 (Per cent)			
	Yes		**No**	
Promotion of special health schemes at Government and Corporate hospitals	25(100)	25(100)	0(0)	0(0)
Free LPG connection and supply facility	21(84)	16(64)	4(16)	9(36)
Free travel facility in public transportation	20(80)	25(100)	5(20)	0(0)
Free education for children	25(100)	25(100)	0(0)	0(0)
Special housing schemes	21(84)	23(92)	4(16)	2(8)
Provision for reservation in government jobs	25(100)	25(100)	0(0)	0(0)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Sanitation workers are facing many socio-economic and cultural issues in society. They expect better facilities and special provisions for the uplift of their community. Health is the basic requirement of every individual and sanitation workers are more prone to opportunistic diseases due to their occupational environment. Table 4.1.26 states the expectation of services from the State Government by the respondents. All 100% respondents from both the zones expect promotion of special health schemes in Government and Corporate hospitals such as provision of free health check-ups and distribution of medication for minor diseases, followed by free education for children as well as provision for reservation in government jobs. A majority of 84% and 64% from both the Municipal Corporations had expectation of free LPG connection and supply services, followed by 80% and 100% respondents from both the Municipal Corporations for free travel facility in public transportation, 84% and 92% from both the Municipal Corporations expect a special housing schemes for sanitary workers, and 100% each respondents from both the Municipal Corporations expect reservation in Government jobs for them or for their children.

4.2 People (Residents') Participation in Solid Waste Management

The most numerous category of people who have a stake in waste management are residents, also known as households. Residents' roles as waste producers, customers of waste services, information receivers, and participants in the mobilization of waste management and urban cleanliness are only some of the many facets of their varied activities. According to Annepu (2012), the rate of trash creation per capita in India has increased from 0.44 kg/day in 2001 to 0.5 ka/day in 2011, primarily as a result of changing lifestyles and increasing spending power of urban Indians. This growth can be seen in the graph below. The Indian Constitution makes it clear in Article 51A(g) that it is the individual's responsibility to take steps to preserve the natural world.

The following section enumerates about the residents' participation in waste management. The data has been collected through interview schedule used as testing tools.

Table 4.2.1: Demographic Profile of household respondents

Demographic details		**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
		N=150 (%)	**N=150 (%)**
Gender	Male	80(53)	108 (72)
	Female	70(47)	42 (28)
Religion	Hindu	136(91)	134(89)
	Muslim	12(8)	11(7)
	Christian	2(1)	4(3)
	Others	0(0)	1(1)
Age (in years)	17-20	17(10)	15(11)
	21-24	19(13)	13(9)
	25-28	40(27)	21(14)
	29-32	27(18)	28(19)
	33-36	15(10)	12(8)
	37-40	13(9)	23 (15)
	41-44	4(3)	8(5)
	45-48	7(5)	11(7)
	49-54	3(2)	10 (5)
	55-60	5(3)	7 (5)
	60- 64	0(0)	0(0)
	65-69	0(0)	0(0)
	70 and above	0(0)	2 (1)
Qualification	Upto SSLC	37(24)	49(33)
	PUC	46(31)	46(31)
	Graduation	41(28)	29 (19)
	Post-Graduation	17(11)	17(11)
	Professional course	9(6)	9(6)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.2.1 represents the demographic details of the household respondents zone-wise. The first column depicts the gender of the respondents as one of the important variables for the present study because it reflects awareness and participation in the management of solid waste between the genders. In the present study, 72% and 53% were male respondents and 28% and 47% were female respondents drawn from the Zone 1 and 2 of MCM and zone's of MCG. It reflects that most of the respondents are males from both the zones. The immediate column examines the religion of the respondents shows that, 91% and 89% are Hindus, followed by eight per cent and seven per cent Muslims, one and three per cent are Christians from both the Municipal Corporations, and only one per cent from Zone 1 and 2 of MCM belonged to other religion. As per the Census report 2011, Hindu is one of the major religions in the MUNICIPAL CORPORATIONS GURUGRAM AND MANESAR.

Further, the table presents the age of the respondents. The study had covered respondents of 17yrs as young respondents and 70yrs and above as household respondents. About 27% respondents from zone's of MCG fall under the age group of between 25 to 28yrs, and 19% belong to 29-32yrs of age group in the Zone 1 and 2 of MCM. Hence, it is evident that many respondents are in under potential age group, however, it can be attributed that young minds can possibly bring about positive change towards solid waste solutions.

The educational qualification of the respondents is also important because the study explores their participation in the management of solid waste produced at individual generation point. About 33% from Zone 1 and 2 of MCM and 24% from zone's of MCG had studied upto SSLC, 31% each from both the Municipal Corporations had studied up to PUC, 28% and 19% from zone's of MCG and Zone 1 and 2 of MCM could complete graduation degree, 11% each respondents were Post graduates, and six per cent each from both the Municipal Corporations had studied professional courses.

Joseph Kurian (2006) explains that residents play a predominant role in waste management such as proper storage of garbage at house/ premises, segregation at source level, setting out of garbage at the agreed time and place, using official landfills or sites in the absence of door-to-door collection, encouraging 3Rs (Reduce, Reuse, Recycle) principles at home, and participating in environmental clean activities with neighbours.

Table 4.2.2: Housing Pattern of household Respondents

Housing Pattern		**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
		N=150 (%)	**N=150 (%)**
Housing type	Rent	55(37)	71(47)
	Own	47(31)	69(46)
	Leased	48(32)	10(7)
Form of House	Pukka	87(58)	104(69)
	Kuccha	63(42)	46(31)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Housing is the basic need of an individual. The housing pattern indicates the lifestyle of the people. Housing protects human beings from floods, rain, and stagnant water, which are the breeding places for mosquitoes and other insects. These are the key factors in the spread of infectious diseases in communities.

Table 4.2.2 explains the housing pattern and type of house of the household respondents. As many as 37% and 47% respondents from zone's of MCG and Zone 1 and 2 of MCM reside in rented houses, which shows that many of the respondents do not own a house. About 31% and 46% respondents in zone's of MCG and Zone 1 and 2 of MCM have own houses, followed by 32% and seven per cent respondents from both the Municipal Corporations live in leased house. The table further explains about the type of houses in existence. As many as 58% in zone's of MCG and 69% respondents in Zone 1 and 2 of MCM reside in pukka houses and the remaining 42% and 31% respondents live in kuccha houses. The rates of trash generation are increasing, and the nature of the waste are changing, as a direct result of the rise in population, industrial growth, and living standards, in particular in rapidly expanding cities like Gurugram. A reasonable mechanism for the collection and disposal of municipal solid waste could as well be a pipe dream given the limited financial resources available (Sasikumar & Krishna, 2014).

Table 4.2.3: Number of Family Members in Respondent's Family

Classification		Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG	Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2 MCM
		N=150 (%)	**N=150 (%)**
Number of family members	Two	31 (21)	62 (41)
	Three	77 (51)	68(45)
	Four	34(23)	18(12)
	Five	7 (5)	1 (1)
	Six and more	1(1)	1(1)
Number of elderly members	One	10(7)	16 (11)
	Two	5(3)	33 (22)
	Three	63 (42)	53(35)
	Four	42 (28)	39 (26)
	Five	25 (17)	7 (5)
	Six and more	5 (3)	2 (1)
Number of children in the family	Childless Family	97 (65)	102 (68)
	One	45 (30)	33 (22)
	Two	8 (5)	15 (10)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Family is the primary institution in a social structure. Family includes elders, children, and adults. It is viewed that there is direct connection between waste generation and number of family members.

Table 4.2.3 highlights the number of members in the respondent's family. The number of family members is very important in the study because in waste generation each member of the family takes a direct part. As many as 51% and 45% respondents from zone's of MCG and Zone 1 and 2 of MCM had three members in the family. About 21% and 41% respondents from zone's of MCG and Zone 1 and 2 of MCM, respectively, have with two members in the family, showing that in both the Municipal Corporations there is prevalence of the nuclear family system. Again, 23% and 12% respondents have with four members; five and one per cent are living with five members in the family, and one each per cent from both the Municipal Corporations are living with six and more members as part of the family.

Further, the next row depicts the number of elderly living in the family. As many as

42% and 35% respondents had three elderly members in the household, followed by 28% and 26% respondents in zone's of MCG and Zone 1 and 2 of MCM, respectively, live with four elders at home; 22% and three per cent live with two elder members, whereas 11% and seven per cent respondents in the Zone 1 and 2 of MCM and zone's of MCG, respectively, have only one elder member in the family; 17% and five per cent respondents have five elderly members at home, and three per cent and one per cent from zone's of MCG and Zone 1 and 2 of MCM, respectively, have six elderly members in the family.

The third row examines the number of children in the family. About 65% respondents in zone's of MCG and 68% respondents in Zone 1 and 2 of MCM mentioned no school going children or below fourteen years children in the family, but grown-ups or adult members were included,30% and 22% respondents from zone's of MCG and Zone 1 and 2 of MCM have only one child; five per cent from zone's of MCG and 10% respondents from Zone 1 and 2 of MCM have two children in the family. The raising quality of life and high rate of resource consumption have negative impact on waste generation and present a challenge to the government and other agencies (Agamuthu et al., 2010).

Table 4.2.4: Employment Details of Household Respondents

Type of employment	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N=150 (%)	**N=150 (%)**
Employed for wages	49 (33)	72 (48)
Self-employed /Business	27 (18)	35 (23)
Employed in Military	26 (18)	16 (11)
Student	23 (15)	12 (8)
Professional Job	6 (4)	11 (7)
Job Aspirant	9 (6)	1 (1)
Homemaker	3 (2)	2 (1)
Teacher	3 (2)	1 (1)
Employed in Garment	2 (1)	0 (0)
Unable to work	2 (1)	0 (0)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Employment is the source of livelihood. In the present study, employment sources are very important because the level of income determines the lifestyle of the individual.

Table 4.2.4 sets forth the employment details of the respondents from both the Municipal Corporations. About 33% and 48% respondents are daily wage earners,18% and 23% respondents are self- employed, and 18% and 11% respondents are in the military from zone's of MCG and Zone 1 and 2 of MCM, respectively. About 15% and eight per cent respondents are students, four per cent and seven per cent are holding professional jobs, six per cent and one per cent are job aspirants, from both the Municipal Corporations, respectively. About two per cent and one per cent are women and homemakers, two per cent and one per cent respondents are working as teachers from both the Municipal Corporations; one percent from zone's of MCG is employed in garments, and one per cent reported being unable to work, however they are employed none.

Table 4.2.5: Duration of Stay in their Respective Ward

Duration of Stay	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N=150 (%)	**N=150 (%)**
Permanent resident	74 (49)	69(46)
More than 1 year but less than 3 years	30 (20)	46 (31)
More than 3 year but less than 10 years	23 (15)	21 (14)
More than 10 years	16 (11)	11 (7)
Less than one year	7 (5)	3 (2)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Dwelling place means residence or living in a particular locality, it may be permanent or temporary domicile. Residential information is important for the present study as it helps to explore the quantum of waste extracted over the years, and exhibits community observation about the prevailing practices of waste management.

Table 4.2.5 explains the duration of stay of the respondents in their respective wards. About 49% respondents from zone's of MCG and 46% respondents from Zone 1 and 2 of MCM were permanent residents in their respective wards, and this shows that most of the respondents have stayed in this area for a long time; permanent residents' ratio is more in less waste generated ward than more waste generation ward; Followed by as many as 20 % and 31% respondents from both the Municipal Corporations have been residing for more than one year and less than three years; and respondents from both the Municipal Corporations who have been residing more than ten years is 11% in zone's of MCG and 7% in Zone 1 and 2 of MCM.

This endorses community participation with duration of stay of respondents in their respective wards. And in the present study, majority of the respondents are permanent dwellers of their areas, and hence, they are in a better position to analyze and compare the waste management process and situation. The severity of the issue of waste management rose in 2012, when waste had accumulated and piled- up on both the sides of the streets and footpaths for many days. From then onwards, waste management become a challenge to the Municipal Corporations.

Table 4.2.6: Sanitary Workers Performance Assessed by Household Respondents

Classification		**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
		N=150 (%)	**N=150 (%)**
Handling of waste	Excellent	32 (21)	46 (31)
	Good	77 (52)	37 (25)
	Sufficient	35 (23)	54 (35)
	Poor	6 (4)	10 (7)
	Very poor	0 (0)	3 (2)
Response towards residents' recommendations	Excellent	16 (11)	21 (14)
	Good	55 (37)	56 (38)
	Sufficient	53 (35)	47 (31)
	Poor	21 (14)	20 (13)
	Very poor	5 (3)	6 (4)
Overall rating	Excellent	31 (21)	10 (7)
	Good	73 (49)	118 (78)
	Sufficient	34 (22)	17 (11)
	Poor	12 (8)	4 (3)
	Very poor	0 (0)	1 (1)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Sanitation workers are in direct contact on a daily basis with the residents. The rating given by the residents is important to assess the performance of the workers. Table 4.2.4

shows the first row as s the opinions of household respondents on the handling of waste by sanitary workers. About 52% respondents from zone's of MCG rated it as good, and 35% from the Zone 1 and 2 of MCM said it is sufficient. This indicates that residents from both the Municipal Corporations are expecting better services from the sanitation workers. With regard to overall work done by sanitary workers, 49% and 78% household respondents from zone's of MCG and Zone 1 and 2 of MCM rated it as good, followed by 22% and 11% as satisfactory. However, the performance of the sanitary workers could be rated overall as good. In conclusion, the household respondents seem to be satisfied by the work done by the sanitary workers, but expect better services, and mentioned need for more training on waste management for the sanitation workers for work efficiency.

Table 4.2.7: Waste Disposal Practices among Household Respondents

Waste disposal practices	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N=150 (%)	**N=150 (%)**
Burning	46 (31)	90 (60)
Burying near dump site	21(14)	5 (3)
Discarding in ward containers	19 (12)	24 (15)
Throwing on street	18 (12)	10 (7)
Handing over to waste collectors	15 (10)	10 (7)
Burying in the backyard	14 (9)	3(2)
Burying near open drainages	9 (6)	3 (2)
Don’t know	8 (5)	3 (2)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The process of getting rid of unwanted material or items is known as waste disposal mechanism. Basically, different types of waste disposal methods are in practice, with the important being reducing waste generation, recycling waste through incineration, composting, sanitary landfills, etc. The waste disposal methods followed by the residents are very important in the present study because waste is generated by every individual. Hence, it is the responsibility of each individual to learn to manage waste at the generation point.

Table 4.2.7 highlights that 60% respondents from the Zone 1 and 2 of MCM and 31% respondents from zone's of MCG are said to burn the waste. From this, it can be assumed that households from the Zone 1 and 2 of MCM waste more than the zone's of MCG. Waste burning produces a wide variety of pollutants detrimental to human health. Buried waste releases toxic emission from different chemicals, and produces toxic ash and other residues, which are harmful to human health. About 14% and three per cent from zone's of MCG and Zone 1 and 2 of MCM bury the waste near the dump site, 12% and 15% household respondents discard waste in their respective ward containers provided by the Municipal Corporations, 12% and seven per cent throw it on the street, 10% and seven per cent dispose at waste collectors, nine per cent and one per cent bury waste in the backyard, six per cent and two per cent bury the waste near open drainages, and five per cent and two per cent do not know waste disposal practices as it is done by a family member, instead of them.

Table 4.2.8: Waste Collection and Frequency of Waste Collection

Classification		**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
		N=150 (%)	**N=150 (%)**
Waste collection by Sanitary workers	Yes	99 (66)	114 (76)
	No	51 (34)	36 (24)
Waste collection frequency from residents	Daily	72 (48)	107 (71)
	Twice a week	20 (14)	19 (13)
	Once a week	23 (15)	6 (4)
	No collection system	17 (11)	9 (6)
	Don't know	18 (12)	9 (6)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The term "waste collection" refers to the act of collecting solid trash from the location where it was produced (including residential, industrial, commercial, and institutional locations) to the location where it will either be treated or disposed of. Municipal solid waste is collected in several ways such as house- to- house, community bin, curbside pick- up, self-delivered and contracted, etc.

In the present study, an attempt was made to explore the opinion of household respondents on waste collection and frequency of waste collected by the sanitary workers. The table explains that 76% and 66% from the Zone 1 and 2 of MCM and zone's of MCG opined that sanitary workers collect waste from the residents, and 34% and 24% respondents from both the Municipal Corporations mentioned that sanitary workers do not collect waste. Through this it can be understood that sensitization programme on waste collection to the general public should be taken up seriously and compulsorily by the Municipal Corporations. In the next row, 71% and 48% household respondents from zone's of MCG and Zone 1 and 2 of MCM said waste is collected on a daily basis, 14% and 13% opined waste collected twice a week, 15% and four per cent said once a week waste 11% and six per cent said there is no waste collection system at all, and 12% and six per cent from zone's of MCG and Zone 1 and 2 of MCM do not know the frequency of waste collection. Though there is a provision of waste collection from the houses on a daily and weekly basis, it seems that few respondents from zone's of MCG and Zone 1 and 2 of MCM are unaware of the frequency of waste collection.

Table 4.2.9: Waste Disposal Handled by Household Family Member

Respective Family Member	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N=150 (%)	**N=150 (%)**
Mother	35 (23)	78 (52)
Father	35 (23)	17 (11)
Children	60 (40)	34 (23)
Maid	8 (6)	14 (9)
Friend	5 (3)	5 (3)
Husband	4 (3)	1 (1)
Wife	2 (1)	0 (0)
Respondent	1 (1)	1 (1)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The table mentions the family member who disposes the wastes daily. Waste disposal is the most important process in sustainable waste management. It includes segregation of dry waste and wet waste into different bins along with recycling wastes. Many literatures have highlighted that proper waste disposal helps sanitation workers to work more efficiently. In the Indian social system, the kitchen and household work are done by women.

In both the zones, it is the women who are disposing the waste regularly. About 52% women (mother) from Zone 1 and 2 of MCM and 23% from zone's of MCG handle the waste. From zone's of MCG, it is 23%, and 11% men (father) from Zone 1 and 2 of MCM, who dispose wastes, followed by 40% and 23% children, who dispose waste, and six and nine per cent housemaid, who dispose of the waste. Three per cent each from both the Municipal Corporations said friend disposes waste, three and one per cent said husband dispose wastes from both the Municipal Corporations, one per cent wife from zone's of MCG, and one each self from both the Municipal Corporations dispose waste in their respective wards.

Table 4.2.10: Handling of Recyclable Wastes

Classification		**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
		N=150	**N=150 (%)**
Handling of recyclable wastes	Segregation of recyclable wastes for selling	57(38)	106 (71)
	Mixing with other waste	50 (33)	20 (13)
	Giving it to others for reuse	12(8)	3(2)
	Separate it for own reuse	10 (7)	6(4)
	Don't know	21(14)	15(10)
Handling of (organic) kitchen wastes	Feed it to the animals	34 (23)	100(67)
	Discarding in ward container	34 (23)	13(9)
	Disposing on streets	36 (24)	7(5)
	Leave it to be collected from houses	22 (14)	16(10)
	Use as compost	7 (5)	5(3)
	Throwing in the open drainages	6 (4)	2(1)
	Don't know	11 (7)	7(5)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Converting waste materials into new materials and objects is called recycling. Recyclable materials includes paper, glass, cardboard, metal, plastic, cloth, electronic items, and many more. Other biodegradable wastes such as kitchen waste and garden waste are also considered for recycling.

The recycling of waste is one of the prominent methods of proper waste management. In the present study, it was found that most of the respondents are aware of the ways to handle recyclable wastes. As much as 71% household respondents from Zone 1 and 2 of MCM and 38% respondents from zone's of MCG were actively engaged in segregation of recyclable wastes for the purpose of selling, less than half of 33% and 13% respondents from zone's of MCG and Zone 1 and 2 of MCM mix waste with other waste, seven and four per cent separate waste for domestic reuse, eight and two per cent handover waste to others for reuse from both the Municipal Corporations, respectively, and 14% and 10% respondents do not know how to recycle waste.

The table further explains about organic waste management. A majority of 67% from Zone 1 and 2 of MCM and 23% from zone's of MCG opined that they feed the kitchen wastes to the domestic animals. Recycled feed is fifty per cent cheaper than other standard animal feed. Residual food recycling is economically beneficial for the animal fodder industry. A statement says that in Japan, food waste is used as fodder for piggery and poultries. The unused meat collected from these farms were the recycled along with food waste have been used as fodder process, has high demand in market (Maeda, 2008).

About 23% and nine per cent said they discard waste in ward container, 24% and five per cent discard waste on the streets, five and three per cent use kitchen waste as compost for, four and one per cent throw it in open drainages, and seven and five per cent do not know how to handle kitchen wastes.

Further results could be viewed as feeding of waste to domestic animal's leads to animal attacks such as stray dogs, crows, vultures number would also increase and they attack the children and other vulnerable very easily. 'This may cause arousal of many other environmental issues due to food wastes. Land filling produces larger quantities of greenhouse gases' opine Makkar and Ankers (2014).

The programme is successful due to the fantastic 3 bins programme, where black, blue, and green bins are respectively used for trash, recycling, and composting. The city took two decades for behavior and cultural shift in the whole of country.

From the table it is clear that the residents are aware about the segregation of recyclable wastes, but motivation is needed for the same as organic waste management is considered in both the zones, at least by few respondents. Further more emphasis is needed on the segregation of organic wastes and encouragement for compost production. The accumulated food wastes on streets leads to pollution, which is generally not a good sign of citizens' responsibility, and may have an adverse impact on the health of both humans and animals.

Table 4.2.11: Reasons for Practicing Waste Management

Classification		Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG	Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2 MCM
		N=150 (%)	N=150 (%)
Reasons for practicing waste management	Doing it because everyone does it	35 (23)	108 (72)
	Nothing is wrong with current waste management process	43 (29)	15 (10)
	There would be problems at the end	21 (14)	15 (10)
	No opinion	51 (34)	12 (8)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.2.11 reflects the reasons for practicing waste management. It has been said that 72% from Zone 1 and 2 of MCM and 23% from zone's of MCG practice waste management process because others are doing it, without knowing its importance, Few respondents from zone's of MCG i.e., 29% & 10% from respective wards opined that the present waste management process is the proper one to practice, 14% and 10% from zone's of MCG and Zone 1 and 2 of MCM felt that problems would arise in the end if they did not segregate waste, hence, they followed it, and 34% and eight per cent respondents do not know the process of waste management at all.

Hence, it can be concluded that people from both the Municipal Corporations, are not much bothered about the management of waste. The reflection shows that the respondents in the study does practice waste management as others follow it, but they don’t know the reality of it. The citizens talks about it in a platform, rather neither action nor initiatives have been taken up with regard to waste management. It seems that in zone's of MCG, the residents are comfortable with the prevailing system, where they look for neither welfare nor development of the ward.

Table 4.2.12: Level of Awareness on Impact of Improper Waste Management

Level of awareness	Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG		Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2 MCM	
	N=150 (%)		N=150 (%)	
	Yes	No	Yes	No
Affects personal health	80(53)	70(47)	134(89)	16(11)
Pollution in area	123 (82)	27(18)	133(89)	17(11)
Littering of solid waste in neighbourhood leads to waste accumulation	103 (69)	47(31)	91(61)	59(39)
Endangers fish catchment and other species	43(29)	107(71)	45(30)	105(70)
No opinion/ Don't know	27(18)	123(82)	31(21)	119(79)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

In the table, an attempt has been made to highlight the residents' awareness on the impact of improper waste management. As many as 89% residents of the Zone 1 and 2 of MCM and 53% from zone's of MCG opined that improper waste management process directly on affects an individual's personal health, where in 89% and 82% residents of both the Municipal Corporations viewed that improper waste management pollutes the living area respectively. More than half, i.e., 69% from zone's of MCG and 61% from the Zone 1 and 2 of MCM stressed that littering in the neighbourhood led to waste accumulation, followed by 71% and 70% mentioned it does not endanger the fish and other species, 82% and 79% respondents did not know the impact of improper waste management from both the Municipal Corporations, respectively. Overall, the Zone 1 and 2 of MCM residents have better awareness of the impact of improper waste management process than the zone's of MCG study area.

Table 4.2.13: Opinion on Existing Community Containers for Waste Disposal

Waste disposal containers	Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG		Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2 MCM	
	N=150 (%)		N=150 (%)	
	Yes	No	Yes	No
It is far away from the house	113(75)	37(25)	103(69)	47(31)
Too small to contain solid wastes	109(73)	41(27)	103(69)	47(31)
Produces unpleasant odour	117(78)	33(22)	87(58)	63(42)
Size of the container is sufficient	107(71)	43(29)	104(69)	46(31)
Satisfied with community containers	121(81)	29(19)	86(57)	64(43)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The table investigate the practices that are utilized for the disposal of garbage, namely the community containers that are already in place in the wards that are the focus of this research. The phrase "municipal solid waste" refers to a heterogeneous combination that can include things like paper, cloth, metal, glass, and organic materials. This mixture can be generated in homes, commercial facilities, and marketplaces. The amount of garbage produced varies from one season to the next and from one location to the next based on the lifestyle, eating habits, standard of living, and the degree to which industrial and commercial activities are prevalent in the area.

Community bins have been established across the wards by municipal corporations in order to collect rubbish and to give better waste management services to the residents of the community. This enables the local administrative body to transport the garbage that has been gathered with greater ease. This facility is made available for the residents of the wards to utilize in the event that they are not home during the door-to-door collection that is performed by the sanitation employees employed by the Municipal Corporations. The goal is to eliminate the practice of dumping solid garbage in the neighborhood, whether it be on streets or in open areas, in drains or in bodies of water.

About 75 percent and 69 percent of residents of the zones of MCG and Zone 1 and 2 of MCM felt that the instilled dustbins were too far away from the houses, 73 percent and 69 percent respondents viewed that the dustbins were too small in size, 78 percent and 58 percent from both the Municipal Corporations shared that the dustbins produced unpleasant odors when overloaded with soiled wastes, respondents from both the zone, i.e. 71 percent and 69 percent

In general, the respondents from both zones were dissatisfied with the existing circumstances of the community containers. This was due to the absence of a separate community container that could differentiate between hazardous and non-hazardous trash at the disposal level.

The local administrative bodies should request that voluntary organizations, community-based organizations, non-governmental organizations, and other welfare associations mobilize street rag pickers to prevent them from picking soiled and contaminated solid waste from community bins and streets and disposal sites. Instead, they should sensitize them to the idea of collecting recyclable clean materials from doorsteps. This will allow the street rag pickers to keep their jobs and protect the environment.

Table 4.2.14: Opinion on Existing Domestic Waste Disposal Site in Ward

Current domestic waste disposal site	Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG N=150 (%)		Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2 MCM N=150 (%)	
	Yes	**No**	**Yes**	**No**
Anybody can throw the waste	108(72)	42(28)	94(63)	56(37)
Anything can be thrown there	113(75)	37(25)	85(57)	65(43)
Site produces foul odour	124(83)	26(17)	103(69)	47(31)
No opinion / Don't know	134(89)	16(11)	80(53)	7047)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Garbage dumping ground or site is a place for the disposal of waste materials. This form of waste treatment has been practiced since many generations. Table 4.2.14 presents the residents' opinion about existing waste disposal sites in the present study**.** About 72% respondents from zone's of MCG and 63% from Zone 1 and 2 of MCM expressed that anybody can throw waste in the site, followed by 75% and 57% respondents of the same zone shared that anything can be thrown in the site, 83% and 69% respondents opined that the site produced foul odours in the area, and 89% and 53% respondents did not know about the existing disposal site.

Illegal dumping or landfills produce odours and gas. The most common gases produced are ammonia sulfide, methane, and carbon dioxide. Methane and carbon dioxide would be produced by the nearby buildings could also displaces oxygen, the pollutants generated may also lead to irritation in the respiratory system and cause difficulty in breathing and trigger asthma attacks.

Table 4.2.15: Awareness of Impact of Waste Dumping in Open Sites

Impact of open dumping sites	Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG N=150 (%)		Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2 MCM N=150 (%)	
	Yes	**No**	**Yes**	**No**
Public health risk	111(74)	39(26)	135(90)	15(10)
Ground water contamination	117(78)	33(22)	105(70)	45(30)
Leads to eyesore with unpleasant odours	126(84)	24(16)	100(67)	50(33)
Uncontrolled waste dumping at the sites	118(79)	32(21)	105(70)	45(30)
Availability of sufficient community containers	119(79)	31(21)	95(63)	55(37)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Awareness among household respondents on the impact of waste dumping in open sites is to be acknowledged. If their awareness level is high, then it can reduce waste dumping in open sites. However, the concerned department has to take necessary measures to increase the awareness level of the public in general, since its the responsibility of all the citizens. The table indicates respondents' awareness on the impact of waste dumping in open sites. A majority of 90% and 74% residents from Zone 1 and 2 of MCM and zone's of MCG are aware of public health risk in general, 78% and 70% residents of zone's of MCG and Zone 1 and 2 of MCM are aware that dumping of waste in open sites leads to ground water contamination, 84% and 67% respondents from both the zones mentioned eyesore with unpleasant odours as an impact of waste dumping respectively, 79% and 70% respondents from both the Municipal Corporations opined that uncontrolled waste dumping was increasing in the sites, and 79% and 63% mentioned that community had sufficient containers to procure waste from both the Municipal Corporations respectively.

To sum up, people from both the Municipal Corporations are well aware about the impact of waste dumping in open sites.

Table 4.2.16: Residents' Involvement in Recycle and Reuse of Waste

Recycle and reuse practices	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG		**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM	
	N=150 (%)		**N=150 (%)**	
	Yes	**No**	**Yes**	**No**
Currently segregating recyclable goods	120(80)	30(20)	132(88)	18(12)
Currently separating compostable wastes	35(23)	115(77)	74(49)	76(51)
Willing to separate compostable wastes	61(41)	89(59)	102(68)	48(32)
Willingness to contribute to safe disposal of solid wastes	91(61)	59(39)	70(47)	80(53)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The table shows an assessment of household respondents' involvement and willing to be part of recycle and reuse practices of wastes. It seems that many household respondents have concern over recycle and reuse of waste production, however, many of them making use of waste. A majority of 80% and 88% residents from zone's of MCG and Zone 1 and 2 of MCM are aware of waste recycle and currently segregating recyclable waste according to the table, 77% and 51% residents from both the Municipal Corporations are not separating compostable waste, 59% residents from zone's of MCG are not willing to separate compostable waste, 68% residents from Zone 1 and 2 of MCM have shown their willingness to separate compostable waste, 61% from zone's of MCG are willing to contribute for safe disposal of solid waste, and 53% respondents from Zone 1 and 2 of MCM did not show willingness to contribute for safe disposal of solid waste.

Table 4.2.17: Respondents' Willingness to Contribute for Solid Waste Management

Willingness	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG		**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM	
	N=150 (%)		**N=150 (%)**	
	Yes	**No**	**Yes**	**No**
Bringing garbage to municipality container	103(69)	47(31)	128(85)	22(15)
Brining own and neighbour's garbage to municipality container	77(51)	73(49)	29(19)	121(81)
Segregating recyclable wastes	73(49)	77(51)	127(85)	23(15)
Segregating organic wastes for compost	61(41)	8959)	127(85)	23(15)
Voluntarily cleaning litter around community containers	49(33)	101(67)	107(71)	43(29)
Cleaning litter around the site	40(27)	110(73)	88(59)	62(41)
Ready to pay waste management fees as charged by municipality	98(65)	52(35)	77(51)	73(49)
Ready to pay extra service cost for sanitation workers	84(56)	66(44)	70(47)	80(53)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

In the table, the resident's willingness to contribute for effective solid waste management process has been assessed. It was found that more than half i.e., 69% & 85% from zone's of MCG and Zone 1 and 2 of MCM follow the method of dumping of waste by self in the municipality container, 51% and 19% respondents not only bring their own waste but also their neighbour's / neighbours' from both the Municipal Corporations respectively, Less than half of the respondents i.e., 49% from zone's of MCG and 85% from Zone 1 and 2 of MCM said that they segregate recyclable wastes, where in again less than half respondents i.e., 41% & 85% respondents from both the wards segregate organic wastes for compost, 67% from zone's of MCG did not volunteer to clean the litter around the community containers, 71% Zone 1 and 2 of MCM showed willingness to clean, 73% from zone's of MCG did not show willingness to clean the litter around the site, 59% from Zone 1 and 2 of MCM showed their willingness, 65% and 51% respondents from both the Municipal Corporations were ready to pay waste management fees charged by the municipality, 56% respondents from zone's of MCG were ready to pay extra for sanitary workers, and 53% from Zone 1 and 2 of MCM did not show willingness to pay the sanitary workers. The comparison shows that the voluntarism is more in zone's of MCG compared with the Zone 1 and 2 of MCM.

Table 4.2.18: Citizens' participation in solid waste management

Categories		**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG		**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM	
		N=150 (%)		**N=150 (%)**	
		Yes	No	Yes	No
Citizens' Participation	Regular payment of service cost	90(60)	60(40)	129(86)	21(14)
	Voluntarily joining in waste management process	52(34)	98(65)	115(76)	35(23)
	Voluntarily involving in creating awareness in community	51(34)	99(66)	110(73)	40(26)
	Assisting the ULB for affective implementation of waste management programme	43(28)	107(71)	110(73)	40(26)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Participation on the part of citizens offers them an opportunity to have an impact on decisions that affect the public and is an essential element of the democratic decision-making process.

Interventions in the process of managing solid waste have been made throughout the years in the city of Gurugram by civil society organizations, individual residents, and a combination of the two. In order to successfully implement waste segregation at the source and achieve effective management of solid waste, gaining the participation of a large number of citizens would be an essential component.

Because street sweeping is the most prevalent method of waste collection in Asian cities, it is highly typical for residents to throw their trash out onto the streets. Participation from the public at the point of generation in the form of source segregation and door-to-door pickup can significantly cut down on the habit of tossing garbage out onto the street as well as on other hazardous behaviors. It is imperative that the communities come forward voluntarily to take on either a partial or whole investment in the management of the local services.

Table 4.2.19: Opinion on Implementation of Swacha Bharath Programme

Opinion on Swacha Bharath Programme	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N=150 (%)	**N=150 (%)**
Protection towards environment	39(26)	13(9)
Heard about it, but don't have much knowledge	35(23)	73(48)
Keeps city clean and protects from chronic diseases	26(17)	7(5)
More propaganda is needed	24(16)	47(31)
Good initiative, but needs effective implementation	4(3)	0(0)
Very useful for waste management process	2(1)	0(0)
Encourages waste segregation at generation points	1(1)	1(1)
Emphasis on reuse and recycle of waste is needed	0(0)	1(1)
Good programme	1(1)	0(0)
Overall development of the nation	18 (12)	8(5)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The Swacha Bharath program is the most ambitious undertaking ever undertaken by the Government of India. The goal of universal sanitation is to eliminate all instances of public urination and excrement entirely. This program was initiated as a way to pay homage to Mahatma Gandhiji on the occasion of the 150th anniversary of his birth, and the mission's goal is to attain Swacha Bharath by the year 2019. The Swacha Bharath Mission-Urban programme was initiated with the purpose of bringing about an improvement in the level of cleanliness and hygiene as well as the overall quality of life in rural and urban areas. One of the key components of the programme is the management of solid and liquid resources, which includes waste management. The urban areas of India, which are estimated to be home to 660 million Indians by the year 2050, are the focus of the Swacha Bharath Mission - Urban. As of the end of the year 2016, urban India was home to 33 percent of the country's total population. It is anticipated that the urban population of India would reach 600 million by the year 2031. Since a rising number of people are moving from rural areas to urban areas, the urban population of India will also require special attention. Consequently, this goal was established so that improved sanitation and waste management services might be made available in the urban environment. In January of 2016, the Ministry of Housing and Urban Affairs inaugurated the annual Swachh Survekshan Survey, which rates 73 cities on their level of cleanliness. As of the year 2018, the number of to the program. In addition to this, 67,085 wards had a collection rate of one hundred percent door-to-door (Solid Waste Management Rules). The World Health Organization (WHO) has calculated that the country might be on pace to save 300,000 deaths due to diarrheal illness and protein-energy malnutrition if the government meets its goal of achieving 100 percent implementation of its cleaning push by the year 2019. (PEM).

In this regard, an effort was made to discover the opinions on the Swach Bharat Mission held by the respondents located in both zones. 26 percent and nine percent of respondents from both Municipal Corporations said that segregation protects the environment. 23 percent and 48 percent of respondents from zones's of MCG and Zone 1 and 2 of MCM had heard about the programme, but did not have much knowledge about it. 17 percent and five percent of respondents were of the opinion that the programme would be helpful in keeping the city clean and protecting against chronic diseases. 16 percent and 31 percent of respondents from both Municipal Corporations said that there is a need for propaganda regarding the programme. Three percent from zone's of MCG mentioned that the programme is a good initiative, but needs effective implementation, whereas opinion from the Zone 1 and 2 of MCM is nil. One percent from zone's of MCG opined that the programme is very useful for the waste management process, and one percent each from both the zones said that the programme encourages people to take part in the process

Table 4.2.20: Awareness of Existing Solid Waste Management Unit in Zonal (office) limits

Categories		**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
		N=150 (%)	**N=150 (%)**
Knowledge on existence of solid waste management	**Yes**	85 (57)	150 (100)
	No	65 (43)	0 (0)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.2.19 indicates the knowledge of solid waste management unit in the zonal limits. All the respondents, i.e., 100% from the Zone 1 and 2 of MCM are very well aware that bio-methanization plant exists in their zone, but in the zone's of MCG, only 57% respondents are aware about the existence of solid waste management unit in their zonal limits. It reflects that residents from Zone 1 and 2 of MCM have more knowledge about the existence of solid waste management unit in their zone.

Table 4.2.21: Assessment of pro-activeness of ward members towards solid waste management issues

Pro-activeness of ward members	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N=150 (%)	**N=150 (%)**
Yes	74(49)	73(49)
No	76(51)	77(51)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The members of the municipal corporation are elected by the people through direct elections. Table 4.2.21 highlights the pro-activeness of ward members towards solid waste management issues. An equal number of respondents from both the Municipal Corporations, i.e., 49% each respondents have been pro-active towards solid waste management issues and half of 51% respondents from each zone are not active in management of waste.

Table 4.2.22: Corporator's Involvement Indicating Activities

Activities	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N=150 (%)	**N=150 (%)**
Motivation for segregation and proper disposal	21(14)	15(10)
Awareness about preventive methods for chronic diseases	18(12)	11(7)
Creating awareness about cleanliness of ward	8(5)	22(15)
Identification of illegal dump yards	5(3)	6(4)
Conducting community level meetings	6(4)	3(2)
Timely arrangement of waste management equipment	6(4)	5(3)

Timely arrangement of waste storage containers and dustbins at the ward level	5(3)	4(3)
Motivating the community through various methods of IEC activities	4(3)	5(3)
Creating awareness in the sanitation workers	1(1)	2(1)
Not answered	76(51)	77(52)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.2.22 highlights the Corporator's involvement in disseminating knowledge on solid waste management. As many as 14% and 10% respondents from both the zones opined that the Corporator motivated them in segregation of waste and its proper disposals,12% and seven per cent opined that the Corporator provided awareness about preventive methods for chronic diseases, five per cent and 15% respondents from both the Municipal Corporations opined that the Corporator created awareness about cleanliness of wards, three and four per cent mentioned that Corporator attempted to identify illegal dump yards in their respective wards, four and two per cent opined that Corporator conducted community level meetings in the respective wards, four and three per cent said that they provided timely arrangement for waste management equipment, Very few i.e., three per cent each opined that the Corporator made a timely arrangement of waste storage containers, three per cent each opined that the Corporator motivated the community through various methods of IEC activities, one per cent each revealed that the Corporator created awareness among sanitation workers, and 51% and 52% did not answer.

Table 4.2.23: Reasons for Non-involvement of People's Representatives

Reasons for non- involvement	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N=150 (%)	**N=150 (%)**
Not listening to the demands of community people post-election	61(41)	19(13)
Ward members are not approachable	7(5)	54(36)
Lack of knowledge about waste management	5(3)	3(2)
Not specific about the issue	3 (2)	0 (0)
No strict action for offenders	0(0)	1(1)
Don't know	74(49)	73(48)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Ward members are representatives of the people who live in the ward. They provide a bridge between the community and the corporation. In turn, the residents expect the ward member to respond to their needs and requirements. Improper disposal of solid waste has become major issue in urban areas. Municipal solid waste management has become a global problem due to enhancement of economic activities and modernization.

In Table 4.2.23, 41% and 13% respondents from both the Municipal Corporations mentioned that the ward members make false promise until the election and, after the election never look back or visit the areas to visualize the solid waste management problems. About five per cent from zone's of MCG and 36% from Zone 1 and 2 of MCM said that elected ward representatives are not approachable to place their complaints, three and two per cent said that ward members lack knowledge about waste management, two per cent from zone's of MCG opined that elected representatives are least bothered about specific issues of solid waste management, and no responses were found from the Zone 1 and 2 of MCM, one response from Zone 1 and 2 of MCM said that no strict action was taken against offenders, who do not follow the waste management process by the elected representatives, and again no single opinion was heard from zone's of MCG, less than half i.e., 49% & 48% from each ward do not aware of all these matters.

Table 4.2.24: Residents' Suggestions for Effective Waste Management

Suggestion for effective waste management process	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N=150 (%)	**N=150 (%)**
Waste bins needs to be placed in all the streets	14 (9)	111 (74)
Door- to- door collection system needs improvement	33 (22)	5 (3)
Timely monitoring of / by SWM officers	32 (21)	20 (13)
Organizing ward level meetings and constant follow- up	18 (12)	2 (1)
Sufficient supply of covered waste collection vehicles to the wards	13 (9)	0 (0)
Encouragement of waste recycling	10 (7)	1 (1)
Supply of dustbins to individual households	8 (5)	3 (2)
Proper identification of dump sites	6 (4)	5 (3)
Separate waste containers for each streets	6 (4)	1 (1)

More community participation	6 (4)	0 (0)
Proper propaganda to public	3 (2)	1 (1)
Effective propaganda about disposal	1 (1)	0 (0)
Preventing of littering in empty spaces	0(0)	1(1)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

People's participation means close involvement of people in economic, social, and cultural and political processes that affects their lives. Participation is one of the elements of human development. Table 4.2.24 examines the resident's suggestions for effective waste management.

A majority of 74% respondents from Zone 1 and 2 of MCM and nine per cent from zone's of MCG opined that waste bins need to be placed in all the streets to collect waste, rather than littering it on the street, and 22% from zone's of MCG and three per cent from Zone 1 and 2 of MCM said that door -to- door collection has to be increased to bring improvement in the process of management of solid waste.

As many as 21% and 13% respondents said that there must be timely monitoring of Solid Waste Management by the concerned officers, 12% and one per cent opined that the officials should organize ward level meetings and constant follow- nine per cent respondents from zone's of MCG said there must be sufficient supply of covered waste collection vehicles to collect waste from the respective wards.

Only seven and one per cent residents from both the Municipal Corporations said that there must be encouragement for waste recycling, five and two per cent mentioned supply of dustbins to individual households, four and three per cent said officers should identify proper dump sites, four and one per cent said there should be separate waste containers for each street to collect waste, four per cent from zone's of MCG said their participation is must. Two per cent and one per cent residents stressed on proper propaganda among public, one per cent from zone's of MCG said there must be provision for effective propaganda about disposal of waste among community, and one per cent resident from Zone 1 and 2 of MCM said preference to be given to prevention of littering in empty spaces.

4.3 Entrepreneurs' and Marginal vendros Participation in Solid Waste Management in Municipal Corporations of Gurugram City

In this section, data relating to entrepreneurs and marginal vendors such as small hotels and street vendors of vegetable, fruit stalls, saloons, beauty parlours, slaughter shops, etc. has been analyzed and interpreted in Municipal Corporations of Gurugram City . All these respondents were interviewed to know their views and opinions on solid waste management.

Table 4.3.1: Details on Respondent's Vending Activities

Vending Activity	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N=50 (Per cent)	
Hotel	5(20)	5(20)
Saloon	4(16)	2(8)
Electrical shop	0(0)	6(24)
Painting shop	0(0)	6(24)
Vegetable / Fruit stall	5(20)	0(0)
Carpentry	0(0)	5(20)
Beauty parlour	2(8)	0(0)
Clinic	2(8)	0(0)
Street vending	3(12)	0(0)
Slaughter shop	3(12)	0(0)
Tea stall	1(4)	0(0)
Wholesale cloth shop	0(0)	1(4)
Type of Vending Venture		
Own	9(36)	8(32)
Leased	11(44)	8(32)
Rental	5(20)	9(36)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

A trader on the street or a person or company offering something for sale is called a vendor. Marginalized group means people relegated to the fringes of society and lack access to rights, resources, and opportunities. In both the Municipal Corporations, i.e., zone's of MCG and Zone 1 and 2 of MCM, respondents employed in various forms, i.e., hotels, saloons, electrical shops, painting shops, vegetable/ fruit stalls, carpentary, beauty parlours, clinics, street vending, slaughter shops, tea stalls, and wholesale cloth shops were covered to know their views and opinions on waste management problem. It seems that the data was scattered, wherein the zone's of MCG, 20% each respondent was drawn from hotels, vegetable/fruit stall, 16% respondents from saloons, 12% each from street vending and slaughter shops, eight per cent each from beauty parlours and clinics, and four per cent from tea stalls. With regard to the Zone 1 and 2 of MCM, 24% each respondent was from electric shops and painting shops, 20% each from hotels and carpentry, eight per cent from saloons, and four per cent from wholesale cloth shops. With regard to type of vending ventures, 18% and 16% from zone's of MCG and Zone 1 and 2 of MCM own their shops, 22% and 16% have a leased shop, and 10% and 18% are in a rented shop from both the zones, respectively. Effective solid waste management is a major challenge for Municipal Corporation with high rate of migration. Achieving sustainable development and improvement in waste management has become difficult for the Municipal Corporations because it is a fast growing city with many different groups, cultures, and traditions. "The solid waste management system in India has unchanged despite there is socio-economic and environmental development. Currently in India 90% residual waste has been dumped rather effective land filling" (Naryana, 2008). The table also presents the type of vending ventures, where majority of the respondents 38% are carrying out business on lease basis / in leased premises, 34% own the premises 28% conduct their business from a rented shop.

Table 4.3.2: Gender and Age- wise Distribution of Respondents

Gender	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N =50 (Per cent)	
Male	19(76)	21 (84)
Female	6(24)	4 (16)
Age distribution (in yrs.)		
20-25	0(0)	4(16)
26-30	5(20)	4(16)
31-35	4(16)	4(16)
36-40	7(28)	4(16)
41-45	3(12)	4(16)
46-50	3(12)	4(16)
51-55	3(12)	1(4)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.3.2 tabulates the gender and age- wise distribution of the data. It is found that 84% from Zone 1 and 2 of MCM and 76% from zone's of MCG are male respondents engaged in different works and 16% and 24% respondents are females from both the Municipal Corporations respectively.

With regard to age, in zone's of MCG 28% respondents are in the age group of 36-40yrs, 20% are in the age group of 26-30yrs, 16% range between 31-35yrs, and 12% each are between 41-45yrs, 46-50yrs, and 51-55yrs of age. In the Zone 1 and 2 of MCM,16% each respondents belonged to 20-25yrs, 26-30yrs, 31-35yrs, 36-40yrs, 41- 45yrs, and 46-50yrs age group and four per cent was between 51-55yrs.

Table 4.3.3: Literacy Level of Respondents

Categories	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N=50 (Per cent)	
Illiterate	2(8)	2 (8)
Below SSLC	6 (24)	14(56)
SSLC	3(12)	2(8)
PUC	11 (44)	6 (24)
Graduate	2 (8)	1 (4)
Professional course/Training	1(4)	0(0)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Vendors are a significant part of urban self-employment in the informal sector and account for two- thirds of city employment in India. Vendors play a key role in providing goods and services to the urban community. The table presents the literacy level of the respondents of both the Municipal Corporations. As many as 44% and 24% respondents from both the Municipal Corporations studied upto PUC, 24% and 56% studied less than SSLC, 12% and eight per cent studied upto SSLC, eight per cent each from both the Municipal Corporations are illiterate, eight and four per cent are UG, four per cent from zone's of MCG had studied professional courses.

Table 4.3.4: Family details of respondents

Categories		**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
		N=50 (Per cent)	
Number of Family Members	1-2	3(12)	5(20)
	3-4	14(56)	15(60)
	5-6	8(32)	5(20)
Number of Elders in the Family	1-2	7 (28)	6(24)
	3-4	6(24)	7 (28)
	5-6	10(40)	11(44)
	7-8	2(8)	1(4)
Number of Children in the Family	0-2	17(68)	23(92)
	3 & above	8(32)	2(8)

Webster has defined family as "a group consisting of parents and children living together in the household including elderly members. The table presents the total number of family members of the vendors. It seems that majority of 56% from zone's of MCG and 60% from Zone 1 and 2 of MCM have 3 to 4 members in the family, 32% and 20% have 5-6 members, and 12% and 20% respondents have 1-2 members in the house. The total number of elders in the family is accounted by 40% from zone's of MCG and 44% from Zone 1 and 2 of MCM have 5-6 elder, and 68% from zone's of MCG and 92% from Zone 1 and 2 of MCM have 0-2 children in the house.

Table 4.3.5: Details about Dwelling in Same Zone

Categories		**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
		N=50 (Per cent)	
Permanent Dweller of the Ward	Yes	17(68)	1(4)
	No	8(32)	24(96)
Dwelling Details in the Ward	< One Year	5(20)	6(24)
	More Than One Year but Less Than Three	6(24)	13(52)
	More Than Three Years but Less Than Ten	4(16)	1(4)
	More Than Ten Years	10(40)	5(20)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Residing/Dwelling details about the respondents provides scope for information on past and current scenario of locality and the changes taken place over the period, which shows the impact of infrastructure development in the ward. It is seen that a majority of 68% respondents from zone's of MCG live in permanent abode, while Zone 1 and 2 of MCM shows that 96% respondents are temporary dwellers. Further, 40% vendors in zone's of MCG have lived in the zone for more than 10yrs, 24% have stayed more than an year, 20% less than an year, and 16% more than 3yrs. The Zone 1 and 2 of MCM shows that 52% have been dwelling more than a year, 24% less than an year, 20% more than 10yrs, and four per cent more than 3yrs. It shows that majority of the respondents from both the Municipal Corporations have live there between 1to 10yrs.

Table 4.3.6: Duration of Vending Activities in the Zone

Categories	Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG	Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2 MCM
	N=50 (Per cent)	
< 1 Year	1(4)	1(4)
1-5 Years	8(32)	6(24)
6 -10 Years	7(28)	6(24)
11-15 Years	4(16)	7(28)
15-19 Years	4(16)	3(12)
20 Years & >	1(4)	2(8)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The table mentions the vending activities of the respondents in terms of experience. As many as 32% and 24% respondents have been working for 1-5yrs in zone's of MCG and Zone 1 and 2 of MCM, 28% and 24% for 6-10yrs, 28% and 16% from Zone 1 and 2 of MCM and zone's of MCG for 11-15yrs, 16% and 12% for 15-19yrs, eight per cent and four per cent less than 20yrs, and four percent each from both Municipal Corporations for extracting their work less than a year.

Table 4.3.7: Vendors' Assessment on Waste Collection

Categories	Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG	Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2 MCM
	N=50 (Per cent)	
Excellent	7(28)	1(4)
Good	18(72)	20(80)
Sufficient	0(0)	2(8)
Poor	0(0)	1(4)
Very Poor	0(0)	1(4)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

In the table, the vendors' assessment on waste collection on a daily basis by the sanitary workers in the respective wards has been presented. A majority of respondents preferred between good and excellent ratings. As much as 72% from zone's of MCG and 80% from Zone 1 and 2 of MCM assessed the waste collection as good, and 28% and four per cent as excellent. The respondents from Zone 1 and 2 of

MCM i.e., eight and four per cent each assessed the waste collection as sufficient, poor to very poor. On the whole, in both the zones, the vendors are satisfied by the work done by the waste collectors.

Table 4.3.8: Vendors' Assessment on Work Performance of Sanitary Workers

Categories		**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
		N=50 (Per cent)	
Quality of Work of sanitation workers	Excellent	7(28)	1(4)
	Good	18(72)	20(80)
	Sufficient	0(0)	2(8)
	Poor	0(0)	1(4)
	Very poor	0(0)	1(4)
Job Shift Management by Sanitation Workers	Excellent	12(48)	17(68)
	Good	10(40)	4(16)
	Sufficient	3(12)	3(12)
	Very poor	0(0)	1(4)
Smartness in Material Handling	Excellent	6(24)	4(16)
	Good	14(56)	15(60)
	Sufficient	3(12)	4(16)
	Poor	2(8)	1(4)
	Very poor	0(0)	1(4)
Response Towards Recommendations of Sanitary workers	Excellent	7(28)	8(32)
	Good	10(40)	6(24)
	Sufficient	8(32)	10(40)
	Poor	0(0)	1(4)
Waste Management Knowledge of Sanitation Workers	Excellent	3(12)	3(12)
	Good	12(48)	5(20)
	Sufficient	6(24)	6(24)
	Poor	4(16)	11(44)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The table denotes the various dimensions on waste management as explained by the vendors in both the zones. Regarding quality of work of sanitary workers, it seems that 72% and 80% respondents from zone's of MCG and Zone 1 and 2 of MCM assessed it as good, and 28% and four per cent from both the zones said excellent respectively. With regard to shift management, 68% and 48% respondents from Zone 1 and 2 of MCM and zone's of MCG opined as excellent, and 40% and 16% vendors from zone's of MCG and Zone 1 and 2 of MCM as good. With regard to smartness in material handling, 56% and 60% rated it as good and 24% and 16% as excellent from both the zones respectively.

Further the vendor respondents were asked to know the recommendations of sanitary workers towards job. It seems that respondents from zone's of MCG i.e., 40% said good, 32% opined sufficient, and 28% mentioned it as excellent, and from the Zone 1 and 2 of MCM i.e., 40% opined sufficient, 32% said excellent, and 24% as good. Regarding waste management knowledge by sanitary workers, respondents from both the Municipal Corporations 48% and 20% opined as good, 16% and 44% as poor, 24% each from both the Municipal Corporations said good, and 12% each said excellent.

Table 4.3.9: Methods of Waste Disposal followed by Respondents

Categories	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N=50 (Per cent)	
Burning	4(16)	14(56)
Letting it on the Street	2(8)	7(28)
Discarding in Ward Containers	14(56)	1(4)
Burying in the Backyard	0(0)	1(4)
Burying Near Open Drainage	1(4)	0(0)
Burying in Dump Site	1(4)	0(0)
Handing it over to Waste Collectors	1(4)	0(0)
Don’t Know	2(8)	2(8)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

There are various methods to discard/dispose waste in a proper manner, but many people are unaware of it, while few ignore it. In the study, majority 56% in Zone 1 and 2 of MCM and 16% from zone's of MCG burn the waste, 56% in zone's of MCG and four per cent from Zone 1 and 2 of MCM discard the waste in the container, in the Zone 1 and 2 of MCM and eight per cent from zone's of MCG littered the street, four per cent each from zone's of MCG buried the waste near open drainages, in dump site, and threw it in the trash collected by the sanitary workers, eight per cent each from both the Municipal Corporations did not know the methods as they were not involved in it.

On the whole, in the Zone 1 and 2 of MCM, vendors are polluting the environment by burying the waste, and in the zone's of MCG, majority of the vendors are discarding the waste in the ward containers. In both the Municipal Corporations, scientific waste disposal methods needs to be adopted and there is need of publicity, mass education, and awareness about scientific waste disposal methods to the vendors. Even then Municipal Corporations must take steps to emphasis more on information, education, and communication (IEC) activities.

Table 4.3.10: Details on Waste Collection and Frequent of Waste Collection

Categories		**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
		N=50 (Per cent)	
Waste Collection from Waste Generation Point	Yes	19(76)	14(56)
	No	6(24)	11(44)
Frequency of Waste Collection	Daily	9(36)	13(52)
	Twice a Week	10(40)	6(24)
	Once a Week	3(12)	3(12)
	Now and Then	1(4)	1(4)
	Not Collecting	1(4)	0(0)
	Don't Know	1(4)	2(8)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.3.10 shows the respondents opinion on waste collection and frequency of waste collection intervals. About 76% and 56% respondents from both the Municipal Corporations agreed that waste is collected from generation point. On frequency of waste collection, 52% and 36% said that the waste is collected daily, 40% and 24% mentioned twice a week, 12% each said once a week, four per cent each from both the Municipal Corporations said now and then, four per cent only from zone's of MCG said the sanitary workers are not collecting it, four and eight per cent vendors from both the Municipal Corporations do not know the frequency of waste collection.

Table 4.3.11: Action taken by Vendors in Absence of Waste Collection

Categories	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N=50 (Per cent)	
Inform Ward Office	5(20)	8(32)
Throw into Open Drainages	8(32)	8(32)
Throw on Empty Lands	7(28)	5(20)
Wait for Waste Transporting Vehicles and Waste Collectors	4(16)	2(8)
Throw on empty lands outside the city	1(4)	2(8)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

According to the Solid Trash Management Rules that came out in 2016, source segregation of garbage is the fundamental requirement for recovering, reusing, and recycling waste in order to bring it back into compliance with health standards. Before turning it over to rag pickers or authorized waste collectors, every waste generator is required to sort the waste that they produce and store it in separate bins according to the type of waste, namely biodegradable, non-biodegradable, and domestic hazardous waste. This must be done before the waste can be collected. According to the findings of the survey, thirty-two percent of respondents from both Municipal Corporations dispose of rubbish in open drainages. Twenty percent and thirty-two percent of respondents respectively indicated they inform the ward office in order for them to arrange for waste pickup. 16 percent and eight percent of people wait for garbage collectors, four and eight percent of people discard it on empty lands outside of the city, and 28 percent and 20 percent of people throw it on empty lands inside the city. This demonstrates that many different vendors lack common sense with regard to waste. Therefore, the concerned staff at Municipal Corporations should be in charge of educating them about the garbage disposal methods and taking responsibility for doing so.

Table 4.3.12: Details on Recyclable Waste Management

Categories	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N=50 (Per cent)	
Mixing with Other Wastes	9(36)	14(56)
Segregating to Sell in Junk Shop	8(32)	8(32)
Segregation for Reuse	3(12)	0(0)
Giving it to others only after segregation	1(4)	1(4)
Don't Know	4(16)	2(8)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The scientific disposal of solid waste, which entails the separation, collection, treatment, and eventual disposal of garbage, is an environmentally sound technique to lessen the negative influence that waste has on the surrounding environment. Recycling is currently one of the most essential measures that can be taken to lessen these impacts, and it also represents one of the most dynamic areas in the field of environmentally responsible waste management. Recycling creates potential to cut down on consumption of oil, emissions of carbon dioxide, and the amount of waste that needs to be disposed of. In this section, we will discuss recycling in the context of various waste reduction measures, such as reducing the amount of material used by downgauging or product reuse, using alternative biodegradable materials, and recovering energy as fuel. According to the Solid Garbage Management Rules, 2016, all gated communities, residents' welfare associations, and institutions with an area of less than 5,000 square meters are required to separate waste at the point of generation. The recyclable components of dry waste, including but not limited to plastic, tin, glass, and paper, should be delivered as such to either approved waste pickers or recyclers or to urban local bodies (MSWM Rules, 2016). In the table, as much as 56 percent and 36 percent vendors from Zone 1 and 2 of MCM and zone's of MCG mix all types of waste together; 32 percent each respondents from both the zones segregate the waste and sell it to the Junk collection shop; 12 percent from zone's of MCG segregate waste at generation point and reuse it for their purposes; four percent each give it to others after they segregate it; and 16 percent and eight percent from both the Municipal Corporative Government and the Municipal Corporation Although the majority of them are knowledgeable of garbage sorting and recycling practices, a significant number of them do not work together, despite the fact that they could have learned from others' examples. The 3R approach has been adopted by the Municipal Corporations in order to maximize the effectiveness of the management of municipal solid waste for all categories of stakeholders, including waste generators, service providers, the informal sector, regulators, administrators, the government, and the community.

Table 4.3.13: Details on Organic Waste Management

Classification	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N=50 (Per cent)	
Use as Compost	1(4)	0(0)
Feed it to Animals	12(48)	18(72)
Collected by shops	4(16)	1(4)
Discarded in Ward Container	3(12)	1(4)
Disposed on Streets	3(12)	4(16)
Thrown in Open Drainages	2(8)	1(4)
Don’t Know	2(8)	1(4)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Organic waste management is a process in which microorganisms naturally present in organic matter decompose the materials. The microorganisms require various nutrients such as oxygen and water mainly for decomposition to urine at an accelerated pace. Technology has improved to manage and effectively re-use waste as much as possible and ninety per cent of what is thrown into landfills can be reused. Large and increasing volume of urban organic or biodegradable waste generated and 50-70% of municipal waste is organic and less than 10% of organic waste is used as resources. Organic waste if not used properly is a threat to health and environment. Open dumping and land filling are the major issues dominating at the global level.

In Table 4.3.13, vendors from both the zones have opined about the organic waste being managed by them About 72% from Zone 1 and 2 of MCM and 48% from zone's of MCG said that they feed organic waste to the animals, 16% and 12% respondents from Zone 1 and 2 of MCM and zone's of MCG dispose it on the street, 16% and four per cent vendors sell it organic manure to the shops, 12% and four per cent discard in the ward container, eight per cent and four per cent each throw it in open drainages, followed by few who did not know, and four per cent from zone's of MCG said they use it as compost.

In both the Municipal Corporations, many vendors know that organic waste is being fed to local animals. In the olden days, livestock had functioned as bio-processor, the contemporary treatment technologies helps to convert the food waste as safe nutritious feed for animals.

Table 4.3.14: Impact of Improper Waste Disposal

Classification		Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG	Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2 MCM
		N=50 (Per cent)	
Physical Health	Yes	18(72)	23(92)
	No	7(28)	2(8)
Pollution of Living Area	Yes	21(84)	22(88)
	No	4(16)	3(12)
Littering of Solid Waste in Neighbourhood Leads to Environmental Issues	Yes	16(64)	13(52)
	No	9(36)	12(48)
Nothing is Wrong	Yes	12(48)	9(36)
	No	13(52)	16(64)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Improper waste disposal leads to many environmental issues and impacts on human and livestock health directly.

It seems that many vendors are aware of the impact of improper waste disposal. The data shows that 72% and 92% respondents from both the Municipal Corporations said that improper waste disposal affects physical health, 84% and 88% said improper waste disposal leads to stinking/pollution in living area, 64% and 52% said littering of solid waste in neighbourhood leads to environmental issues.

Plastics may be recycled, which is one way to lessen our influence on the environment and preserve our limited supply of resources. Fundamentally speaking, high levels of recycling, as well as reduction in use, reuse, and repair or re-manufacturing can allow for a given level of product service to be provided with lower material inputs than would otherwise be required. This can be achieved by reusing materials and repairing or re-manufacturing products. Both of the Municipal Corporations' vendors, in general, have a good understanding of the dangers associated with incorrect garbage disposal. The vast majority of respondents from both Municipal Corporations indicated that incorrect trash disposal has direct implications for one's physical health and creates environmental pollution in living areas. In both of these zones, there is a pressing need for widespread training and instruction concerning the correct disposal of trash.

Table 4.3.15: Opinion on Existing Waste Disposal Containers in the Ward

Classification		**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
		N=50 (Per cent)	
Too Far Away from the Shops	Yes	22(88)	23(92)
	No	3(12)	2(8)
Too Small to Contain Solid Wastes	Yes	20(80)	22(88)
	No	5(20)	3(12)
Produces Unpleasant Odours	Yes	19(76)	15(60)
	No	6(24)	10(40)
Nothing is Wrong with Community Containers	Yes	16(64)	15(60)
	No	9(36)	10(40)
No Opinion/ Don't Know	Yes	12(48)	6(24)
	No	13(52)	19(76)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Waste disposal containers are provided by the Municipal Corporations in each ward to avoid littering of waste. In Table 4.3.15, the vendors have shared their opinions about the existing/current waste disposal containers provided by the Municipal Corporations. About 88% and 92% vendors said that the containers are far away from the shops to dispose waste, 80% and 88% said the containers are too small to contain solid waste, Therefore, it is obvious that when the containers loaded with full of waste would produces unpleasant odours opined by 76% & 60% from both the Municipal Corporations, 64% and 60% said they are satisfied with the community containers, and 52% and 76% are not aware of waste disposal containers kept in the ward. On the whole, in both the Municipal Corporations, the respondents mentioned that the containers are too far away from their trading centres. This demotivates the traders to dispose the waste in the provided containers. The vendors from both the Municipal Corporations emphasized that the provided containers are too small in size. Unless the provided waste containers are effectively utilized by the community dwellers, it will not serve the purpose of proper/efficient waste management.

Table 4.3.16: Recommendations for Effective Waste Disposal

Classification	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
	N=50 (Per cent)	
Serious Action should be taken by the Municipal Corporations	19(76)	6(24)
Establishment of More Recycling Waste Centers	2(8)	16(64)
More Training and Propaganda on Recycling of Waste	4(16)	0(0)
Don't Know	0(0)	3(12)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The present study has put forth recommendations for effective waste disposal. Even the vendors have shown enthusiasm to complement the recommendations. It seems that 76% and 24% from zone's of MCG and Zone 1 and 2 of MCM emphasized that the Municipal Corporations should take serious action for effective waste disposal, 64% and eight per cent from Zone 1 and 2 of MCM and zone's of MCG recommended establishment of more recycling waste centers, 16% vendors only from zone's of MCG said more training and propaganda on recycling of waste has to be given for its effective implementation, and 12% from Zone 1 and 2 of MCM did not have any recommendations. On the whole, zone's of MCG respondents emphasized and stressed that Municipal Corporations should undertake more serious action with regard to waste disposal practices and provide more training and propaganda on recycling waste collection centers, and the in Zone 1 and 2 of MCM, the respondents are looking forward to the establishment of more recycling waste collection centers. Overall, the vendors are socially responsible and ready to implement the prescribed norms and regulations by the administration authority.

Table 4.3.17: Opinion about existing waste disposal site

Classification	Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG		Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2 MCM	
	N=50 (Per cent)			
	Yes	No	Yes	No
Anyone can throw waste there	22(88)	3(12)	22(88)	3(12)
Anything can be thrown	13(52)	12(48)	22(88)	3(12)
Site produces foul odors	18(72)	7(28)	14(56)	11(44)
Nothing is wrong with the site	16(64)	9(36)	19(76)	6(24)
No Opinion/ Don't Know	12(48)	13(52)	5(20)	20(80)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

It is seen that 88% each respondents from both the Municipal Corporations said that anybody can throw wastes in the open site, 88% and 52% vendors from Zone 1 and 2 of MCM and zone's of MCG mentioned anything can be thrown in the sites, 72% and 56% said site produces foul odors' sometimes, 64% and 76% from both the Municipal Corporations said nothing is wrong with the site, and 52% and 80% vendors failed to respond.

Table 4.3.18: Awareness of Impact of Existing Waste Dumping Site in the Ward

Classification	Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG		Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2 MCM	
	N=50 (Per cent)			
	Yes	No	Yes	No
Public Health Risk	20(80)	5(20)	24(96)	1(4)
Ground Water Contamination	10(40)	15(60)	20(80)	5(20)
Leads to Eyesore and Other Health Issues	14(56)	11(44)	13(52)	12(48)
Leads to Uncontrolled Waste Dumping at the Sites	11(44)	14(56)	17(68)	8(32)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The table represents the awareness of vendors on the impact of existing waste dumping sites in their respective zones. About 80% and 96% said that the impact would be on public health 80% from Zone 1 and 2 of MCM and 40% from zone's of MCG opined it affected/contaminated ground water, 56% and 52% stressed that unplanned existing waste dumping site would result in eye sore and other health issues, 68% from Zone 1 and 2 of MCM and 56% from zone's of MCG said that the existing waste dumping site would give way to uncontrolled waste dumping, which would cause overall health risk.

Table 4.3.19: Vendors Participation/ Contribution towards Solid Waste Management

Classification	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG		**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM	
	N=50 (Per cent)			
	Yes	**No**	**Yes**	**No**
Bringing Own Garbage to Municipality Container	24(96)	1(4)	23(92)	2(8)
Bringing Own and Neighbours' Garbage to Municipality Container	21(84)	4(16)	22(88)	3(12)
Segregating Recyclable Wastes	20(80)	5(20)	22(88)	3(12)
Segregating Organic Wastes	18(72)	7(28)	20(80)	5(20)
Voluntarily Cleaning Littering Around Community Containers	19(76)	6(24)	20(80)	5(20)
Paying Service Charges for Solid Waste Collection	17(68)	8(32)	19(76)	6(24)
Would Like to Sell Waste to NGOs for Recycling Process	17(68)	7(28)	18(72)	5(20)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Participation from the community in the management of solid waste is critically necessary for achieving sustainable waste management. Individuals, families, and elected representatives of vendors and traders all need to take responsibility for their own well-being as well as the well-being of the community in order for there to be community engagement. The participation of the suppliers in the management of solid waste is broken out in Table 4.3.19. Since the vendors are directly associated with the production of garbage, it is essential for them to participate and be involved in the process of managing waste in a sustainable manner. The following are some of the many factors that have been broken down and explained in the table: 96 percent and 92 percent of respondents from both Municipal Corporations preferred to throw waste in the containers provided by the municipality; 84 percent and 88 percent of respondents not only bring their own waste but also bring the waste of their neighbors and throw it in the containers provided by the municipality; 80 percent and 88 percent of respondents segregate wastes as recyclable wastes; and 96 percent and 92 percent of respondents preferred to throw waste in the 72 percent of vendors separate organic waste, 76 percent of vendors volunteer to clean up litter around community containers, 68 percent of vendors volunteer to pay service charges for sanitary workers, and 68 percent of vendors prefer to sell waste to NGOs for recycling. These percentages are based on the number of vendors who segregate organic waste and who prefer to sell waste. The majority of suppliers in both of the Municipal Corporations are engaged in proactive participation in the management of solid waste. According to Mullar and Hoffman (2001), community management is relatively widespread in rural areas, but formal relations are rarely seen and begun in urban settings. This contrasts with the prevalence of community management in rural areas. For the most efficient service delivery and community management, it is necessary to have effective social intermediation, which includes the raising of awareness, the partnership of user groups and NGOs, the provision of microfinancial services, the promotion of health education, and the education of consumers.

Table 4.3.20: Modes of willingness to be involved in solid waste management process

Categories	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG		**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM	
	N=50 (Per cent)			
	Yes	No	Yes	No
Payment of Service Cost	23(92)	2(8)	24(96)	1(4)
Voluntarily Joining with CBO/NGOs	12(48)	13(52)	19(76)	6(24)
Voluntarily Creating Awareness in Community	17(68)	8(32)	23(92)	2(8)
Assisting the ULB for Implementation of Waste Management Programme effectively	10(40)	15(60)	21(84)	4(16)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.3.20 represents the mode of willingness shown by the vendors to bring possible measures for solid waste management. It seems that 92% and 96% respondents from both the Municipal Corporations are ready to pay service cost for sanitary workers in keeping the environment clean, 76% from Zone 1 and 2 of MCM and 48% from zone's of MCG volunteered to work with CBO/NGOs for solutions for solid waste management, 68% and 92% respondents volunteered in creating awareness in the community, and 84% and 40% volunteered to assist the ULB (Urban Local Bodies) for implementation of waste management programmes effectively. A Community Based Organization would be a critical partner in local waste management. The activities of CBOs (Community Based Organaization) include health, hygiene, environment, education and community services. The legitimate leaders of the CBOs are recognized and respected in the community. To get the support from the community, Municipal Corporations has launched Citizen Participation Programme (CPP) in 2017. Its main objective is to integrate citizen participation for effective micro and macro solid waste planning and implementation in Gurugram district. Citizen participation provision is made at every level from city level, zonal, constituency, and ward to the block level through various roles such as master trainers, micro level planners, civic wardens.

Table 4.3.21: Awareness of Swacha Bharath Mission

Awareness on Swacha Bharath Mission	**Categories**	**Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2** MCG	**Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2** MCM
		N=50 (Per cent)	
	Yes	22(88)	17(68)
	No	3(12)	8(32)
Sources of Awareness	Television	18(72)	23(92)
	Newspaper	5(20)	1(4)
	Corporation	2(8)	1(4)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

To achieve universal coverage and focus on sanitation, Swachh Bharat Mission was launched by the Prime Minister of India on 2nd October, 2014, to improve the level of cleanliness through solid and liquid waste management and freeing from open defecation. Table 4.3.21 describes the awareness among the vendors on Swachh Bharat Mission. About 88% and 68% respondents are aware of Swachh Bharath Mission. Their sources of awareness are primarily through TV said 72% and 92%, followed by 20% and four per cent said newspaper, and the remaining respondents said the awareness was given by the corporation. Through the result it can be assumed that visual media has greater impact on creating awareness in both the study areas. It was highlighted in both the study areas, that Municipal Corporations effort for creating awareness is less. Municipal Corporations needs to focus more on creating awareness in the masses.

Table 4.3.22: Awareness about existing solid waste management unit in zonal (office) limits

Categories	Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG	Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2 MCM
	N=50 (Per cent)	
Yes	11(44)	14(56)
No	14(56)	11(44)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The table depicts awareness about existing solid waste management unit in the zonal office limits. About 44% and 56% from zone's of MCG and Zone 1 and 2 of MCM are aware of the existing solid waste management unit in their zonal office limits. On the whole, in both the study areas, the vendors are moderately aware about the existence of the waste management unit at the zonal office limits. The awareness about the existence of waste management unit, encourages and motivates the vendors to take active participation as per the waste management is considered.

Table 4.3.23: Selling of Recyclable wastes to Municipal Corporations Gurugram Collection centres

Categories	Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG	Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2 MCM
	N=50 (Per cent)	
Yes	9(36)	11(44)
No	3(12)	0(0)
Don't know	13(52)	14(56)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Three 'Rs' Reduce, Reuse, and Recycle are the fundamental principles of sustainable waste management. The generation of wastes can be prevented by reducing and reusing the same. Once the wastes are generated, the best way to handle them would be recycling, otherwise the generated wastes will generate chemical and would be mixed with environment. Recycling is pivotal in reducing the overall impact on the environment and public health. The separation and sale of recyclable provides livelihoods to the marginalized population. Table 4.3.23 presents the practice of vendors selling recyclable wastes to Municipal Corporations collection centres. Most of the vendors do not know that collection centres have been established by the Municipal Corporations to reuse recyclable wastes. About 36% and 44% vendors know that Municipal Corporations receives recyclable wastes for commercial purposes.

Table 4.3.24: Assessment of Proactiveness of ward members towards the issue

Categories	Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG	Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2 MCM
	N=50 (Per cent)	
Yes	14(56)	14(56)
No	11(44)	11(44)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.3.24 throws light on the proactive and reactiveness of selected members towards the waste management issues. In both the study zones, 56% each of the vendors mentioned that ward members are proactive towards the issue of waste management. The reactiveness or pro-activeness is the reflection of elected members in trust and concern about the issue. The elected members are the link between the citizen and the government and they are politically responsible for the management of public services in their respective wards. They have mass support in their respective wards. And they have the power to decide about the dump sites, and the mode and method of waste collection services for their ward. Since the ward councillors have considerable influence on the working and locations of waste management in their respective wards, they can represent their ward issues in various forums majorly in Municipal Corporations.

Table 4.3.25: Reasons for Poor Involvement of Representatives

Categories	Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG	Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2 MCM
	N=50 (Per cent)	
Not worried about waste management	10(40)	11(44)
Don't know	15(60)	14(56)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

During the interview, the vendors were also asked their opinion as to the poor involvement of the representatives. As many as 40% and 44% vendors opined that the representatives are not at all worried about waste management and 60% and 56% did not know the reasons for their poor involvement.

Table 4.3.26: Suggestions for Elected Representatives

Categories	Municipal Corporation, Gurugram (Nagar Nigam) Zone 1 and Zone 2 MCG	Municipal Corporation, Manesar (Nagar Nigam) Zone 1 and Zone 2 MCM
	N=50 (Per cent)	
Free supply of dustbins for segregation	4(16)	2(8)
Regular interaction with community people	21(84)	23(92)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Many vendors during the discussion gave their suggestions to the elected representatives to involve themselves in the waste management process. As much as 84% and 92% vendors suggested regular interaction with community people, followed by 16% and eight per cent mentioning provision for free supply of dustbins for segregation.

4.4 Administrative Officers Participation in Solid Waste Management:

'A chain is only as strong as its weakest link' goes a wise saying. If one person fails, the whole group fails. Solid waste management is a long and complicated process in which different groups of people with different roles and responsibilities work in unison. If one groups fails to do its part efficiently, the work done by other groups become useless. The discussion is regarding the process of solid waste management, which involves generation, collection, transportation, and processing. Municipal Corporations is the authority which builds systems and puts them in place to take care of each of these stages. It also a department in its structure to plan, implement, provide infrastructure, budget and also evaluate and monitor the whole process. Hence, the researcher considered it important involve the officials of Municipal Corporations, who are responsible for solid waste management in the city, in the survey. An interview schedule was designed specifically for them and the findings are presented below.

Table 4.4.1: Designation and Type of Employment of the Respondents

Designations	N=30 (Per cent)
Junior Health Inspectors	8(27)
Assistant Executive Engineers	5(16)
Senior Health Inspectors	5(16)

Executive Engineers	3(10)
Revenue Officers	3(10)
Chief Engineers	2(7)
Environment Engineers	2(7)
Superintendent Engineers	2(7)
Type of employment	
Permanent	29(97)
Contract	1 (3)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.4.1 presents the opinions of the administrative officers, who are directly responsible and involved in the municipal solid waste management process in the Municipal Corporations Gurugram and Manesar. About 27% respondents are Junior Health Inspectors, 16% each are Assistant Executive Engineers and Senior Health Inspectors, 10% each are Executive Engineers and Revenue Officers, and seven per cent each are Chief Engineers, Environment Engineers, and Superintendent Engineers in the Municipal Corporations Gurugram and Manesar. Further the table, depicts that 97% are permanent employees and three per cent are working on contract basis. The administrative staff play a key role in mitigating the issues of Municipal Solid Waste in Gurugram city.

Table 4.4.2: Aware of Quantity of Waste Collection

Aware of quantity of waste collection	**N=30 (Per cent)**
Yes	12(40)
No	18(60)
Aware of quantity of waste collection per day	
Less than 5 tonnes	2 (7)
5-10 tonnes	3(10)
11- 15 tonnes	1 (3)
16 tonnes and above	2(7)
Don’t know	4(13)
Not applicable	18(60)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

60 percent of administrative officers are not aware of the quantity of waste collection, 60 percent of administrative officers mentioned that it was not applicable to them, but few are aware of it, 13 percent could not mention the quantity specifically, 10 percent said between 5-10 tonnes, 7 percent each said 16 tonnes and above and less than 5 tonnes per day, and 3

percent of administrative officers opined between 11-15 tonnes. These findings are highlighted in Table 4.4.2. Households are responsible for producing approximately 58 percent of the city's garbage, while business entities are responsible for producing approximately 49 percent, and street cleaning contributes approximately 7 percent. The average garbage produced per person in the city's conventional houses is 309 grams, whereas the average waste produced per person in the city's slums is 300 grams. It is estimated that bulk producers are responsible for around 24 percentage points worth of the total garbage that is produced. Wet waste, dry waste, sanitary waste, and reject or inert garbage are the four primary types of waste that Gurugram has classified in accordance with the MSW Rules. In addition, the Municipal Corporations of Gurugram and Manesar have taken steps toward the separation, collection, and processing of other specialized streams, such as coconut and sugarcane waste, waste from leaves and gardens, waste from animals, waste from electronic devices, and waste from construction and debris. The two categories that make up the categorization of trash are "value generating streams" (streams that are able to be handled) and "no value streams." Wet garbage, dry waste, leaf and garden waste, coconut and sugarcane waste, and electronic waste are all examples of streams that generate value. Waste from street sweeping that is inert, animal, sanitary, or construction-related does not contribute to any value streams. Despite this, the municipal corporations of Gurugram and Manesar have both decided to use the same categories for their classifications.

Table 4.4.3: Reasons for being unaware on Quantity of Waste Collection

Reasons for being unaware	N=30 (Per cent)
No use of knowing about it / the knowledge	8(27)
It is not so important	7(23)
Not interested	3(10)
Not applicable	12(40)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.4.3 mentioned the reasons for the administrative officers not being aware about the quantity of waste collection. As many as 27% officers felt that there is no use of such knowledge, 23% said it is not so important, 10% were not interested, and 12% viewed that it's not applicable to them. From the table, it can be assumed that the officers are aware of the waste collection, but are least bothered about the quantity of waste collected.

Table 4.4.4: Waste Collection Methods

Mode of waste collection	Yes	No
	N=30 (Per cent)	
Door- to- door	29(97)	1(3)
Door-to-door in small pick- ups	29(97)	1(3)
Door-to-door in push carts	27(90)	3(10)
Door-to-door in open truck	24(80)	6(20)
Community collection points	19(63)	11(37)
Block system by trucks	17(57)	13(43)
Door-to-door in compaction trucks	17(57)	13(43)
Door-to-door by other means	3(10)	27(90)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.4.4 reflects multiple responses on the methods of waste collection practiced. A majority of 97% each respondents are aware of the door- to- door collection and door-to-door collection in small pick-ups, 90% respondents mentioned door-to-door in push carts, 80% said door- to- door in open truck, 63% viewed that the waste was collected through community collection points, 57% each opined collected by block system by trucks and door- to- door in compaction truck, and 10% stated as door- to- door by other means of waste collection. From the table, it can be presumed that many administrative officers are aware of the mode of waste collected in their respective wards. A few of the respondents are unaware of waste collection methods. Therefore, ICT – Information through communication and technology method is best and suitable to sensitize public as well as the officers. There must be provision of community trash bins, and encouraging private contractors for waste collection could also prevent the public from being exposed to diseases.

Table 4.4.5: Time Spent for Waste Management Activities

Time spent for waste management activities	Yes	No
	N=30 (Per cent)	
30 minutes daily	1(3)	29 (97)
No spare time for this cause	29(97)	1(3)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

In a meeting chaired by the Commissioner and Special Commissioner a special mention was made that all respective Municipal Corporations Gurugram and Manesar officers' responsibility is to work as overall monitoring and evaluation special personnel, as mentioned in their job chart. The table shows that majority of 97% administrative officers neither spend time on waste management activities nor spending time to this particular cause in their respective wards, and three per cent spend time on waste management activities.

Table 4.4.6: Planned Activities by Ward Level Officers

Plans	**N=30 (Per cent)**
Yes	26 (87)
No	4(13)
Planned Activities	
Discussion with waste collectors	18(61)
Interaction with SHG members	4(13)
Interaction with vendors	4(13)
Working for effective implementation of Swacha Bharath Mission	4(13)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The solid waste management department officers such as the Assistant Executive Engineers, Junior Engineers, and Health Inspectors are responsible for the waste management. They monitor the mastering roll and remastering roll.

The above table shows the administrative officers' voluntary plans with respect to waste management in their respective wards. A majority of 87% respondents agreed to having their own plans and 13% did not have any plans for waste management. Many administrative officers were found to be enthusiastic as far as waste was concerned. They have their own plans and activities to manage waste problem at a certain level. The officers (61%) are actively involved in discussion with waste collectors, 13% each had interaction with SHG members, vendors, and worked out plans for effective implementation of the Swaccha Bharath Mission.

Table 4.4.7: Awareness about collected waste disposal

Awareness about collected waste disposal	**N=30 (Per cent)**
Yes	24(80)
No	6(20)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

According to Table 4.4.7, 80% of the respondents are aware of waste disposal and the remaining 20% respondents are not aware of collected waste.

Table 4.4.8: Attempt to Form an Association

Initiated Association	**N=30 (Per cent)**
Yes	4(13)
No	26(87)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The above table presents, ward level officers' initiatives for formation of association to resolve the issues of waste management. About 13% respondents have taken the initiative to form an association for effective management of waste, and 87% did not take any initiative to resolve the issue of waste management and have not formed any association at the ward level. This reflects the officers' voluntary involvement in the process of waste management.

Table 4.4.9: Motivation and Methods Adopted for Motivation

Motivate Residents	**N=30 (Per cent)**
Yes	13(42)
No	17(58)
If, Yes	
Door- to- door campaign	9 (30)
Formation of task force committee	1 (3)
Prioritized meeting on waste management	1 (3)
Workshops to be organized	1 (3)
Various competitions to be organized for ward level children	1(3)
Not applicable	17 (58)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The ward level officers follow various methods of motivation, and as shown in the table, 57% had not attempted to motivate residents, and 43% had motivated residents of their respective wards for waste segregation and disposal in a proper manner. Further the table enumerates the methods adopted for motivation such as 30% officers said door-to- door campaign, followed by three per cent each said that formation of task force committee, frequent meetings to be held on waste management on the basis of priority wise, workshops to be organized for sanitary workers, and various competitions to be held for children who come up with best solutions, and 58% said the variable is not applicable to them. It is clear that ward level officers are not keen to motivate the community.

Table 4.4.10: Action taken by the officers with regard to waste management Attempted to Form Association & Committees

Types of Association	**Yes**	**No**
	N=30 (Per cent)	
Street Vendors Committees	15 (50)	15 (50)
Merchants Associations	9 (30)	21(70)
Residents Associations at apartments	4(13)	26(87)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

As waste management is a concerted effort of all stakeholders such as agencies, municipalities, NGOs, and the government, each one has to play an active role in making it a success. Many officers have initiated action to bring about a solution to the waste management problem. As many as 50% officers had put an effort to bring out street vendors committees, where in only 30% attempted to brought out Merchant's association in view of waste problem, where as 13% camp up with residents associations in the apartments so that the respective volunteers of association would take incharge of supervising the waste.

The officers are actively involved in the Street Vendors Committees and Merchants Association Activities and tried to act through these segments.

Table 4.5.11: Willingness to give suggestions for best practices

	Yes	**No**
Willingness to suggest	**N=30 (Per cent)**	
	13 (43)	17(57)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.4.11 presents the willingness of officers to suggest best practices. It seems that half of 57% officers are unwilling to suggest and 43% respondents are willing to suggest best practices for waste management.

Table 4.4.12: Suggestions for Best Practices

Suggestions for best waste management practices	**N=30 (Per cent)**
Active involvement by public and representatives	5(17)
Municipal Corporations Gurugram and Manesar must have specific guidelines for affective implementation	3(10)
Immediate recruitment of more staff	2(7)
Ward- level educational programes	1(3)
No suggestions	2 (7)
Not applicable	17 (56)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The administrative officers showed keen interest in suggesting best practices for solid waste problem. It seems that 17% officers stressed that the residents must be actively involved and support Municipal Corporations Gurugram and Manesar in segregating the waste, 10% said Municipal Corporations Gurugram and Manesar should frame specific guidelines for effective implementation, seven per cent suggested immediate recruitment of staff to meet the challenges of waste segregation, three per cent said ward- level educational programme seven per cent gave no suggestions, and a half of 56% respondents said that the variable is not applicable to them.

Table 4.4.13: Reasons for not giving suggestions

Reasons for not giving suggestions	**N =30 (Per cent)**
No use of giving suggestions, rulers are decision makers	5 (26)
Work carried out as per government norms	5 (26)
Impossible to implement due to technical and non-technical issues	4 (21)
Higher officers plan and assign work	3(16)
Public will never change	2(11)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

In the above table, 26% each respondents said that there is no use of giving suggestions and the Municipal Corporations Gurugram and Manesar officials work on the basis of government norms, 21% said it is impossible to implement suggestions due to its technical and non-technical issues, 16% mentioned higher officers plan and assign work, and the 11% opined that public will never change even after giving repetitive instructions.

Table 4.4.14: View about ward members concern about waste management process

Ward members concern about waste management process	**Yes**	**No**
	N=30 (Per cent)	
	5(17)	25 (83)
Support given by ward members		
Active discussion in meetings	2 (7)	28 (93)
Discussion with officers and other staff members	2 (7)	28 (93)
Daily monitoring of waste management process	1(3)	29(97)
Not applicable	26 (87)	4 (13)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Waste management is the social and ethical responsibility of each individual. It is the key responsibility of policymakers and other stakeholders. Ward- level officers work closely with the representatives of the wards. As much as 83% officials shared that ward representatives are not concerned about waste management, seven per cent each stressed that active discussion on solid waste management and discussion with ward level officers and other staff members would be helpful, three per cent viewed that ward- level representatives had to get involved in the daily monitoring of waste management in their ward, and said that the variable is not applicable to them.

Table 4.4.15: Ward members less involvement in waste management

Reasons for less involvement by ward members	**N=30 (Per cent)**
Not bothered about the issue	11 (36)
Do not know the importance of waste management	6 (20)
Busy with other works	5(17)
More attracted to housing and other schemes	3(10)
Not applicable	5(17)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The table throws light on the administrative officers' perception towards ward members/representatives' poor participation in waste management. As many as 36% respondents said that ward representatives are least bothered about the issue, 20% mentioned that they do not know the importance of waste management, 17% opined that ward representatives are busy with other works, 10% were of the opinion that ward members are more attracted towards other schemes rather waste management problem, and 17% said the variable is not applicable to them.

Table 4.4.16: Solid waste management issues faced by Officers

Issues faced	**Yes**	**No**
	N=30 (Per cent)	
	15(50)	15(50)
Major issues of the Ward		
Low community involvement	22 (73)	8 (27)
Lack of support by hotel and shop merchants	21 (70)	9 (30)
Lack of co-operation by street vendors	20 (67)	10 (33)
Lack of orientation among waste collectors	19 (63)	11 (37)
Inadequate number of sanitary workers	18 (60)	12 (40)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The concerned administrative officers explained the issues for lack of waste management. About 50% each respondents said that they faced issues and did not face any issues in the wards. Further the table shows that 73% said lack of community involvement, 70% mentioned lack of support from hotel and shop owners, 67% opined lack of co-operation by street vendors, 63% opined lack of orientation on waste management among waste collectors, and 60% explained inadequate number of sanitary workers in the respective wards were the issues faced by the officers.

Table 4.4.17: Means of Encouragement for community involvement in waste management Means of Encouragement to Practice Waste Management

Means of encouragement	**N=30 (Per cent)**
Regular follow- up and publicity	5(17)
Training, meeting various associations, and awareness workshops for community people	3(10)
More awareness of the importance of solid waste management to the public	2(7)
Cash prize for best wards	2(7)
School programmes	2(7)
Encouragement by government	1(3)
No suggestions	10(32)
Don't know	5(17)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The table depicts the means of encouragement for the residents to avail their fuller participation in the waste management process. Among 30 respondents, 17% said regular follow- up on waste management and publicity to be given through different modes, 10% mentioned training on need basis, regular meetings with various associations, and awareness workshop could be organized for the residents seven per cent each said more awareness to be conducted as part of motivation and cash prize for best wards can be executed, awareness programme can be conducted in schools , and 32% did not respond, and 17% did not know about it.

Table 4.4.18: Administrative Officers' (AO) Views on Plans

Plans	**N=30 (Per cent)**
No action plans	16(53)
According to government	10(33)
As per higher officers	4 (14)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.5.18 gives an idea of administrative officers' views on the waste management problem. Half of 53% AO respondents said they have no action plans, 33% mentioned that the work is and 14% opined that the work was carried out according to the instructions given by higher officers.

Table 4.4.19: Requirements with regard to solid waste management

Needs (requirements) of the ward	**N=30 (Per cent)**
Need of more public participation	14 (47)
Need of more awareness about government programmes	11(37) (36)
More involvement of ward members	4(13) (14)
Serious action against contractors	1(3)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

It is also the responsibility of officers to know the requirements of the ward before making any decision on solid waste management. A majority of 47% officers said that to implement proper solid waste management more public participation is needed, 36% mentioned that ward residents need to be more awareness of government programmes, 14% said more involvement of ward members, and only three per cent opined that serious action should be taken against contractors, who do not follow the directions given by higher authorities on waste management.

Table 4.4.20: Officers Visit to other cities as part of Exposure

Officers visit to other	**Yes**	**No**
	N=30 (Per cent)	
	4 (13)	26 (87)
Details of exposure		
Chandigarh City Municipality	2 (7)	28 (93)
State Institute for Urban Development, Mysuru	2 (7)	28 (93)
Not applicable	26 (87)	4 (13)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Visiting other cities to observe best practices motivates the officials to active involvement in their work. With regard to it, 13% officers have visited other cities, and 87% have never visited other cities. Further, the table examines on the details of exposure, as seven per cent each respondent has visited Chandigarh Municipality and the State Institute of Urban Development (SIUD) Mysuru, and for majority of them, it is not applicable. It is very clear that little scope has been given for official's exposure.

Table 4.4.21: Best practices observed during visits

Best practices observed during visits	**N=30 (Per cent)**
Segregation of waste at generation point	2(7)
Recycling of waste	2((7)
Not applicable	26(87)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The ward levels officials had visited the Chandigarh City Corporation and SIUD, Mysuru, as part of the exposure visit. Seven per cent each of the officers, who had visited other cities observed segregation of waste at generation point and were impressed with the recycling of waste process. It seems that very less respondents got an opportunity to visit and many of them could not be a part of it.

4.5 Civil Society Role /Elected Representatives Participation in Solid Waste Management:

The Municipal Council of Gurugram is made up of its group of elected Municipal Councilors, and its Mayor is in charge of presiding over the body. Municipal Councilors are the individuals chosen to serve on behalf of Gurugram's 35 wards within the municipal jurisdiction. In the year 2020, the Manesar Municipal Corporation was established in order to upgrade the town's infrastructure in response to the requirements of the local population. In order to facilitate management and organizational tasks, Manesar Corporation is divided into seven distinct zones. The mayor is in charge of governing the Manesar Municipal Corporation, while the Municipal Commissioner is in charge of administration. The information was collected from council members of the Municipal Corporations of Gurugram and Manesar to achieve a comprehensive comprehension of their expertise regarding the management of solid waste in the wards to which they were assigned.

Table 4.5.1: Demographic profiles of Council Members

Demographic details	Categories	N = 30 (Per cent)
Sex	Male	14(47)
	Female	16(53)
Age (in yrs.)	30-35	7 (23)
	36-40	2 (7)
	41-45	12 (40)
	46-50	5(17)
	51-55	4(13)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The study had chosen thirty council members from two respective wards. Out of 30, female council member i.e., 53% precede male council members of about 47%. With regard to age, as many as 40% council members are in the age group of 41- 45yrs, 23% between 30-35yrs, 17% in the age group of 46-50yrs, 13% in the age group of 51-55yrs, and seven per cent ranged between 36-40yrs. The mean age of the respondents is 43yrs. The ward councillors are politically responsible for the management of public services in their respective wards. They form an important link between the citizens and the government. They are key for liaison between the government and other stakeholders. They are the deciding authority about local dumpsites, mode, and model of waste management in their respective wards.

Table 4.5.2: Involvement in Ward development Activities

Full time involvement	N = 30 (Per cent)
Yes	26(87)
No	4(13)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.5.2 presents the data on the full-time involvement of the elected representatives in ward development activities in their respective zones. It seems that the elected representative's duty and responsibility is to involve fully in development activities of the ward, once they are elected as representatives. A majority of 87% respondents were already involved in developmental activities and attended to the various needs of the residents in their area, and 13% could not give complete attention and were partially involved in ward activities. Hence, there is urgent need to sensitize these ward representatives on making them more responsible. Municipal Corporations Gurugram and Manesar has to keep an eye on all elected representatives and should develop proper mechanisms to monitor their engagements and involvements.

Table 4.5.3: Council Members' Knowledge on quantity of waste collection

Aware of quantity of waste collected /day	**N = 30 (Per cent)**
Yes	14(47)
No	16(53)
Knowledge about quantity of waste collection /day	
Between 10-20 tonnes	3 (10)
Between 20-30 tonnes	4(13)
Between 30-40 tonnes	4 (13)
Between 40-50 tonnes	2(7)
More than 50 tonnes	1(3)
Not applicable	16(53)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.5.3 denotes the elected ward members' knowledge about the quantity of waste collected per day in their respective wards. About 53% elected representatives were unaware of the quantity of waste collection in their ward and 47% were aware of it. The study also gathered data on knowledge of the quantity of waste collection per day and 10% elected respondents said that the waste collected per day is between 10-20 tonnes, 13% each respondents mentioned it as between 20-30 tonnes and 30-40 tonnes seven per cent and three per cent opined between 40-50 tonnes and more than 50 tonnes, and 53% were unaware of it. This implies that the ward members are not active members as they are supposed to have minimum knowledge of the waste generation in their respective wards. Municipal Corporations Gurugram and Manesar should take proper steps to sensitize them about waste collection and their role in managing it.

Table 4.5.4: Reasons for being Unaware of the Quantity of Waste Generated

Reasons for Unawareness	N = 30 (Per cent)
Not interested	3(10)
No use of knowing about it	5(17)
It is not important	8(27)
No response	14(47)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The researcher made further investigations to find out the reasons behind in many of the representatives not being aware of the precise statistics of the waste collection in their words. In Table 4.5.4, data was gathered as to the reasons for unawareness among elected representatives on the quantity of waste generated in their respective ward. About 10% council members had no interest in knowing the quantity of waste generated, 17% said it yielded no return 27% mentioned it as not important, and 47% opined that they were neither aware of it nor interested to know about it. The data reflects that the elected representatives do not consider the problem of solid waste management as a major issue, hence their knowledge and sense of responsibility is rather poor. Again, there is a need for Municipal Corporations Gurugram and Manesar to sensitize them about this crucial issue**,** has found that if the municipal leaders are interested and give importance to solid waste issues, then thy support for the strategies which are more efficient way of waste collection and management.

Table 4.5.5: Council Members' Perception on Waste Collection Methods

Mode of Waste Collection	Yes	No
	N = 30 (Per cent)	
Door- to- door	30(100)	0 (0)
Door-to- door in pushcarts	30(100)	0 (0)
Door-to-door in small pick- ups	22(73)	8(27)
Door-to-door in open trucks	5(17)	25(83)
Door-to-door in compaction trucks	8(27)	22(73)
Door-to-door by other means	6(20)	24(80)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.5.5 shows details of the waste collection methods followed in the wards. It seems that all respondents (100%) are aware of the door- to- door collection as well as door- to- door collection in pushcarts, 73% council members are aware of door-to- door collection in small pickups, 83%, 73% and 80% council members are unaware of the door- to- door collection in open truck, door- to- door collection in compaction truck, and by other means. The data shows the need of sensitization of waste collection methods of the elected ward members.

Table 4.5.6: Aware of Waste Dumping Points

Mode of waste collection followed	Yes	No
	N = 30 (Per cent)	
Waste collection points	5 (17)	25 (83)
Open dumping yards	5 (17)	25 (83)
Garbage dumping areas	9 (30)	21 (70)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.5.6 provides information on awareness of waste dumping points among council members. Majority of respondents are unaware of the availability of waste dumping points. As high as 83% each council members opined that waste collection points and open dumping yards are unavailable in their respective wards, 70% members said garbage dumping areas were not created in their ward areas, 17% each and 30% council members said all these types of dumping points were available to dispose waste in their respective wards.

Table 4.5.7: Type of Vehicles Used to Carry Waste

Type of vehicles used	Yes	No
	N = 30 (Per cent)	
Small pick-up trucks	30(100)	0 (0)
Farm tractors and trailers	30(100)	0 (0)
Non-compaction side loading truck	6 (20)	24 (80)
Open truck with non-tipping body	30(100)	0 (0)
Open tipping truck	30(100)	0 (0)
Compactor truck	30(100)	0 (0)
Skip container and lift truck	30(100)	0 (0)
Roll- on container and arm roll truck	30(100)	0 (0)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.5.7 gives information on the type of vehicles used to carry waste in the wards. It seems that all council members are aware of the type of vehicle used for waste collection in the ward, since these Trucks works on a daily basis in the ward had been witnessed by the council members, hence they are aware of it except for non-compaction side loading truck, as many as 80% council members were unaware of this type of Truck according to the data shown in the table, the non-compaction side loading trucks spills the waste while transporting. All respondents said that open truck with non-tipping body, open tipping truck, compactor truck, skip container and lift truck, and roll on container and arm roll truck are being used for waste collection in their wards. This shows increased awareness among elected representatives on the various types/modes of vehicles used in their wards for waste collection. This also shows that in Gurugram city, attempt has made to adapt scientific methods of waste collection and transportation.

Table 4.5.8: Duration of Work Rendered by Council Members

Time spent on waste management activities	**Yes**	**No**
	N = 30 (Per cent)	
30 minutes daily	0(0)	30 (100)
30 minutes once in two days	0(0)	30 (100)
60 minutes per week	0 (0)	30 (100)
Not sparing time for this cause	30(100)	0 (0)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Here, the researcher attempted to collect and analyze information about the time spent on waste management activities by the elected representatives. About 16.7% of representatives are sparing thirty minutes for this issue, 30.0% are sparing thirty minutes once in two days, and 20.0% are sparing one hour on waste management issues. On the whole, there is no active involvement in waste management by the elected representatives, and partial involvement is reflected in the study, hence there is need for intervention by the Municipal Corporations Gurugram and Manesar to raise the level of awareness and level of commitment of the elected representatives to get involved in waste management issues.

Table 4.5.9: Awareness and efforts of Elected representatives on effective solid waste management

Awareness and efforts on effective SWM	N = 30 (Per cent)	
	Yes	No
Representatives are Aware on Collected Waste Disposal	9(30)	21(70)
Representatives Attempt to Form Association	0 (0)	30(100)
Representatives Motivation towards Residents	11(37)	19(63)
Representatives interact frequently with Ward Residents	19(63)	11(37)
Representatives Plans for SWM	30(100)	0 (0)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.5.9 examines the council members' awareness on collected waste disposal practices. A majority of 70% council members are unaware of waste disposal practices, which shows that council members have not considered this matter as serious and are not acting according to it. About 30% council members are aware of the waste disposal practices. One of the major actions from Municipal Corporations Gurugram and Manesar should be to ensure that all elected representatives are aware of the collected waste disposal and their role in managing it. Municipal Corporations Gurugram and Manesar must develop proper mechanisms for it. Through the above table, the researcher has attempted to collect information on whether the elected representatives have taken the initiative for the formation of residents' associations to resolve the issue of waste management. All the respondents said 'no' to this, this is not surprising given their knowledge and commitment to be aware and get engaged in resolving the problem of solid waste management.

Table 4.5.9 shows rate of motivation to the public by the elected representatives. Majority of 63.3% respondents said they have not undertaken any motivational activities for the public about their role in waste management, and 36.7% said there is a motivation to the public by the elected representatives. This is also obvious because if the elected representatives hardly give value time to this crucial issue, if their awareness itself is of low quality, commitment is poor, how can they think of conducting motivation activities for the public. Even those who agreed that they have done the motivation to the public, they don't seem to be very clear about what they did, or want to do. Municipal Corporations Gurugram and Manesar should design a comprehensive strategy to pair the representatives and the public to learn about solid waste management and pledge to a partnership for resolving the problem. Waste workers have low motivation due to being associated to low social status situation. Local leaders give low priority for solid waste management. Comparing to other municipal activities.

Constant interaction with the people of the ward is a needed for elected representatives to understand their problems and redress them suitable. It is their primary duty, and those who have elected them expect. Unfortunately, most of the times the politicians who frequently forget the ward so very often in the ward during election campaign, suddenly disappear into oblivion after they are elected. They are busy, with what the common public don't know, Councillors' main concern should be listening to and solving the day to day civic problems of their ward. For this, they should constantly be in touch with the public directly and not through their assistants. Hence, researcher wanted to know the scenario as to how is their interaction with the community in their ward.

The table further highlights the ward members' interaction with the community people as 63.0% mentioned interacting with the community people and another remaining 36.7% said they do not interact. Municipal Corporations Gurugram and Manesar has to ensure that the ward members interaction with community closely on various civic problems including solid waste management, since it is the only way to ensure people's participation in resolving the sever problem of waste generated in the city.

The table shows about plans for wards from elected representatives. Very interestingly all respondents said they have visionary plans for their wards in view of waste management problem.

Table 4.5.10: Suggestive Plans by Council Members

Suggestive Plans	**Yes**	**No**
	N = 30 (Per cent)	
Organizing Trainings from MUNICIPAL CORPORATIONS GURUGRAM AND MANESAR	30(100)	0 (0)
Implementation of Swaccha Bharath Mission	0 (0)	30 (100)
Encouraging people	0 (0)	30 (100)
Reduce illegal dumping of waste in the wards	0 (0)	30 (100)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Further, the researcher attempted to collect and specify visionary strategic plans from the respondents. About 100% of the respondents said there is need of organizing training from Municipal Corporations Gurugram and Manesar. And all respondents responded, no for time spent for waste management activities like implementation of Swachcha Bharath Mission programme. Encouraging people and reducing the illegal dumping of waste in the wards.

Table 4.5.11: Type of Motivation

Type of Motivation	**N = 30 (Per cent)**
Door- to -door campaign	11(37)
Formation of task force committee	0 (0)
Organize Workshops	0 (0)
Various competitions for ward children	0 (0)
Not applicable	19 (63)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.5.11 depicts the types of motivation rendered by council members towards the residents in their wards. A majority of 63% respondents said the question is not applicable to them, and 37% motivated the community people through door- to- door campaign. However, there is a need of formation of task force, organizing workshops, and various competitions to ward children to motivate the respective ward residents. This table suggests that there is need of formation of task force, organizing workshops and various competitions for ward children etc. to motivate pubic.

Table 4.5.12: Formation of Association to Resolve Waste Management Problem

Formation of Association	N = 30 (Percent)
Merchants Associations	7(23)
SHG Federations	6(20)
Street Vendors Committees	4(13)
SHG members	2(7)
Not applicable	11(37)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

It is with only constant interaction with the community that the representatives can get a holistic picture of their word. As far solid waste management is concerned, they have to motivate each individual and institutional waste generator to feel responsible and take action in alleviating the problem. Another effective way to address this problem is to draft an active participation of groups and organizations. The researcher identified a few such organized groups, and asked the respondents if they have recognized the importance of involving the people's groups and what they have so far done about this.

Table 4.5.12 describes the actions taken by the ward members with regard to waste management with the help of organized groups. About 23.3% respondents said that through merchants' associations, 20.0% said through SHG federations, 13.3% said through street vendors committees and only 6.7% said through SHG members and for remaining 36.7% respondents chose not answer this question.

Table 4.5.13: Community Involvement in the perception of Elected Representatives

Residents Involvement	Yes	No
	N = 30 (Per cent)	
Merchants	23 (77)	7(23)
People's participation	20 (67)	10 (33)
Street vendors	17(57)	13(43)
Waste collectors	8(27)	22(73)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.5.13 throws light on the respondents' perspective on community participation in resolving the problem of solid waste management. Majority 67% respondents said there is active people's participation, 77% mentioned that merchants are actively involved and supporting the waste management policy, 57% mentioned street vendors are following waste management rules, and with regard to waste collectors, 27% of the elected representatives observe their participation and adaptation of waste management policy.

Table 4.5.14: Response on various aspects related to Elected Representatives

Response on various aspects	**Yes**	**No**
	N=30	
Issues faced by elected representatives	19(63)	11(37)
Timely Monitoring of Work of sanitary workers	0 (0)	30(100)
Willingness to lend moveable/immovable resources to support SWM	17(57)	13(43)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

Table 4.5.14 highlights the issues faced by the elected representatives, wherein 63% faced issues and 37% have not faced any issues. The table also reflects timely monitoring of the work of sanitary workers by elected representatives. The study has identified that none of the elected representative personally monitor the work of sanitation workers in their wards. It is an alarm to Municipal Corporations Gurugram and Manesar to make and ensure that as one of the responsibilities of elected representatives is timely monitoring of sanitary workers.

The table further explores the elected representative's involvement and participation for effective management in their respective wards. The people's representatives are ready to support by providing land, building, waste processing equipment, and labour. In the study, an attempt was made to bring out the response on willingness to lend moveable and immovable resources to support waste management in the ward. Surprisingly, as many as 57% council members agreed to lend resources such as land, buildings, equipment, and human resources to support to waste management, and 43% did not agree to it.

Table 4.5.15: Major Issues identified by Ward Members

Major issues	**N = 30 (Per cent)**
Residents are not following the rules	14(47)
Lack of scientific methods of segregation	5(17)
Sanitation workers don't know proper waste collection methods	3 (10)

Irregular waste collection	3 (10)
Lack of systematic waste collection methods	3(10)
Lack of awareness	2(7)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

People's representatives are one of the stakeholders of the waste management system. They interact directly with the residents, small entrepreneurs, street vendors, taxi drivers, etc. With their available knowledge, the people's representatives have listed out few major issues with regard to waste management.

Table 4.5.15 provides details on the issues identified as lacking in the waste segregation process by the council members. It seems that 47% opined residents are not following waste segregation process, five percent said generally residents lack scientific methods of segregation, three per cent each said sanitary workers don't know proper waste collection methods, irregular waste collection, and lack systematic waste collection methods, and two per cent opined that sanitary workers and residents are unaware of proper waste segregation methods.

As a result of interaction with other stakeholders, the people's representatives have been able to identify problems which need urgent addressing. They should bring them to the notice of the concerned authority in the Municipal Corporations Gurugram and Manesar, and with them should draw a plan, detail the requirements, source the resources, and implement the plans with the active involvement of the people.

Table 4.5.16: Needs identified by the Elected Representatives

Need identification	**N = 30 (Per cent)**
co-operation by residents	18(60)
Systematic waste transportation system	7(23)
Municipal Corporations Gurugram and Manesar officers must be responsible	5(17)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The people's representatives are willing to mitigate the issues of waste management. Whereas, they are looking forward few basic needs satisfied by the administrative authorities for the effective waste management in their respective wards.

In the table 4.5.16 it is shown that the council members have identified few needs to meet the challenges of solid waste management, whereby 60% council members said they expect co-operation from residents, 23% said they need systematic waste transportation system, and 17% mentioned Municipal Corporations Gurugram and Manesar officers must take up the responsibilities to meet the challenges of waste problem.

Table 4.5.17: Best Practices to be followed

Best practices	**N = 30 (Per cent)**
Effective training programmes for sanitation workers	15(50)
Clear guidelines for participation	9(30)
More Media Publicity	3(10)
Rewards and awards for best practices	2(7)
Effective implementation of government programmes	1(3)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The people's representatives have identified few means to encourage people's participation.

Table 4.5.17 denotes the best practices to be followed for waste management process. It seems that 50% council members opined effective training programme to be organized for sanitary workers to sensitize them to the importance of segregation of waste, 30% said clear guidelines for both sanitary workers and residents on waste segregation to be taken up 10% mentioned more publicity towards waste management to be encouraged by the Municipal Corporations Gurugram and Manesar through mass media seven per cent were of the opinion that rewards and awards as part of best practices in the respective wards to encourage residents involvement in waste management , and three percent said there must be effective implementation of governmental programmes to meet the challenges of waste management. The people's representatives have identified few means to encourage people's participation in their perception.

Table 4.5.18: Action Plan for Effective Waste Management

Action Plan	**N = 30 (Per cent)**
Encouraging people's participation	11(37)
Effective implementation of Swacha Bharath Programme	7(23)
Development of dumping areas	5(17)
Private initiatives	4(13)
Implementation of Technically waste collection methods	3(10)

Source: Field survey (Primary Data Collection from MCG and MCM Gurugram)

The representatives have greater responsibility towards the community. Since they are the people representatives, they need to design actions for the civic welfare of the community. The study explored people's representatives' ideas on designing action plan for effective solid waste management.

The action plans that have been established for efficient waste management are outlined in Table 4.5.18. The researcher was tasked with identifying the requirements posed by the elected officials. About 37 percent of respondents believed that encouraging people to participate in waste management would help, 23 percent believed that effective implementation of the Swacha Bharath Programme would support effective waste management in their wards, 13 percent believed that private initiatives, primarily corporate social responsibility efforts, would help to resolve the issue of waste management, 10 percent opined of technically sound waste collection methods, and 17 percent emphasized the need for thinning out the population as a whole.

Training in efficient waste management is something that is desperately needed for people's representatives. In accordance with Rule 2016 of the Municipal Solid Waste Management, the elected representatives serve as the presidents of the respective ward committees. As a result, the Municipal Corporations of Gurugram and Manesar bear the bulk of the duty for carrying out the requirements of the Municipal Solid Waste Management Rule, 2016, which came into effect in 2016.

Chapter 5

Conclusion and Suggestion

5.1 Findings related to Sanitary Workers:

- **Gender distribution in the profession of solid waste management:** The study found that 72.0 percent of female and 56.0 percent of male have chosen waste collection as profession. And it is also found that women workers are more vulnerable to the working conditions.

- **Religion of sanitation workers:** In the study it is found that a majority of the sanitary workers belonged to Hindu religion is 88 percent and 96 percent from Zone 1 and 2 of MCG and Zone 1 and 2 of MCM respectively. Only 12 percent from Zone 1 and 2 of MCG zone are found to be Muslims and 4 percent from Zone 1 and 2 of MCM said they belong to Christian religion.

- **Age of respondents:** With regard to the age of the respondents, it is found that as many as 48 percent & 32 percent respondents age ranged between 30-39 yrs. from the both zones, followed by 24 percent & 28 percent belonged to 20-29 years, 24 percent each respondent belonged to 40-49 years from both the zone. The remaining 16 percent and four percent respondents belong to 50-59 yrs from Zone 1 and 2 of MCG and Zone 1 and 2 of MCM. Sizable numbers of them belong to prime youth, i.e. 20-29 years. Because they are not formally educated and no other skills, they are into sanitary work. This human resource could have been utilized by the community in a better way.

- **Qualification of sanitation workers:** 60.0 percent of sanitation workers are non-literate in Zone 1 and 2 of MCM and 44.0 percent workers of Zone 1 and 2 of MCG Zone are illiterate, hence it is majorly found that non-literate has opted for waste management as a profession. Most of them being migrants from other places and states live in very in pathetic conditions, they are hardly motivated to reap the benefits of formal education, even when government schools provide it free of cost. They are illiterate because their parents were poor, now the same chain continues. Not many send their children to schools.

- **Type of houses:** The study found that majority of the sanitation workers are living in rented houses i.e., 52 percent from Zone 1 and 2 of MCG Zone & 100 percent from Zone 1 and 2 of MCM. The remaining respondents of 28 percent live in their own houses and 20 percent have been in leased house in Zone 1 and 2 of MCG Zone.

- **Type of household:** In the study majority of 68 percent and 56 percent live in Kaccha houses, 32 percent and 24 percent respondents' abode is Pakka house and the remaining only 20 percent respondents from Zone 1 and 2 of MCM could not mention in which type of house they live in as per the type of house these sanitary workers live in.

- **Availing of schemes:** The study that 88.0 percent of waste management workers have ration card at Zone 1 and 2 of MCG Zone and 76.0 percent are having BPL card, 12.0 percent APL card and 12.0 percent have Anthyodaya card, and only 12.0 percent workers have recently migrated and joined the profession. With regard to Zone 1 and 2 of MCM 60.0 percent of waste management workers have ration cards and all of them are having BPL card. And the major reasons given by the workers for not having ration cards are; 20.0 percent mentioned no valid identity cards' 3.6 percent stressed that they do not know how to apply for ration cards. So did not avail it and 12.0 percent workers did not applied for ration cards.

- **Engaged in recreational activities:** The study has highlighted that all the respondents from Zone 1 and 2 of MCG Zone and 92 percent workers from Zone 1 and 2 of MCM own television followed by mobile phone for their recreation. Around 44 percent from Zone 1 and 2 of MCG Zone and 4 percent from Zone 1 and 2 of MCM use refrigerator as household goods. Mixer grinder (52 percent & 92 percent), household gas cylinder connection (68 percent & 88 percent), were common household facilities that are utilized by the sanitary workers. Very few of 24.0 percent each respondent from both the zones own two wheelers, whereas only 8 percent respondents from Zone 1 and 2 of MCG own four wheelers followed by washing machine.

- **Profession choice:** It is evident from the study that 60 percent each (both zones) respondents opined that since they did not get any other job opportunity to earn, they joined as sanitation workers, around 28 percent and 12 percent workers have chosen the profession due to lack of skill to avail other jobs, lack of education, lack of training etc. 24 percent respondents from Zone 1 and 2 of MCM opined due to migration they have opted this profession, and the remaining 12 percent and four percent being part of the profession as it is hereditary job to them.

- **Health issues of sanitation workers:** In the present study majority of solid waste collectors from Zone 1 and 2 of MCM 96 percent and 64 percent from Zone 1 and 2 of MCG Zone are aware of fever as part of health issues. Except fever, waste collectors are not aware of the prevalence of the other health issues such as skin disease, cough, headache, breathing problem, blood pressure, back pain and diabetics which they are likely to suffer due the nature of their work. Such as skin disease 64 percent from Zone 1 and 2 of MCM and 56percent from Zone 1 and 2 of MCG Zone, cough 80percent and 76 percent, headache 76percent each, breathing problem 88percent each, blood pressure 88percent & 84percent, back pain 80percent & 88percent, diabetics 92 percent and 96percent respondents were not aware of the health issues acquired through profession respectively.

- **Habits and recreation of sanitation workers:** The study reveals that 68 percent and 52percent workers in Zone 1 and 2 of MCG and Zone 1 and 2 of MCM watch television as part of their daily recreation, 12percent and 8 percent workers from Zone 1 and 2 of MCG and Zone 1 and 2 of MCM go to movies on a weekly basis. There are other respondents who consume substances daily and considered this as their recreation i.e., 8percent only from Zone 1 and 2 of MCG. The other respondents who consume substance while watching television 4 percent and 28percent respondents from respective wards, followed by 4 percent from Zone 1 and 2 of MCM use other type of recreational activities. There are respondents who do not have any other type of recreation facilities/recreation is nil in both the zones i.e., 8percent each from both the zones.

- **Working hours of sanitation workers:** The study has explored that, 16percent & 72percent respondents are working for duration of 7 to 8 hours a day, whereas 8 percent and 28percent respondents from two zones work for about 8 to 10 hours on a daily basis respectively. From Zone 1 and 2 of MCG Zone it is found that 24percent work for about 6 to 7 hours, 20percent respondents for a duration of 5 to 6 hours, 16percent to an extent of 2 to 4 hours and the remaining 8percent each respondent work for a duration of 4 to 5 hours and 0 to 2 hours on a daily routine respectively.

- **Earnings of sanitation workers:** In terms of their earnings, it is evident from the above study that many respondents fall under the category of monthly earnings from Rs. 6000 to Rs 10,000 from both the Zones i.e., 60percent from earnings between Rs.

21,000 to 25,000 from Zone 1 and 2 of MCM and other 4percent from Zone 1 and 2 of MCG Zone earn Rs. 16,000 to 20,000, whereas 4 percent each from both the zones receive Rs. 26,000 and above per month. Very less salary is drawn by the 12percent respondents from Zone 1 and 2 of MCG zone i.e., below Rs. 5000.

- **Apart from salary other sources of income:** The study found that 36 percent and 16 percent respondents from both the zones have other sources of income and a majority of them do not have any other sources of income. Most of the sanitary workers work for a restricted duration and the remaining hours they happen to be free, hence during those free hours these sanitary workers have chosen other work. 24percent from Zone 1 and 2 of MCG have chosen to work as daily wage earners, 4 percent each worker work as coolies and street vendors from Zone 1 and 2 of MCG Zone respectively. 8 percent respondents from Zone 1 and 2 of MCM work as drivers and four percent each from both the zones work as insurance agents. The remaining, majority respondents i.e., 64percent and 84percent from both the zones have not responded.

- **Details about bonus, provident fund facilities:** The study revealed that majority of 76percent and 100percent respondents from Zone 1 and 2 of MCG and Zone 1 and 2 of MCM have not received annual bonus. As much as 76percent and 64percent from both the zones have been accorded with Provident Fund (PF). In the study 56percent each from both the zones have availed ESI from Municipal Corporations Gurugram And Manesar.

- **Details on Savings:** The study revealed that 60percent respondents from Zone 1 and 2 of MCG Zone have given priority for savings, while only 28 percent respondents from Zone 1 and 2 of MCM have a habit of saving.

- **Memberships in various associations:** In the study, majority of 88percent respondents from Zone 1 and 2 of MCG Zone and all the respondents 100percent from Zone 1 and 2 of MCM had a membership in the association. And also, in the study, a majority i.e., 88 percent and 84percent respondents from both the zones have a union membership, whereas only 12percent and 16percent respondents had self-help group membership from both the zone respectively.

- **Awareness on proper waste segregation**: the study has shown that more than half of 64 percent and 52 percent sanitary workers in both the wards opined that the households are aware of segregation of waste into different bins. Only a smaller number of respondent's 36 percent and 48percent sanitary workers from both the zones opined public do not know the waste segregation.

- **Knowledge about waste segregation**: The study found that 64percent from Zone 1 and 2 of MCG Zone do not know the advantages of waste segregation, whereas only 28percent from Zone 1 and 2 of MCM do not know the advantages. A few of the respondents i.e., 48percent from Zone 1 and 2 of MCM and 12percent from Zone 1 and 2 of MCG Zone opined that Municipal Corporations Gurugram And Manesar should encourage the waste segregation at source level, whereas 12percent each from both the zones were of the opinion that Municipal Corporations Gurugram And Manesar should strictly implement waste segregation practice through Municipal Solid Waste Rules, where in only 12percent sanitary workers from Zone 1 and 2 of MCM ward said that Municipal Corporations Gurugram And Manesar should implement Municipal Solid Waste Management Rules for effective solid waste management.

- **Capacity building trainings attended by sanitation workers:** The study has revealed that, 76percent and 60percent sanitary workers from both the zones had attended training on waste segregation at source, 8 percent respondents only from Zone 1 and 2 of MCG Zone said they had attended training on waste disposal methods and the remaining sanitary workers i.e., 16percent and 40percent attended training on occupational safety measures from two zones respectively.

5.2 Findings related to Household (Residents):

➢ **Type of family:** The study revealed that, in both the study wards there is prevalence of nuclear family system. The sanitation workers work has been appraised by the residents of the sample collected area, in both the study wards the residents have appraised the overall performance as good. With regard to the handling of waste by the sanitation workers, the Zone 1 and 2 of MCM study ward residents are expecting better services from them.

➢ **Findings on waste disposal practices:** The residents from both the study areas are practicing burning of waste as one of the waste disposal methods. In Zone 1 and 2 of MCM study area this has been practiced more than Zone 1 and 2 of MCG Zone study area. 16.0 percent of residents in Zone 1 and 2 of MCM study ward and 12.7percent of Zone 1 and 2 of MCG Zone follow the practices of discarding of waste on provided containers. And very less percentage of 6.7percent of respondents in Zone 1 and 2 of

MCM study ward and 10.0percent in Zone 1 and 2 of MCG Zone study ward hand over to the waste collectors. Majorly they practice burying of waste in backyard, open drainage, dump sites.

- **Findings on opinions on waste collections at ward level:** The study found that, 11.3 percent of respondents of Zone 1 and 2 of MCG Zone and 6.0 percent in Zone 1 and 2 of MCM has mentioned that there are no waste collections practices followed in their respective wards.

- **Findings on waste handled in the family:** Women play significant role in waste handling in the family. In both the study areas, women take care of waste disposal in the family, whereas, in the Zone 1 and 2 of MCG Zone study area 23.0 percent of the residents have mentioned that women and men both take equal responsibility of waste disposal.

- **Findings on handling of recyclable and organic wastes:** In the study in Zone 1 and 2 of MCG Zone 38.0percent of residents are segregating the waste for recycling of waste and 6.7percent of residents are segregating the waste for their own usage. With regard to use of organic waste as compost, in Zone 1 and 2 of MCG Zone study area very less of 4.7 percent of residents are practicing recyclable and organic wastes

- **Findings on awareness on improper waste management:** 89.3percent of residents of Zone 1 and 2 of MCM study area have better awareness than 53.3percent of Zone 1 and 2 of MCG study area residents. The residents have expressed their opinion about existing waste containers in their respective wards. 75.3percent of residents of the Zone 1 and 2 of MCG Zone study area expressed that the placement of containers is too far from their houses, hence it is difficult for them to drop the waste when routine door to door collection does not happen someday.

- **Findings on residents' involvement in Recycle and Reuse of waste:** In both the study areas, residents have the habit of segregating recyclable wastes. 88.0 percent of residents from Zone 1 and 2 of MCM study area are segregating Zone 1 and 2 of MCG zone, Zone 1 and 2 of MCM residents have better knowledge on waste segregations.

- **Findings on opinion on existing waste disposal containers in wards:** In the study 75.3 percent of Zone 1 and 2 of MCG Zone study area respondents opined that the provided containers are too far from their houses, 72.7percent respondents viewed that they are too small in size, 78.0 percent shared that containers produces unpleasant odours. 68.7percent respondents of Zone 1 and 2 of MCM study area are of the opinion that the containers are too far from their houses again 68.7percent of them mentioned it is too small,58.0percent of the residents, specifically stressed that it produces unpleasant odours, and 69.3percent of respondents said that the size is small and not sufficient for the ward. Overall, the residents from both zones study area are not satisfied with provided community containers.

- **Waste disposal methods followed:** 75.3percent of respondents of the Zone 1 and 2 of MCG Zone shared anything can be thrown in the site and 82.7 percent of respondents observed the site produces foul odours in the area. In comparison 62.7percent of residents in Zone 1 and 2 of MCM expressed anybody can throw anything on open sites. 68.7 percent of respondents mentioned waste troughing in site produces foul odour.

- **Awareness on impacts of waste troughing in open area:** In the study 74.0percent of residents aware that the open dumping of wastes throws public health at risk. And 78.0percent of respondents viewed that the dumping of waste in open sites leads to ground water contamination. 78.7percent of respondents mentioned open dumping sites encourages public to dump more waste in some sites in Zone 1 and 2 of MCG Zone.

- **Waste segregation practices by residents:** 88.0 percent of residents have the habit of segregating recyclable wastes. 49.3 percent of residents are segregating compostable wastes. 68.0 percent of residents are willing to segregate the wastes, 46.7 percent of residents are concerned about safe waste disposal in Zone 1 and 2 of MCM. In comparison to Zone 1 and 2 of MCM 80.0 percent of residents have the habit of segregating of recyclable wastes. 23.3 percent of residents are currently separating compostable wastes. 40.7 percent of residents are willing to segregate compostable wastes. 60.7 percent of residents are concerned about safe waste disposal in Zone 1 and 2 of MCG.

- **Residents opinion on Swachh Bharath mission:** The comparative study of both the study areas reveals that 8.7 percent of the residents viewed Swaccha Bharath Mission program which leads to overall development of nation. 23.7 percent of residents expressed that there is a need for more mass education and propaganda. 11.0 percent of respondents from both the wards have mentioned that the Swachh Bharat Mission program helps to keep the city clean and prevent from chronic diseases. Further, 0.7 percent of respondents from both the wards have expressed that Swacch Bharat Mission gave to more emphasis to reuse and recycle of waste. And overall, only 1.4 percent of residents viewed that this program on waste management was useful.

- **Awareness about existence of bio-methanaization plants:** The study explored that, in Zone 1 and 2 of MCM all the respondents (100.0 percent) are aware about existence of Zonal office and are very well aware about bio- methanization plant. And in Zone 1 and 2 of MCG Zone 56.7 percent of the residents are aware about existence of Zonal office.

- **Residents perceptions about elected representatives involvement in waste disposal:** 53.4 percent of residents from both the wards shared that after the elections the representatives are not listening to the demands of the community people. 40.7 percent of the residents shared that the elected representatives are non-approachable. 0.7 percent of residents shared that there is lack of proper implementation of solid waste management in Indian judicial system. Further, 5.3 percent of residents observed that in both the study areas the elected representatives lack knowledge on importance of waste management.

- **Residents suggestions for betterment of management of solid waste:** 83.3 percent of residents suggest that dustbins need to be placed in all streets of the wards. 52.0 percent of residents viewed that there is need for timely monitoring by Municipal Corporations Gurugram And Manesar. 25.3 percent of residents expressed that the door-to- door waste collection system needs improvement. only 11.0 percent of residents recommends for waste recycling as one of the best methods of effective waste management. 3.3percent of respondents from both the study area are looking forward for effective ward level monitoring and constant follow up at ward levels. 8.7percent of respondents from both the study wards suggest to use closed or covered waste containers. Further, 4.0 percent of residents' recommendations are for more community participation.

5.3 Findings on Elected Representatives' Participation:

- **Sampled elected representatives' details:** The study has found 46.7 percent male and 53.3percent of female compotators are the respondents of this study. Majority of the elected representatives in this study area are in the age group between 41 to 45 years. And 86.7 percent of the elected representatives are actively involved in politics.

- **Knowledge on quantum of waste collected:** About 53.3percent of people representatives are not aware about quantum of waste collected in their wards, only 46.7percent are aware about it. The study revealed that, about 13.3percent of the representatives assumed that either 20to 30 tons or 30 to 40 tons of wastes generated in their wards. And also 26.7percent of the representatives said it is not important to know about quantum of waste generation in their wards.

- **Knowledge on waste collection methods:** The results reveal that, majority of 73.3percent of the elected representatives are aware of the door-to-door waste collection method practiced in their wards.83.3 percent of the representative's highlights there is no waste collection points in their wards. All (100.0percent) representatives are aware that small pick-up trucks and farm tractors and trailers are commonly used for waste collection in their wards.

- **Times spent for waste management:** It is evident from the study that none of the representatives is sparing time for waste management issues. Whereas, all the representatives have visionary plans about Solid waste management in their wards.

- **Awareness on waste disposal:** 30.0 percent of elected representatives are aware about the disposal of collected waste.

Initiatives taken by elected representatives to form associations:

- The study found that none of the representatives have taken initiative to form the associations to resolve the issue of waste management. Whereas, 23.3 percent of representatives have initiated interacting with merchant associations.13.3 percent of them with street vendors committees.

- **Motivation by elected representatives:** Only 36.7 percent of representatives are motivating the public's about waste management through door-to-door campaigns. 63.0 percent of representatives are interacting with the public about waste management.

- **Addressing of issues of solid waste:** The study highlights that 63.0percent of them have mentioned that they are addressing various issues related to waste management in their wards.

- **Assessment of various stakeholders' participation:** About 66.7percent of representatives have observed people participation in waste management.76.7percent of representatives observed merchants are actively participating in waste management. 56.7 percent of representatives said street vendors are participating.

- **Willingness to support for effective management of waste:** 56.7percent of representatives expressed their willingness to provide land, building, equipment and human resources for waste management.

- **Opinion on public participation:** In the study majorly, all elected representatives are highlighting that publics are not following the waste management rules.

- **Recommendations for scientific waste transporting system:** In the study it has been found that, 23.3 percent of the elected representatives recommended introduction of scientific waste transporting system.

- **Assessment about administrative staff involvement:** About 16.7percent of representatives are blaming Municipal Corporations Gurugram And Manesar staff's inefficiency as the reason for improper waste management.

- **View on people's participation:** About 30.0percent of representatives emphasise on the need for specific guidelines for active people's participation. On the whole 36.7 percent of the elected representatives opined that encouraging people participation, 23.3percent of elected representatives focus on implementation of Swachh Bharath Mission programs, and 10.0 percent are stressing on implementation of innovative technology for effective waste collection.

5.4 Findings about Responsible Administrative Officers:

- **Administrative staff details:** The study found that 96.7percent of the administrative personnel are permanent employees of Municipal Corporations Gurugram And Manesar and 3.3 percent of the respondents are contractual employees.

- **Awareness about quantum of waste generation:** About 60.0 percent of the officers are not aware about the quantity of waste generated in their ward. And 40.0 percent of officers mentioned that the major reason for not being aware about the quantity of waste collection is because they have considered it as not applicable to them. The study found that, 96.7 percent of officers are not sparing time for waste management issues.

- **Administrative staff willingness to plans about waste management:** About 60.0percent of officers are ready to have discussion with the waste collectors as their visionary plans for waste management at their ward levels.

- **Initiative taken by officers to resolve waste management issues:** About 86.7percent of the officers have not taken any initiatives to resolve the waste management issues.

- **Readiness to motivate publics:** The study found that, 43.3 percent of officers are willing to motivate the publics.

- **Officers action taken on improper waste management:** The study reveals that the officers are taking action on improper waste management, 50.0percent of officers on street vendors, 13.3percent on resident's associations at apartments, and 30.0percent of officers have taken action through these sectors, which is a positive reflection of Solid Waste Management in Municipal Corporations Gurugram And Manesar.

- **Officers suggestions for effective waste management:** In the study it is found that, 16.7 percent of offices suggest active involvement by public and elected representatives for effective waste management, 10.0 percent of them highlighted that Municipal Corporations Gurugram And Manesar must set specific guidelines for effective implementation, and 3.3 percent of the officer's stress on regular ward level educational programmes. And rest are not ready to express their suggestions.

- **Readiness to give suggestions:** The study reveals that, 50.0percent of officers are not ready to give suggestions because majorly 16.7percent of them mentioned there is no use of giving suggestions, rulers are decision makers, and also 3.3percent of offices specifically mentioned that higher offices planning and assigning work to the subordinates.

- **Opinion on elected members participation:** It is found that, 16.7 percent of officers opined that, ward members or elected representatives are concerned about waste management, whereas majorly 83.3percent of officers said ward members / elected representatives are not concerned about the issue of waste management. And also the study found that, only 6.7percent of officers mentioned that the elected representatives take active discussion in the meetings, 6.7 percent of officers viewed that the elected representatives discuss with officers and other staff members regarding solid waste management and 3.3 percent of officers expressed that elected representatives are monitoring waste management process on daily basis.

- **Reasons for improper waste management:** The study reveals that majority of

73.3 percent of the officers listed that low community involvement is the main reason for improper waste management. 70.0 percent of offices said hotel and shops merchants are not supportive in the community. 66.7 percent of officers expressed that street vendors are non-cooperative and 63.3percent officers highlighted inefficient waste collection system.

- **Officers vision on waste management:** The study found that, 53.3percent of officers do not have any visionary strategic plan on waste management for their wards.

- **Major requirements:** Majority of 63.3 percent of officers have viewed that there is need of extensive public participation along with the involvement of ward members.

- **Officer's exposure visits to other cities:** The study had explored that, 13.3 percent of officers visited other cities as part of exposure/ training on solid waste management.

5.5 Findings related to Vendors/ Entrepreneur:

➢ **Type of vending activities:** As far the type of vending ventures, majority of the respondents of 38.0percent are carrying out the business on lease basis, 34.0percent are doing the business on ownership basis and on rent basis are 28.0percent.

➢ **Gender details of vendors:** 80.0 percent of the sampled respondents are male and 20.0percent are female from both the study wards. Hence majority of the respondents are male. And age-wise, majority of them fall between the age group from 36 to 40 years age.

➢ **Qualification of vendors:** It is evident that majority of sampled respondents of 40.0 percent have studied below S.S.L.C and 34.0 percent of respondents from both the study ward have completed P.U.C education.

➢ **Type of family:** 58.0 percent of sampled respondents from both the zones' study wards have a family consisting of three to four members. Hence, they are into nuclear family system. 26.0 percent of the vendors have five to six members in their family. Further, it has been explored that 42.0 percent of respondents have elder members in their families and 80.0percent of respondents from both zones study areas have mentioned that they have two children in their families.

- **Duration of stay in the same area:** 38.0 percent of sampled vendors are residing in the same ward from more than one year but less than three years, vendors residing more than ten years in the same ward is 30.0percent, 22.0 percent of venders are residing less than one year and 10.0 percent of them are residents in the same ward from more than three years and less than ten years.

- **Assessment on waste management services:** In the Zone 1 and 2 of MCG zone study ward 28.0 percent of vendors have assessed the waste management followed in the ward as excellent. Whereas, majority of 72.0 percent of sampled vendors has mentioned that, it is good. Whereas 80.0 percent of vendors of Zone 1 and 2 of MCM have mentioned that the waste management work in their ward is good. Hence, it has been reflected that in study wards the vendors are satisfied about the waste management work in practice by Municipal Corporations Gurugram And Manesar.

- **Opinion on quality services by sanitation workers:** regarding the work shift management by waste collectors, 48.0 percent has mentioned that the service quality is excellent, 40.0 percent of sampled respondents remarked that it is good and 12.0 percent of respondents has mentioned that it is sufficient in Zone 1 and 2 of MCG Zone study ward. In comparison to Zone 1 and 2 of MCM study area, 68.0 percent of respondents have remarked that, the shift management among waste collectors is excellent. And also, 16.0 percent of respondents have mentioned that it is good. 4.0 percent of them are not happy about shift management by waste collectors. The Zone 1 and 2 of MCG zone study area residents are more satisfied with the quality services by sanitation workers.

- **Repose towards the work performance of sanitation workers**: In Zone 1 and 2 of MCG study area 56.0 percent of vendors have felt that the sanitary workers are good enough to handle waste. 60.0 percent of them have recommended as them are smartness in their work. In Zone 1 and 2 of MCM study area 32.0 percent of them have mentioned that the response is excellent.

- **Waste management knowledge among the waste collectors:** 48.0 percent of Zone 1 and 2 of MCG zone study area vendors have highlighted that, the waste collector knowledge about waste management is good. 44.0 percent of entrepreneurs / vendors from Zone 1 and 2 of MCM study area have mentioned that the knowledge about waste management among the workers is poor. 24.0 percent of the respondents in the same study area highlighted that, the work is sufficient, 20.0percent of sampled respondents in the sample collected area has mentioned that the workers knowledge is good, and very minor 12.0 percent of respondents has agreed that the knowledge is excellent. The Zone 1 and 2 of MCG study area sanitation workers have better knowledge on waste management than Zone 1 and 2 of MCM study area.

- **Opinion on waste collectors' responses**: 40.0 percent of Zone 1 and 2 of MCG Zone study ward has responded that sanitation workers response is good and 28.0 percent of sampled respondents said the response by the waste collectors is excellent.

- **Methods of waste disposal followed by vendors**: In Zone 1 and 2 of MCG Zone study area majority of 56.0 percent of vendors are discarding the generated waste in ward containers, 16.0 percent of them are burning the waste, 8.0percent of restaurants are letting the waste on the streets and 4.0percent of sampled respondents following the practice of burying near open drainage, burying in dump sites and handing over to waste collectors. In the Zone 1 and 2 of MCM study area 56.0 percent of vendors are practicing burning of waste, 28.0 percent of the respondents are letting the generated waste on the streets, 4.0 percent of the vendors are practicing both discarding the waste in the ward containers and burning in the backyard and 8.0 percent of them have responded that they do not know about disposal method followed in their business activities.

- **Opinion on waste collection**: In Zone 1 and 2 of MCG Zone study area, 76.0 percent of vendors have mentioned that waste has been collected from the generation point. As far as the intervals of waste collection in the Zone 1 and 2 of MCM study area, majority of 52.0percent of vendors have replied that waste is collected from the generating point on daily basis. 24.0 percent of vendors responded that weekly twice the waste is collected, 12.0 percent of them have experienced that once in a week the waste has been collected by the Municipal Corporations Gurugram And Manesar. 8.0percent of vendors do not know as to when the waste is going to be collected in their ward and none of them have mentioned that waste is not collected. But the vendors responded that waste is being collected at different intervals. In the Zone 1 and 2 of MCG Zone study area, majority of 40.0 percent of respondents mentioned that weekly twice the waste is collected from the generation point, 36.0 percent of them said it is collected on daily basis. 12.0 percent of the vendors expressed that waste is collected once in a week and 4.0 percent of them have shared that waste is not been collected, and if collected it only now and then and remaining 4.0 percent of respondents do not know about intervals of waste collection.

- **Practices of waste disposal methods:** In Zone 1 and 2 of MCG study area majority of 32.0percent of respondents are throwing the generated waste in open drainages. 28.0percent of them are throwing it in empty lands, 20.0 percent of the vendors have taken the responsibility of informing the Municipal Corporations Gurugram And Manesar ward office. 16.0percent of the vendors waiting for the waste transporting vehicle and waste collectors and only 4.0 percent of vendors in this study area are taking the waste outside from the city and throwing in empty lands. In the Zone 1 and 2 of MCM study area 32.0 percent of vendors are either informing to the Municipal Corporations Gurugram And Manesar ward office or throwing it into open drainages, 20.0 percent of them throw the waste into empty lands and only 8.0percent of respondents have responded that either they will wait for waste transporting vehicle and waste collectors to collect, are taking the waste outside the city and throwing on empty lands.

- **Waste segregation practices followed by vendors:** In Zone 1 and 2 of MCG Zone study area, 36.0 percent of the vendors mix the waste. 32.0 percent of the vendors are selling the waste to junk collection shops. 12.0 percent of vendors are segregating the waste for reuse, 4.0 percent of them segregate, give to others and higher ratio of 16.0 percent do not know about recycling of waste. In Zone 1 and 2 of MCM study area 56.0 percent of entrepreneur/ vendors mix all the wastes, 32.0 percent of vendors segregate the waste to sell in junk collection shops, 4.0 percent of them segregate to give others and 8.0 percent of them don't how know how to recycle the wastes out of their business waste. The Zone 1 and 2 of MCM study area vendors have the better knowledge on segregation of waste

- **Organic waste disposal methods followed by vendors**: In the Zone 1 and 2 of MCG Zone study area 48.0 percent of the vendors are feeding the organic wastes to animals, 16.0percent of them leaving the waste to be collected from their shops, 12.0 percent of the vendors are both discarding in the ward containers and disposing on streets, 8.0 percent of the vendors are throwing into the open drainages and also 8.0 percent of the vendors does not know about organic waste management. In Zone 1 and 2 of MCM 72.0 percent of vendors are feeding the local animals, 16.0 percent of them are disposing the organic wastes on streets and 4.0 percent of are leaving it to be collected from their area and 4.0 percent of vendors do not know about organic waste management. In total, in both the study wards the vendors are mainly using the organic waste to fed local animals. In the olden day's livestock has functioned as bio-processor, the contemporary treatment technologies help to convert the food waste as safe nutritious feed for animals. The organic waste is a viable solution, which addresses the issues of waste management, food security, climate change mitigation (Dou et al 2018).

5.6 Suggestions and Recommendation:

The present study, which was carried out in Gurugram city has explored that it is possible to have effective solid waste management through community participation. The study validates the assumption that it is possible to have interventions to have sustainable community development. The present study suggests the following recommendations; Sustainability of community-based interventions. The solid waste management services such as door to door collection, street sweeping and drainage cleaning should be integrated. The multiple service providers to be synchronized for effective services.

Cess or user fee need to be collected from all citizens, whereas fees slabs to be introduced based on income level. Slum dwellers and lower income categories must have subsidised fees.

The Urban Local Bodies (ULBs), should provide land and sheds for segregation of waste and other waste management processes.

The Community Based Organizations such as Self-Help Groups (SHGs), SHG federations, entrepreneurs or vendors associations, must come forward to take up solid waste management contracts. This is possible with consistent capacity building trainings and propagandas and awareness.

The unorganized rag pickers of the city must have licenses to pick the wastes and need to design strategy to track their activities. This can be done with the convergence of police department and NGOs.

The local leaders should take it up as priority issue. The stake holders such as CBOs NGOs, waste collectors, municipality administrative officers and local leaders should come to the common platform for continuous interaction and discussion to mitigate the issues.

Organizing Regular Street plays to create awareness among the community people.

The street plays must include different modules of plays with different themes.

In the Municipality schools weekly one-hour program about solid waste management to be conducted for children from grade one to ten. The government must pass the policy of convergence with education department. The schools need to be awarded on the basis of solid waste management programs assessment. This program should be mandatory for all type of school's government, private, or government aided schools.

The government must conduct different inter school competitions on solid waste management themes. And it should be in the curriculum of the children and has to be on-going program in the school. Exclusively one teacher or facilitator has to be trained in the subject of solid waste management. Similar to that of Indian Scuots and Guides teachers. The facilitator's responsibilities are to conduct workshops, orientations, competitions, and creating awareness among the children.

Extended Producers Responsibility (EPR) must provide an overall frame work for existing informal recycling system through product life cycle approach. This will solve many interrelated waste management issues. In countries such as India waste recycling is most economical and socially viable option as it generates employment for urban poor. The EPR need to have contract with corporate companies where huge amount of waste generates, and these wastes such as water bottles, tetra packs, used papers would be collected and invested in recycling sector, the recycling sector is presently facing resource crunches.

Extra taxes on non-recyclable products to be charged by the government, with that policy many companies will be demotivated to produce non-recyclable products.

Similar to ASHA worker in the women and children department, the Urban Development Department must recruit **Suchi Sakhis** in each ward to educate people on weekly basis in individual households and to monitor waste segregation at generation point itself.

Enrolment of Sanitation workers under social security schemes: Recommended social security schemes for sanitary workers are:

- **Jan-Dhan Account:** Zero balance savings account, government releases directly to the account and depending on transactions up to Rs 10,000 over draft to women beneficiaries.

- **Rupay card:** this card given to Jana Dhan and other card holders, up to Rs 2 lakhs accident insurance amount available.

- **Pradhan Manthri Jeevan Jyoththi Bheema Yojana** (PMJJBY): only Rs 33o/- annual premimum and Rs 2 lakhs insured amount available to the beneficiary
- **Pradhan Manthri Suraksha Bhima yojana (PMSBY):** Rs 12/- annual premium Rs 2 lakhs insured amount to the beneficiary, 18-70 years of age group can avail this benefit, one-year term premium.
- **Atal Pension Yojana**: Monthly benefit of minimum amount from Rs 1000/- to Rs 5000. Age group between 18-40 years are eligible to get benefits. This scheme is exclusively for unorganized workers.

Integration/ Amalgamation with Deendayal Anthyodaya -National Urban Livelihood Mission components (DAY-NULM):

Component 1: Support to Urban Street Vendors (SUSV)

- Integration with existing street vendors vending zones, in these zones there is priority has to be given for effective solid waste management.
- Vending zones office bearers need to monitor the efficacy of solid waste management in their respective vending zone.

Component 2: Integration with Social Mobilization and Institutional Development (SM&ID)

- There is provision for Area Level Federations (ALFs) of SHGs. The ALFs should be registered as per the state registration acts. Through this component the SWM monitoring work could be assigned to Area level federations (ALFs).
- There is provision for developing internal community resource persons (CRPS), here one CRP could be recruited exclusively for SWM can be considered to keep up the cleanliness of the area and to educate the mass.

Recommended new solid waste management administrative staff Structure for Municipal Corporations Gurugram And Manesar:

- Municipal Corporations Gurugram And Manesar should come forward to appoint Community Development or Social Development Officers exclusively for community participation with regard to solid waste management. These social development officers could imply the community participation techniques, tools and skills to encourage community participation to mitigate the issue of waste management. There is need for dedicated personnel to work with community people. Currently the solid waste management department is working with engineers and health inspectors along with them the social development officers required to address the issue of community participation.

- The researcher has observed that there is need for priority on community development and people participation, social mobilization should be an integral part of solid waste management process in Municipal Corporations Gurugram And Manesar. Already there are administrative personnel appointed to implement DAY-NULM scheme, the staff structure is as follows; The Community Affairs Officers (CAO) designated to work at the zonal offices along with Community Organizers are working at the ward level. Both CAO and CO are the permanent employees of B.B.M.P. With the integration of above-mentioned staff, the issue of solid waste management could be handled in a better way.
- The Area Level Federations ALF), could be strengthened by constant capacity building trainings. The strengthened Area Level Federations (ALF), could manage the solid waste of their respective area and they could take up the responsibility of creating awareness among community people.
- Through imparting capacity building trainings about 3Rs (Reduce, Reuse and Recycle), the trained ALFs CRPs can educate the SHG members, and also they can generate income out of waste through recycling process.

Skill development trainings for sanitary workers:

The Ministry of New and Renewable Energy (MNRE) and confirmation of Indian industry has promoted Skill Council for Green Jobs (SCGJ) to impart training to safai karma Charis. This is aligned with National skill development mission.

Solid waste audit needs to be conducted yearly twice.

The State and Central Government must have one special ministry for waste management: At present the solid waste management, water and sanitation and renewable energy are divided between Ministry of Renewable energy and Ministry of Water and Sanitation and Ministry of Urban Development.

5.7 Social Work Implication in Study:

The field of social work encompasses a more comprehensive scope than the majority of academic fields, and it is also a dynamic field. The core methods of social work, which include casework, group work, and community organization, as well as the subsidiary methods of social work, which include participatory and non-participatory approaches, could be implied for the welfare of society as a whole. In relation to the topic that was examined, the implications for social work are extremely broad.

Table No 5.1 Implications for social work

Social work Methods	Implications in the study
Primary Methods	
1. Case work method	Through the case work method, the individual issues could be addressed in a holistic way. This is the best method to deal with sanitation workers. The sanitation workers are addressing socio-economic and psychological issues. Intervention through psychosocial therapies majority of the issues of the sanitation workers could be resolved.
2. Group work method	The psycho-social needs of the problematic groups of the community would be treated through group work method. The psychosocial needs of the group members could be fulfilled by constituting of teams, and groups. The leardship quality could be enriched among the stake holders of the study i.e; sanitation workers, vendors, residents. This method would be recommended for better sustainable waste management practices.
3. Community organization	In the field of research concerning the administration of solid waste, the community organization approach is the one that predominates. Along with fostering a more conscious understanding of politics, this fosters a more cooperative, collaborative, and cohesive attitude and set of practices among the members of the community. For the purpose of providing the most effective management of solid waste in the city of Gurugram, a wide variety of social agencies, associations, non-governmental organizations (NGOs), and line departments have been interconnected. There is a tremendous amount of potential in Gurugram for public-private partnerships (PPP) and corporate social responsibility initiatives (CSR). In the city of Gurugram, the management of solid waste may be carried out in a manner that is both scientifically and effectively conducted through the channelization or amalgamation of CSR.
Secondary Methods	
4. Social work Research	Research in social work is a scientific way of study, and it is possible to conduct research in social work in several aspects of the field of solid waste management. Since the management of solid waste is still a relatively novel idea, there is a great deal of room for expansion in the research fields of the person, the group, and the community levels.

5. **Social Welfare Administration**	The government has provided various provisions for the welfare of the sanitation worker and vendor's community. The welfare schemes emphasise on social excluded, marginalized and other most vulnerable communitites. In the study the sanitation workers and vendors are the most vulnerable communities.
6. **Social Action**	There are empanelled and non-empanelled NGOs are working in Municipal Corporations Gurugram And Manesar for the betterment of management of solid waste in Gurugram city. The NGOs are working with the objective to have desirable changes in the defective system for the holistic progress of the society. NGOs have made attempts to mobilize people, awareness about existing situation and its impacts, to bring suitable legislative changes for the societal

5.8 Recommendations for future research

The study provided an insight about management of solid waste in selected wards of Municipal Corporations Gurugram And Manesar. Since the study subject is very wide there is ample scope for future researches. The following are the suggestions for future research works;

- A study needs to be carried about the solid waste audit at household level, ward level and zone level.
- An in-depth qualitative study on 3Rs (reduce, reuse and recycle) at different stake holder's levels.
- A study needs to be done on women sanitary workers psychosocial aspects.
- State and central governments must encourage CSR programs, exclusively on solid waste management in Gurugram city.
- With the Public Private Partnership (PPP) interventions, innovative projects may be carried out in the areas such as recycling of waste, sanitation workers children education.
- The State and Central Government must have special ministry for waste management. At present the components are divided between Ministry of New and Renewable Energy (MN&RE) and Ministry of Water and Sanitation and Ministry of Urban Development.
- The state and central universities, autonomous universities, affiliated colleges social work departments must take up the action researches and may achieve

innovations through their budding students.

- The central and state universities must start fellowship programs on waste management.
- The state and central governments must encourage social workers, and other social scientists to take up researches on waste management.

5.9 Conclusion:

Along with India, a huge number of other countries are tackling the issue of a growing quantity of trash being produced as a result of rapid population growth and unplanned urbanization. The inappropriate handling of trash results in significant problems for the environment and also poses a risk to public health. As a result, the conventional method of waste management needs to be replaced with an approach that is integrated, both strategically and scientifically. However, the implementation of the ISWM strategy is being hampered by a severe lack of planning, proper resources, and administrative efficacy, which together provide a significant impediment. The method of waste management in Gurugram is still following the conventional model, and there is a pressing need for technological advancement in the areas of collection, storage, transfer, and disposal. The most significant roadblocks to increasing productivity include monetary obstacles, a lack of coordination and cooperation between various agencies and authorities, and a decreased level of public integration and participation. It is possible that the problem of waste management could be alleviated to a significant degree by the implementation of spatial analytical technologies such as global positioning systems (GPS) and geographic information systems (GIS), as well as the opportunity for community involvement. For the system to operate efficiently and effectively, it is essential that proper monitoring of the system be performed at each level. This is of the utmost importance. Municipalities are required to plan and carry out the system by predicting the rise of urban areas in terms of population. This is necessary because the generation of trash presents cities with huge issues. Therefore, the most effective solution to the problem of waste management is the active engagement of the general public.

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An awareness study of solid waste management in Gurugram District

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Abstract---Gurugram's trash collection, transportation, and disposal systems are chaotic. Rapidly rising urban populations create more solid garbage than urban local bodies (ULBs) can handle. Improper garbage management threatens the environment and public health. The present study examines Gurugram's solid waste management and suggests solutions.

Keywords---MSW waste, solid waste management problem, awareness and practice on solid waste management.

Introduction

Gurgaon is India's fastest-growing city. Rapid development and population in the city are creating a health and sanitary danger for its citizens. Gurgaon also creates e-waste (due to a large corporate sector) and bio-medical waste (due to a growing hospital sector). Growing industry also generates significant amounts of industrial waste (sludge, etc.). The city has a 167-km2 urban area and 1,514,085 residents in 2011. It generates 449 metric tonnes of MSW daily, per MCG. MCG is responsible for trash planning and management in Gurgaon. MCG is only responsible for municipal trash (primarily old Gurgaon). Private contractors, RWAs, and HUDA staff handle waste in HUDA sectors. MCG collects, sweeps, transports, processes, and disposes of generators' waste. It collects garbage door-to-door. MCG has streamlined city trash handling.

Solid Waste Solid waste consists of solid or semi-solid domestic waste, sanitary waste, commercial waste, institutional waste, catering and market waste and other non-residential wastes, street sweepings, silt removed or collected from surface drains, horticulture waste, agriculture and dairy waste, treated bio-medical waste excluding industrial waste, bio-medical waste and e-waste, battery waste, and radioactive waste produced in the area (Gazette Notification, 2016).

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Municipal solid trash includes common objects including product packaging, grass clippings, furniture, clothing, bottles, food, scrap, newspapers, appliances, paint, and batteries (Sharma, 2002). (Cointreau, 1982).

Definition of Solid Waste

The Indian Municipal Solid Wastes (Management and Handling) Rules, 2000, describe "Municipal Solid Waste" as "commercial and residential wastes generated in municipal or notified areas in solid or semi-solid form, excluding industrial hazardous wastes but including treated bio-medical wastes."

Statement of problem

During the field study done by the Municipal corporation of Gurugram, it was discovered that... Gurugram's daily per capita trash generation is 320 grammes, which includes residential, business, and institutional waste. In addition, the city generates approximately 700 tonnes per day (TPD) of construction and demolition garbage, 1.5 TPD of biological waste, and 70000 tonnes of electronic waste annually. According to the categorization of municipal solid trash, 71 percent are kitchen scraps, 12 percent are recyclable, and 17 percent are inert. The city creates more than one thousand tonnes of municipal solid trash every day. It is anticipated that the amount of solid waste will increase to 2,900 TPD by 2041. According to MCC data, the annual rate of trash creation growth in Gurugram is 1.33 percent.

Presently, the majority of metropolitan local governments lack an effective action plan for implementing the Solid Waste Management System (Rawat, et al., 2013). There is an average of 70 percent garbage collection in India, with the remaining 30 percent being recombined and lost to the urban environment CPCB. No city in India has a 100 percent segregation of waste living units (2000b). Existing and projected land requirements for the disposal of municipal solid waste, coupled with population increase, may be a significant concern in the future. For a solid waste management system to be efficient, it must be environmentally benign, cost-effective, and acceptable to the local population.

The city of Gurugram has been struggling with a severe solid waste management issue. The mechanism for managing solid waste has been dismal and incredibly inefficient. Overall, it can be described as a failure. It has failed if there are large piles of uncontrolled trash on the sides of streets, sidewalks, drains, water channels, and public spaces. Municipal Corporation of Gurgaon (MCG) is responsible for solid waste management despite long-standing financial, skilled human resource, and technical constraints. And found itself incapable and ineffective of providing improved solid waste management services. The magnitude of the garbage problem has been grossly exaggerated as a result of the public's lack of understanding regarding solid waste issues, their uncooperative attitude, and MCG's indifference. In light of the aforementioned setting, this study sought to determine the significance of people's participation in the waste management process for the improvement of municipal solid waste management.

Review of Literature

Dimpal (2012) examines urbanisation and solid waste management in India. His report describes urbanisation. High population growth, dwindling possibilities in rural areas, and a move from stagnant, low-paying agriculture to urban jobs contribute to urbanisation. Unexpected immigration has led to the expansion of slums, squatters, and informal housing in developing countries cities. Unscientific garbage handling creates health hazards and urban environment damage. Urbanization, changing lifestyles, and increased consumerism will make solid waste management in India more difficult. Financial constraints, institutional deficiencies, poor technological choices, and public apathy towards MSW have worsened the situation. Her report assesses India's current solid waste procedures and concerns. It also provides ways to deal with garbage in a healthy and environmentally responsible way, turning it into a resource.

Joseph, Rajendiran, Renthilnathanand Rakesh (2012) analysed trash creation, collection, disposal, and the legal environment to highlight sustainable solid waste management in Indian cities. The study focuses on increasing local capability with the help of educational groups. They've centralised the implementation of an integrated approach supported by political resolve to remedy the problem, which helps change citizens' perspectives and develop community participation for sustainable trash management. Saikia and Nath (2015) highlight that Tezpur's waste management system is very ancient and needs upgrading. Lack of collaboration between authorities hinders efficiency improvement. Encourage community participation and use technology. Authorities must require recycling and reuse. Iyer emphasised sanitation (2017). Swacch Bharat Mission contributed to this. He said SBM is a complicated behavioural change movement. Plans, applications, and cleanliness efforts were organised across. Mass media awareness is crucial, but grassroots motivators employing interpersonal communication with the target audience are the key to change. SBM was gathering pace, but the centre and state governments knew it was hard to maintain. The author said everyone should help with the mission.

Geographical Area of the Study

Gurugram is in Haryana at 28.3606° N and 76.8721° E. 30 kilometres south of India's capital, New Delhi. The district is part of the National Capital Region and one of Delhi's satellite cities. Gurugram is Haryana's economic hub. The district is in the state's south-east and borders Delhi on the north. Jhajjar, Rewari, Mewat, Palwal, and Faridabad share its eastern border. Gurugram has multiple Aravali and Mangar Bani hill ranges. Gurugram is one of Haryana's 22 districts, covering 1257 km2 (976 km2 rural, 281 km2 urban). Gurugram (West), Gurugram (South), Badshahpur, and Pataudi are subdistricts. Gurugram, Sohna, Pataudi, Farrukh Nagar, and Manesar are further divided into five revenue tehsils and four sub-tehsils. Gurugram, Sohna, Farrukhnagar, and Pataudi are rural development blocks. Gurugram tehsil is 333 km2; 131.8 km2 is rural and 201.3 km2 is urban. Gurugram city is 250 km2. This study focused on Gurugram city in Gurugram tehsil, Gurugram district.

MCG areas are separated into Zones I, II, III, and IV for solid waste management. Khekri Dhaula Toll to Old Railway Road (Zone I) and right (Zone II). Zones I and II, with 122 colonies, are under one SDO, one Senior Sanitation Inspector, and one Sanitary Inspector. One contractor handles door-to-door collection, while numerous contractors sweep streets. MCG is operating in some regions. Zone III (Star Mall, Sector 31 towards Delhi up to MCG limits): No door-to-door contractor. Three companies sweep roads. One Senior Sanitary Inspector and two sanitary inspectors assist the SDO. No private contractor collects door-to-door in Zone IV (Star Mall, 31 towards Jaipur to Kherki Dhaula Toll Tax). Two street-sweeping companies exist. Two sanitary inspectors help the SDO.

Aim of the Study

The purpose of this research is to conduct "An Awareness Study of Solid Waste Management in Gurugram District," which is the title of the study. The following are the goals of the study:

- To Conduct Research on the Social Aspects of the Management of Solid Waste in the Municipal Corporation of Gurugram
- Investigate the current procedures for the management of solid waste in areas chosen from Zones I and II in the city of Gurugram.
- To identify the most significant issues with the methods used for the management of solid waste in Zones I and II of the city of Gurugram.
- To identify the issues that stakeholders are facing in relation to the methods that are being used for the management of solid waste in certain Zones I and II of the city of Gurugram.
- To investigate the connection between people's awareness and their actual behaviours about the management of solid waste in the community.
- to make suggestions for workable solutions that will result in the successful application of solid waste management procedures.

Hypothesis

- The participatory waste management model is not holistically implemented in Zone I and Zone II of Gurugram district due to the lack of systematic integration of stakeholders in the solid waste management system.
- There is a significant relation with respect to awareness and practise on solid waste management among the community people in Zone I and Zone II of Gurugram district.

Methodology of the Research

The research has utilised a descriptive design in order to capture the current state of affairs in the field of study at the point in time when the inquiry is taking place. The researcher has purposefully relied upon a positivist world view to summarise the state of circumstances that are the focus of the investigation; as a result, the methodology is predominately quantitative. An inquiry is conducted into the level of knowledge and impression that individuals have regarding solid waste, as well as their engagement in waste management and the problems that are associated with these topics. The purpose of this project is to provide a detailed description of the many factors in order to investigate the part that each household respondent plays in the efficient management of the solid waste that is produced. The responses from homes are compiled into a more coherent whole because to its design, which is one of the many reasons it is so beneficial. This, in turn, would help in deciphering the subject matter from numerous vantage points in a deductive manner and developing a comprehensive solution to the same in an inductive manner. Within the context of a descriptive design, the research also incorporates a qualitative component. This is accomplished by collecting qualitative data from one of the homes who participated in the study and presenting it in a narrative format in order to verify the findings as a whole.

Population and Sampling Procedure of the Study

The current research was carried out in Gurugram, which is located in the state of Haryana, in order to gain an understanding of the solid waste management techniques that are in place in the city of Gurugram, as well as people's engagement in the management of solid waste. Only two of the four Zones were included in the present study, Zones I and II (225 houses each), for a total of 450 families that served as respondents for the purpose of gaining an understanding of their perspectives about the management of solid waste. The topic is examined from a variety of perspectives throughout the course of the study. The amount of solid trash that is produced by households in the area will serve as the starting point for the investigation. When looking into the issue of waste generation, the focus of the study is on the type of garbage produced, the amount of waste produced, and the factors that contribute to the production of waste in excessive quantities. The 'management' component is another main point of the research that has been done. The terms "collection," "segregation," and "disposal and recycling" are going to be the primary focal points of the inquiry into waste management. Given that the purpose of the study is to determine the role that home respondents play in the efficient management of solid waste.

Tools of Data Collection

- Socio-demographic data sheet
- Interview schedules on solid waste and waste management that were developed for the houses that responded to the survey.

The socio-demographic data was prepared in order to offer questions to the respondents, which included information regarding their age, education, sex, religion, dwelling type, and other characteristics relating to the topic. Details such as socio-economic situations, the type of profession, leisure features, and sources of revenue for the livelihood have also been included as part of the study and obtained using the socio-demographic schedule. This information was gathered as part of the research process. In addition, a detailed interview schedule was established with the purpose of eliciting the respondents' perspectives on the generation, segregation, disposal, recycling, and reuse of solid waste. In addition to determining the responses' perceptions, the respondents' levels of knowledge on the management of solid waste were also evaluated. The use of the schedules has allowed for the identification of the respondents' perceptions and levels of knowledge in relation to the management of solid waste.

Method of data collection

Face-to-face interviews with the households that responded to the survey were used to acquire the primary data. The primary data was gathered over the course of a period of six months, beginning in June 2020 and ending in November 2020. The duration of each interview was twenty-five minutes. The secondary data that was necessary for the study was gathered from a variety of sources, including journals, reports, periodicals, books, seminar sessions, government publications, websites, policy and programme notes, and other documents connected to waste management.

Data analysis

In order to conduct an analysis, the main data that was gathered from the field was reviewed, revised, categorised, and coded. The initial investigation of the data consisted of a descriptive statistical analysis of the primary factors that were being investigated. Tables and figures are used to present the results of this process, which include frequency distributions, percentage breakdowns, means, and standard deviations. Inferential statistical methods are utilised as well, and the findings are summarised in tables for your convenience. Statistical Package for Social Science, Version 25 was used to perform an analysis on each and every piece of primary quantitative data.

Limitations of the study

- The scope of the study is limited to just two areas in Gurugram: Zones I and II.
- The only people who have been taken into consideration are stake holders from Zones I and II in Gurugram.
- The production of garbage by industries and other large-scale commercial parties was not taken into account at any point in the analysis.

Problems encountered in solid waste management service in Zone I and Zone II

- Insufficient service coverage (some people not given service)
- An unacceptable level of service (not frequent enough, spill, etc.)
- The inability to make administrative and financial decisions due to a lack of power
- An insufficiency of available financial resources
- A lack of staff with appropriate training
- A dearth of available vehicles
- A lack of necessary apparatus
- Old vehicle/ equipment frequent breakdown
- Difficulty in acquiring replacement parts
- An inability to do maintenance or repairs on the vehicle or the equipment
- There is no uniformity in the vehicles or the equipment.
- Lack of an adequate institutional framework for the administration of solid waste services

- The absence of legislation 14. The absence of enforcement measures and the competence to implement them
- A failure to plan ahead (short, medium and long term plan)
- Rapid urbanisation is outpacing the capability of service providers
- The unchecked growth of illegal squatter settlements
- It is difficult to find and purchase a location for a dump.
- Cover material is difficult to get as a result
- Unsatisfactory collaboration on the part of government agencies
- a lack of cooperation from the general public 22. an unchecked use of packaging material 23. an inadequate reaction to the reduction of trash (reuse and recycling)
- 24. A scarcity of private contractors with the necessary qualifications
- 25. Difficult to control contractual service
- 26. An absence of regulation regarding hazardous waste

Results and Findings

- In Zone I, the majority of the stakeholders, which accounts for 58 percent, are between the ages of 30 and 40 years old. This is followed by 27 percent of the stakeholders who are between the ages of 20 and 30 years old. Eleven percent of respondents are between the ages of 40 and 50 years old, and four percent of respondents are between the ages of 50 and 60 years old. In Zone II, the majority of the stakeholders are between the ages of 30 and 40 years old (52 percent), followed by 26 percent of stakeholders who are between the ages of 20 and 30 years old, 19 percent of respondents who are between the ages of 40 and 50 years old, and 3 percent of stakeholders who are between the ages of 50 and 60 years old.
- An examination of the data according to gender reveals that the proportion of male respondents in Zone I is 52 percent, which is a little higher than the proportion of female respondents in that zone, which is 48 percent; however, the proportion of female respondents in Zone II is 58 percent, while the proportion of male respondents in that zone is 42 percent.
- The methods pertaining to the effective execution of solid waste management, such as timely collection of garbage, suitable route plan for waste collection vehicle, and landfill management, are not being properly executed. As a result, it has come to light that the management of solid waste in the municipalities that were chosen suffers from an absence of adequate execution.
- The findings of the study indicate that the majority of the garbage produced is plastic waste.
- Based on the findings, one can draw the conclusion that the inhabitants collect rubbish in their homes using containers made of plastic. For the collection of the waste from the household, you need no more than two containers of a more compact size. The residents of the city do not cover the trash cans that are kept inside their homes. The dry trash and the moist trash are not collected in distinctive containers because this practise is not followed.

- After much consideration, it has been determined that residents should empty the container used for the collection of home garbage once per day or once every other day into a public bin or a waste collection vehicle.
- It has come to light that municipalities place garbage collection vans at the doorsteps of residents in order to facilitate garbage collection. However, residents are forced to contend with rubbish collection vans that operate inconsistently. The majority of the time, waste collection vehicles are completely stuffed with waste as they travel from house to house collecting it.
- The findings of the study indicate that the amount of waste produced each day is a significant factor in determining the kind of vehicle used by town municipalities for the collection of garbage.
- The findings lead us to the conclusion that certain municipalities and districts do not routinely replace the public waste containers.
- It has come to light that the machinery and tools utilised for the management of solid waste in the municipalities of the selected towns are antiquated. Since new equipment is not purchased as frequently as it should be, this has a negative impact on the collection and transportation of solid waste.
- It has been determined that the number of transport vehicles for solid waste management in the selected town municipality is insufficient due to either a shortage of funding or the redirection of funds to any other project.
- It has come to light that the transport trucks utilised for the collection of solid trash in the municipalities are not kept in the appropriate condition due to the difficulties associated with management and the improper management of monitoring procedures.
- Based on the findings, it can be deduced that the residents of the selected municipalities do not have adequate knowledge regarding the management of solid waste.
- Based on the evidence presented, it can be deduced that the residents of the municipalities under consideration do not provide the level of cooperation that is required for effective management of solid waste.
- In conclusion, it can be stated that the aforementioned issues pertain to the management of solid waste in the communities that were chosen. 1) A failure to properly plan and carry out the action. 2) An insufficient amount of motivation among the personnel 3) The utilisation of antiquated machinery for the collecting of solid waste. 4) The utilisation of vehicles that are not suitable for the collection and transportation of waste. 5) Inadequate vehicle upkeep and repair 6)Poor public bin management. 7) An insufficient amount of financing from the government 8) A lack of understanding on the part of the general population regarding the management of solid trash 9) A lack of participation from the general population in the management of solid waste
- It has come to light that the various stakeholders in the municipalities that have been chosen have the following challenges with relation to the management of solid waste.
  - A lacklustre attitude among the personnel. 2) Inadequate methods of trash disposal. 3) The lack of awareness among the general people. 4) A failure to

adequately plan and carry out the action. 5) There is insufficient waste management in public areas. 6) A failure to properly manage landfills.

- The research indicates that the performance of the selected municipalities with regard to the timely collection of waste, waste disposal methods, budgetary allocation, placement of public bins, regular replacement of public bins, adequate equipments for waste collection, and dumping site management is average. On the other hand, the research indicates that the performance of the selected municipalities with regard to the separate collection of dry and wet waste is poor.
- Given the current state of affairs, it can be deduced that public bin sites, the frequency of waste collection, the techniques of waste collection, the methods of waste separation, and the waste recycling system that are put into place in municipalities are not satisfactory.
- We have reached the conclusion that there is no feedback system about the practises of solid waste management in the areas that were selected.
- The majority of the extra garbage generated by floating populations is controlled by increasing the number of temporary staff members involved in the process of solid waste management.
- The floating population may produce a maximum of ten tonnes of garbage that is in excess of what is needed.
- 22 The majority of the cities and towns have their very own composting facility.

Suggestions for solid waste management

- Educate people and raising awareness about waste management
- Encourage laws that deal with proper waste disposal.
- Regulations regarding negative externalities (people/industry/institution etc. are not willing to reduce their garbage and this harmful behaviour should be punished)
- Make Effective waste management systems and resource management plans
- Re-use and recycling of materials
- Use a reusable bottle/cup while travelling
- Use reusable bags
- *Composting/Organic Waste Recycling*
- *Waste to Energy Incineration*
- Choose sustainable plastic-free options Such as:
  - Locally made
  - Plastic-free
  - Sustainable
  - Cruelty-free
- Avoiding toxic waste
- Such as : Bleach, furniture, carper or oven cleaners, air freshener, antifreeze, all-purpose cleaners etc.
- Saying NO to single-use plastics

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A study of environmental condition and sustainable solid waste management in Gurugram City

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Abstract---Environmental problem is a global concern. It doesn't stop anywhere. All over the world, people are being educated about how to protect the environment. One of the main reasons why the environment is getting worse is because of how solid waste is handled. In many parts of the world, it is a major source of pollution and disease. There is no long-term solution to environmental problems. The only thing we can do is reduce and control the amount of waste we make by being aware and doing the right things. The most important thing in this situation is to take care of the trash in the right way. Waste management is a science that looks at how to get rid of trash, how it affects the environment, how it affects society, and how much it costs. So the purpose of the present research is to study the impact of solid waste has on the environment in the study area and to study the environmental condition and what kind of pollution problem arises in the Gurugram city.

Keywords---Environmental problem, Municipal Solid Waste (MSW), pollution problem, Sustainable solid waste management.

Introduction

It is common practice in India to dispose of Municipal Solid Waste (MSW) in low-lying locations, which results in Open Dumps (also referred to as Landfill sites), without taking any preventative measures or implementing any operational controls. The improper disposal of municipal waste in this unscientific manner has a negative influence on the health of humans as well as all other aspects of the environment (Rathi, 2006; Sharholy et al., 2005; Ray et al., 200 5; Jha et al., 2003; Kansal, 2002; Kansal et al., 1998; Singh and Singh, 1998; Gupta et al., 1998). The poisoning of groundwater resources as a direct result of these open

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dumps is one particular topic that researchers and scientists from all around the world are focusing their attention on. The waste that is deposited in landfills or open dumps will gradually release its original interstitial water. Additionally, some of the byproducts of the waste's breakdown will trickle into ground water as it moves through the waste deposits. The term "leachate" refers to this type of liquid, which can contain a wide variety of organic and inorganic substances. Leachate is produced when the moisture content of the biodegradable fraction of municipal solid waste (MSW) is high enough. Leachate contains a number of toxic chemical compounds that, in the absence of any lining, are capable of directly penetrating the underground strata and affecting the ground water quality. In recent years, a number of studies (Saarela, 2003; Abu-Rukah and Kofahi 2001; Looser. 2003) have been conducted to investigate the effect that landfill leachate has on both the surface water and the groundwater.

Increased industrialization and fast urbanization have led to a huge increase in garbage production in recent decades. Management of municipal solid waste (MSWM) presents a significant challenge in low-income nations. India currently generates 42.0 million tons of MSW annually. Overall, the amount of solid waste produced each year is estimated to rise by around 5%, with cities accounting for the production of nearly 75% of this total. It is becoming increasingly apparent, not only to members of the general public, but also to members of decision-making bodies, environmentalists, and medical researchers, that the interdependence of economic development, environmental management, and individual well-being is a crucial factor in determining the degree to which sustainability can be achieved (Goosen, 2012).

The term "solid waste" refers to any inert, non-fluid material that has no potential use to the waste producer. Trash, junk, and refuse are other names for it. Human activities generate trash, which must be collected, stored, and disposed of in ways that don't endanger local ecosystems or people's health. Solid waste management refers to the process of dealing with and disposing of solid waste in a way that is safe for humans and the environment (SWM). Municipal solid waste management (MSWM) difficulties and issues have a greater potential influence on public health in metropolitan regions of developing economies than other governance issues.

In India, an estimated 40-50 percent of rubbish created is not collected, and this uncollected waste ends up on highways and drainage systems. This, in turn, causes flooding, the proliferation of insects and disease-carrying pests, and so on. A significant amount of the waste is organic in nature and serves as food and shelter for rats and disease-carrying insects. The organic fraction of garbage causes bad odors and degrades the aesthetic appeal of the surroundings. The gathered garbage is sometimes disposed of in an improper manner, such as burying it in landfills or open burning it, resulting in pollution of land, water, and air. This lack of service and infrastructure typically impacts the lower strata of society due to their proximity to garbage storage places. This increases health risks and deepens social marginalization.

Disposal, however, is not a viable option for the sustainable management of solid waste. The goal of having zero emissions has become increasingly significant since the late 1990s. The concept is reflected by the phrase "no time for waste," because the concept envisions all industrial outputs from processing being used as input process materials or converted into value added inputs for other processes, thereby optimizing the consumption of resources and increasing eco-efficiency. This maximization of resource consumption and increase in eco-efficiency is what the phrase "no time for waste" refers to.

Review of Literature

If waste management activities are correctly managed, they can provide environmental benefits (Gentil et al, 2009). In the past, there has been little attempt to raise community knowledge, either about the potential dangers of inadequate waste management or the easy steps that every person may take. This might have aided in the reduction of trash generation and the promotion of effective waste management. This scenario, however, has changed. People are becoming more interested in environmental issues as they begin to see the negative repercussions of environmental difficulties.

According to Al-Khatib et al (2015) and Hilburn (2015), most developing-country communities often resort to waste disposal methods that have been shown to be harmful to human health and the environment, such as open dumping and burning (or unregulated landfills), because they believe they have no other options for managing their solid waste. This shows that most poor countries do not practice waste management in a sustainable manner.

Objectives of the Study

To study the impact of solid waste has on the environment in the study area and to study the environmental condition and what kind of pollution problem arises in the Gurugram city.

Study design

The study is descriptive in nature. Questionnaire was the main instrument used to solicit for information for discussion. In addition, informal interview was conducted to enable the researcher obtain more detailed information on waste management in the area.

Study Area

Gurgaon is a city in the northern Indian state of Haryana. Its official name is Gurugram. Gurugram is one of the Indian cities that is growing the fastest, and there are tasks to be done at different stages of managing solid waste. The municipal corporation of Gurugram (MCG) made a new wing to keep an eye on the environment and make sure things are sustainable. The new wing will be in charge of regulating and watching construction sites for dust pollution, enforcement of GRAP, micro STPs, reuse of treated waste water, pond rejuvenation, parks, green belts, and concrete forestry, among other things.

Study population

Includes households in Gurugram city.

Inclusion criteria
All households with permanent residents of Gurugram city for atleast a period of 6 months.

Study period
March 2022 to May 2022.

Sample size
400 respondents were randomly selected for the research study.

Tools and Techniques
The statistical measures such as number and percent distribution were used for describing the variables of the study. Data are coded, tabulated and analyze by using statistical method of SPSS (Statistical Package for Social Science) and Microsoft Excel.

Result and Discussion

A science that deals with the generation, storage, collection, transportation, segregation, processing, and disposal of solid waste using the best principles and practices of public health, economics, engineering, conservation, aesthetics, and other environmental conditions is referred to as solid waste management (SWM). In recent years, one of the most significant issues facing India is the accumulation of solid garbage. Waste has been growing both in volume and variety in tandem with the steady expansion of the industrial sector. The open spaces and nooks of every city in India are constantly covered with enormous amounts of garbage and other types of solid waste. This open disposal of rubbish, which is responsible for the spread of diseases, is interfered with by strays such as dogs, rodents, and cats. The problem of garbage disposal is particularly significant in slum regions, which are characterized by extreme poverty, inadequate housing, unsanitary conditions, and a lack of essential amenities. In our culture, only a small minority of people have the civic awareness to put trash away in the appropriate receptacles. SWM refers to the activities that are related with the production of solid wastes, as well as their storage and collection, transfer and transport, treatment, and disposal. However, the Municipal Solid Waste Management (MSWM) system in the majority of Indian cities consists of only four activities: the generation of waste, the collection of waste, the transportation of waste, and the separation of waste before disposal.

Household garbage, business waste, institutional waste, hospital waste, non-biodegradable waste, biodegradable waste, hazardous waste, compostable waste, combustible waste, and inert waste are the primary sources of solid waste. Typically, urban solid waste consists of home, commercial, and construction debris. The term municipal solid waste refers to all trash created from residential, institutional, commercial, industrial, construction, and street sources that is collected by the local government.

Waste reduction, reuse, and recycling are essential components of a comprehensive approach to solid waste management that also prioritizes effective collection and safe disposal. There is still widespread public concern about the state of the environment, despite the government's many initiatives to improve it. Improving management and organizational capacity and increasing people's participation in useful ways should be prioritized. Grugram district now faces a significant challenge that calls for expert-level planning and administration. For waste management programs to be successful, they need to prioritize public health, reduce trash, maximize recycling, and safeguard the environment.

Thousands of tons of municipal solid waste (MSW) are produced everyday as a result of the rapid industrialization and population boom in India, which has caused people to migrate from rural to cities. As the country works to become fully industrialized by 2020, it is producing more and more municipal solid waste (MSW) [Sharma and Shah, (2005), CPCB, (2004); Shekdar et al., (1992)]. The widespread presence of MSW is the result of insufficient collection and transportation efforts. Due to a lack of adequate facilities to treat and dispose of the increased amounts of MSW produced everyday in major cities, waste management is currently experiencing a critical juncture. When waste is disposed of without proper scientific methodology, it has a negative effect on the environment and human health [Rathi, (2006), Sharholy et al., (2005), Ray et al. (2005), Jha et al. (2003), Kansal, (2002), Kansal et.al.(1998), Singh and Singh (1998), Gupta et al. (1998)].

A classification system such as very polluted, polluted, and neutral was developed for the purpose of examining the impact that solid waste has on the environment in the area that was chosen. The fact that the respondent believes the environmental conditions to be unclean is evidence that the city is not very clean. Around sixty percent of respondents stated their opinion that Gurugram city is very polluted, and forty percent of respondents expressed their opinion that Gurugram city is polluted. Only one of the respondents held an opinion that was unaligned with the others on the environment. Many of those who participated in the survey recommended that the government take the required actions to cut down on pollution. According to the findings of the area-by-area investigation, the existing environmental condition of the city is extremely contaminated.

The accumulation of solid waste has quickly become one of the most pressing environmental issues on a global scale. Because it is exposed to many different types of pollutants, the environment in the area under study is rather poor. Table 1.1 contains a list of the environmental issues that are the root of the pollution problem.

Table 1.1
Environmental problems

Problems	Average Score	Ranks
Air pollution	50	1
Noise pollution	37	6
Loss of biodiversity	35	7
Green house effect	20	10
Solid waste problem	47	2
Desertification	31	9
Deforestation	33	8

Land pollution	41	4
Water pollution	45	3
Sewage problem	40	5

Source: Field survey, 2022

Significant environmental problems in the research region include air pollution, water pollution, noise pollution, deforestation, desertification, land pollution, sewage problem, etc. The following is a ranking of environmental issues as reported by respondents. Pollution of the air is the most pressing issue, followed by garbage in the water supply. Other major environmental issues include: land pollution (ranked fourth), sewage problems (ranked fifth), noise pollution (ranked sixth), biodiversity loss (ranked seventh), deforestation (ranked eighth), desertification (ranked ninth), and the greenhouse effect (ranked tenth). The solid waste issue is the second most pressing issue in the research area, after air pollution. Thus, the government must give solid waste management its full attention.

Damage to the environment from improperly managed municipal solid waste is a severe issue (Ejaz and Janjua, 2012). Waste, both in terms of volume and diversity, has been growing steadily as the industrial sector as a whole has expanded. Cities in India always have a lot of trash lying around in the streets, on the roads, and in the fields. Not everywhere has access to municipal waste collection services, and where it is available, it is often spotty and unreliable. Stray animals like dogs, rodents, and cats tamper with it, contaminating the water supply and the surrounding ecosystem as a whole and spreading disease. Water and pollutants are contaminated when solid waste is discharged directly or indirectly into water bodies without proper treatment to eliminate dangerous substances. Pollution and over use of natural resources are also major contributors to eco-system degradation. Solid waste contributes to habitat loss, decreased soil fertility, sewage problems, improper waste disposal, the after effects of poor recycling, offensive odors, and an increase in disease.

Damage caused by solid waste was analyzed using a factor analysis because it is the second most pressing issue in Gurugram city (Table 1.2). Bartlett's test for sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sample adequacy were used in the factor analysis. The calculated KMO score was 0.541, which is statistically significant. The use of component analysis to investigate the underlying structure of the many problems associated with solid waste was validated by passing Bartlett's test of sphericity. Variables having communalities above 0.5 were considered significant and included in the study.

Table 1.2
KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.541
Bartlett's Test of Sphericity	Approx. Chi-Square	123.721
	Degrees of freedom	36
	Significance	.000

Source: Field survey, 2022

The communalities for each variable were analyzed to determine how much variance to include in the factor rotation. The results are displayed in the table below.

Table 1.3
Communalities

Factors	Initial	Extraction
Contamination of water	1.000	.587
Damage to eco system	1.000	.583
Degradation of flora and fauna	1.000	.503
Reduction of soil fertility	1.000	.851
Sewage problem	1.000	.553
Unclean waste dumping	1.000	.585
Effect of inefficient recycling	1.000	.504
Bad smell	1.000	.540
Increasing diseases	1.000	.557

Extraction Method: Principal Component Analysis

All of the variables had values more than 0.050, indicating that the factors accounted for a significant percentage of the variance. The Eigen values, relative explanatory powers, and factor loading for the 9 linear components detected in the data set are listed in Table 1.3.

Table 1.4
Rotated Component Matrix

Factors	Component			
	1	2	3	4
Contamination of water			.712	
Damage to eco system			.576	
Degradation of flora and fauna		.695		
Reduction of soil fertility				.915
Sewage problem	.726			
Unclean waste dumping		.566		
The effect of improper recycling			.701	
Bad smell	.726			
Increasing diseases		.725		
Eigen values	1.521	1.471	1.247	1.023
Percentage of variance	16.900	16.345	13.851	11.368
Cumulative percentage	16.900	33.245	47.097	58.464

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

Factor 1 contains strong loadings for two dimensions: "sewage problem" and "poor odor." These dimensions accounted for almost 16% of the variance. Factor 2 had substantial loadings for three dimensions, namely "degradation of flora and fauna," "unclean waste dumping," and "growing diseases," with a variance of 16%.

Factor 3 explains 13% of the variance by having significant loadings on three dimensions: "water contamination," "environmental damage," and "the effect of incorrect recycling." Factor 4 has a substantial loading on soil fertility loss, which explains 11% of the variance. According to the present study, solid waste will cause foul odors, water contamination, sewage problems, increased disease, and soil fertility loss.

Conclusions

It is concluded that in the studied area, the rising amount and complexity of waste linked with the modern economy poses a major threat to ecosystems and human health. Every year, an estimated 11.2 billion tonnes of solid trash are collected around the world, with organic garbage decomposition accounting for around 5% of global greenhouse gas emissions. An estimated 11.2 billion tons of solid trash are collected each year around the world. Electrical and electronic equipment waste, which contains new and complicated hazardous compounds, is the fastest-growing waste stream in both industrialized and developing countries.

Poor waste management, which includes everything from a lack of collection infrastructure to ineffective disposal, pollutes the air, water, and land. Landfills that are open and unhygienic contribute to the contamination of drinking water and can cause infection and disease transmission. Debris dispersal pollutes ecosystems, and hazardous compounds from electronic trash or industrial junk place a strain on urban inhabitants' health and the environment.

For Sustainable solid waste management in Gurugram city, in the first place, waste minimization is the solution. Recovery of resources and energy from trash, as well as remanufacturing and recycling garbage into useable goods, should be the second alternative when waste cannot be avoided. Recycling saves a lot of money and resources.

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A Study Of Social Impacts Of Groundwater Overdraft In The Selected Sub-Regions Of Haryana State

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Abstract
Water is a natural resource that is essential for human life, agriculture, and the development of sustainable communities. In Haryana District, one of the most important sources of water is ground water. Rainfall that occurs during monsoons and other seasons, as well as return flows from irrigation systems, recharge from canals, lakes, and ponds, and floods all help to replenish ground water resources. This annual recharging of the aquifer helps to contribute to the dynamic ground water resources. A large quantity of the ground water that is recharged into the aquifer is stored there, and a portion of it helps to provide base flow for the rivers. The term "static resource" refers to the vast quantity of ground water that continues to be stored in the aquifer below the zone of yearly fluctuation notwithstanding the annual recharge that takes place there. Due to the fact that out of the 33 blocks that make up the subregion, 22 are over-exploited, 4 are semi-critical, and 7 are critical in terms of their ground water status, there is an urgent need to increase the amount of ground water that is being recharged. This will allow for the annual amount of ground water that is being withdrawn to be balanced out. The purpose of this research paper is to investigate current changes in the amount of ground water found in the Haryana district as well as the social effects of groundwater overdrafts in the Haryana district. In addition to this the researcher has also suggest some measures to raise the ground water level in the Haryana Sub-Region.
Keywords : Ground water, Groundwater Overdraft, ground water recharge, groundwatermanagement strategies

Introduction

Ground water is a key source of drinking water, irrigation water, and industrial development water in many regions of the world where there is a demand for water for these purposes. Ground water is one of the significant components of the worldwide fresh water resource (Singh and Sharma, 2010). Around the world, ground water meets approximately 50 percent of the demand for potable water, 40 percent of the demand for industrial water, and 20 percent of the need for water that is used for the irrigation of agricultural land (Villhoth, 2006). It is a resource that can be replenished, and it is distinguished by being an extremely dependable, safe, and sustainable source of water supply (Singh and Singh, 2002). Ground water is the most important source of irrigation and plays a critical role in ensuring the security of people's livelihoods all over the world, particularly in economies that are based on agriculture. Ground water is a finite resource (Mukherji and Shah, 2005). The majority of agricultural ground water extraction comes from these four countries: India, Pakistan, Bangladesh, and China (Kaur et al; 2011). According to Shah et al. (2003), between 55 and 60 percent of the population of India relies, either directly or indirectly, on ground water for some aspect of their life. It is possible to understand the significance of ground water resource in India by considering the fact that nearly two fifths of all agricultural production is dependent on irrigation from ground water resources (CWC, 2013), and approximately sixty percent of all irrigated food production is dependent on irrigation from ground water resources (Central Water Commission, 2013). As a result, it is abundantly clear that there has been a considerable shift in the level of ground water, occurring over a variety of distincttime periods.

Review of Literature

Goel and Kumar (2003) reviewed the problem of the rising groundwater table in central and south western parts of Haryana and its management strategies. He observed that introduction of the canal system in southwestern part of Haryana is mainly responsible for enhancing water logging conditions and soil salinization due to rising water table. Though this problem has assumed a serious proportion yet it is possible to tackle it with care by reviewing the planning of canal system. Further, he discussed that afforestation with the use of saline irrigation water is helpful in lowering the water table by choosing certain plant species which draw more water and tolerate more salinity than agricultural crops.

Jeet (2001, 2010) established the high magnitude of groundwater depletion in Haryana and suggested various strategies for the management of this natural resource. Yadav (2010) described the trend of groundwater fluctuation in Rewari district of Haryana. He founded that water table is declining downward due to over exploitation of groundwater causing of failure of shallow tubewells.

According to a study on the exploitation of groundwater published by the Groundwater cell of Agriculture department, the maximum fall in water table has been noticed at 30.59 meters in the Mahendergarh and 18.33 meters in Gurgaon district during June 1974 to June 2010. Thus, the fast depleting Groundwater level in the fresh quality zones in Haryana has a critical appraisal of its present use.

STUDY AREA:

Haryana is a state in India that spans an area of 44,212 square kilometres and has a latitude that ranges from 27º39' to 30º56'N latitude and 74º 27' to 77°36'E longitudes. Approximately 1.40 percent of the entire land area of the country is taken up by it. The state is currently subdivided into 22 districts, each of which is overseen by one of four commissionaires. The Shiwalik Hills to the north, the Yamuna River to the east, and the Ghaggar River to the north all serve as natural geographical boundaries for the state. The natural boundary between southern Delhi and the Gurgaon district is defined by the Aravalli Hills. This boundary also includes southern Delhi. The Thar Desert in Rajasthan can be found in the western part of the state. In the east, the state is bordered by Uttar Pradesh and Delhi; in the north by Punjab; in the northeast by Himachal Pradesh; and in the south and west by Rajasthan. As a result of its location in the interior of the Indian subcontinent, the climate in Haryana is predominantly warm and semi-arid. The monsoon winds from the southwest are responsible for bringing here more than 75 percent of the total yearly rainfall during the months of July and September. The weather will be virtually completely dry from October through the end of June of the next year, with the exception of a few showers brought by western disturbances. The state receives an average of 560 millimetres of precipitation each year, however the amount can range anywhere from less than 300 millimetres in the south- western regions to more than 1000 millimetres in the mountainous tracks of the northeast. The state consistently suffers from a lack of available water resources. As a result, Haryana has a climate that is classified as subtropical continental monsoon, with distinct seasons and a wide temperature variation throughout the year. The intricacy of the region is reflected in the way the soils are distributed. Loamy soils make up a significant portion of the state's land area. These soils, which are often referred to as bangar soils, may be found throughout the state's northern and central regions. Khaddar soil is a type of silty loam soil that may be found all along the Yamuna River's path. Bet is the name given to the clayey silts that can be found along the courses of seasonal streams such as Ghaggar and Markanda. The most western region of the state is characterised by soils that range from sandy to loamy sand in texture. The sandy loam soils belt extends from the western district all the way down to the southern district. (Pandey et al. 2004).

Aim of the Study:

 To study the recent trends in ground water level in Haryana district and Social Impacts of Groundwater Overdraft in Haryana district.

 To suggest various groundwater management strategies to improve the Ground Water Table in Haryana Sub-Region.

Hypothesis of the Study

There is urgent need to increase the ground water recharge to compensate for the annual ground water withdrawal in the blocks of Haryana.

Research Methodology and Techniques

The research methodology employed is exploratory, interpretative, descriptive and analytical as well as evaluative, with the help of various data collection.

Data collection for Research Study

Both the primary and secondary sources have been listed to determine the nature, method and scope of this research work. Many other relevant critical works, periodicals, articles, reviews and other sources have been cited and referred to, whenever necessary.

For the purpose of determining the extent of groundwater depletion in southern Haryana, the research being carried out here makes use of both primary and secondary sources of information. In order to collect primary data, a comprehensive field survey was carried out on the attitudes of farmers on the installation of tubewells and the associated lowering problem, change in water table, change in cropping pattern, and so on. We are also interested in hearing the farmer's thoughts on the socio-economic ramifications of the decreasing water levels. A questionnaire has been created by the researcher in order to collect the necessary information from the farmers. Concerning the falling water table, the cropping pattern, and the installation and operation of tubewells were among the topics included in the questionnaire, in addition to questions relating to socioeconomic factors. Six farmers from each block participated in the survey. The researcher interviewed a total of 200 farmers this manner, distributing themselves throughout 33 blocks and 9 different districts. Despite this, it is not impossible to find fault with the sample size that was chosen because it is impossible for such a small size to be adequate when compared to the enormous number of farms and tubewells in the area under study. Despite this, it was not practicable to survey every single farmer or village. As a result of the researcher having firsthand information that assisted in the process of locating sample farms, an effort has been made to reflect the highest possible level of representation. The secondary data on a variety of topics came from documents that have been published and those that have not been published by the Groundwater Cell of the Department of Agriculture of the Government of Haryana and the Central GroundwaterBoard in Chandigarh (Northern Region).

Discussions

Haryana's central ground water cell profile divides the state into three zones based on aquifer production potential. First, tube wells can yield 50 m3/hr in 26,090 sq. km in Sirsa, Hissar, Bhiwani, Mahendergarh, and Jind. The second zone covers Hissar, Kurukshetra, Karnal, Bhiwani, and Gurgaon, with tube wells that may yield 50-150 m3/hr. The third covers 9200 sq.km in Ambala, Kurusksheta, Karnal, and Sonepat districts and yields 150- 200 m3/hr. Parts of Gurgaon, Bhiwani, and Mahendergarh are underlain by consolidated strata, limiting aquifer output (Haryana Central Ground Water Cell).

Out of 33 blocks in the subregion, 22 are over-exploited, 4 are semi-critical, and 7 are critical according to Ground Water Status. Haryana Sub-Region block-wise ground water status:

Table 1.1: Categorisation of Blocks in Haryana Sub-Region

Districts		Gurgaon	Mewat	Faridabad	Palwal	Jhajjar	Panipat	Rewari	Rohtak	Sonepat
BLOCKS	Semi-critical					Bahadurgarh Salhawas			Rohtak Lakhan- Majra	
	Critical		Punhana	Ballabgarh	Hathin	Jhajjar		Jatusana		Gohana Kharkhoda
	Over- exploited	Farukhnagar Gurgaon Pataudi Sohna	Taoru Ferozepu- Jhirka	Faridabad	Hodel Palwal Hassanpur		Bapoli Israna Madlauda Panipat Samalkha	Nahar Rewari Bawal Khol		Ganaur Rai Sonepat

Ground Water Table in Haryana Sub-Region: Within the Haryana Sub-region, the average depth of the groundwater table was found to be 16.3 metres in the Rewari District, followed by Gurgaon (15.2 metres), Panipat (13.5 metres), and Faridabad (12.3 m). In the remaining areas, the depth of the groundwater table varied between 4.60 and 6.15 metres. In terms of temporal shifts in the level of the groundwater table, the Panipat District has seen the greatest reduction, with a net drop of 2.5 metres in the span of four years (2007-2011) or 0.6 metres per year, while Gurgaon has seen the second-most shift (2.2 m or 0.5 m per annum). Other districts in the Haryana Sub-Region, such as Faridabad and Sonepat, also saw a drop in the average groundwater table (0.1 m and 0.2 m respectively). The rest of the districts, including Jhajjar, Rewari, and Rohtak, all saw an increase in water table, with Rewari having the highest level recorded (1.8 m i.e 0.5 m rise per annum).

Conclusion

The rate of depletion is approximately 0.529 metres per year on average. The vast quantities of tubewells that have been drilled into the earth by the farmers in the region are a glaring indicator of the widespread extraction of groundwater. This has alerted farmers to an unsettling dilemma, which is caused by the fact that the rising water table is driving up the cost of installing tubewells, as well as maintaining and operating them. According to the findings of this study, the lack of rainfall in the area under investigation has led farmers to rely mostly on groundwater to satisfy the water requirements that their crops have. The amount of water available has decreased to the point where, in many instances, aquifers no longer provide enough water to fulfil the requirements of the market. As a direct consequence of this, the water table has been falling at an accelerated rate, and its depth is now anywhere from seven to more than forty metres. The continuing trend of falling water levels is a source of grave concern for governmental bodies as well as agricultural organisations. In the event that these tendencies are allowed to persist for an extended period of time, a water crisis will become obvious in the area. In order to find a solution to this issue, corrective measures will need to be implemented not only by the farmers in this region but also by the managers, who may include the government and financial institutions that are involved in the administration of water resources. To make this potentially disastrous scenario in the region more manageable, one of the most workable solutions would consist in irrigating an ever-increasing portion of the land with canals. The collection of rainwater and the artificial recharging of aquifers should both be encouraged in order to enhance the size of groundwater reservoirs andponds.

In addition to the issue of depletion, the increasing demand for water, as well as the competition for it among different industries, made the implementation of integrated management strategies necessary. Irrigation and agricultural practises were taken into consideration as two of the most important components of ecological strategy. Farmers have been pumping groundwater in the most unsystematic and unplanned manner due to the restricted availability of surface water. In this way, excessive extraction has led to the destruction of the ecological system in the region. The following solutions have been proposed in order to achieve success in overcoming this obstacle: (i) a shift in the pattern of cropping; (ii) an increase in awareness regarding the effective use of water; (iii) the conjunctive use of water; (iv) rainwater harvesting and the creation of artificial losses; (v) a decrease in losses during conveyance; (vi) a decrease in losses during application; and (vii) the distribution of water resources. It is possible that the depletion can be stopped, at the very least to some extent, if these techniques are implemented.

Recommendations for enhancing the quality of the Ground Water Table in selected Sub- Region in Haryana state are given below :

Gurgaon District

- Rooftop rainwater collecting technology should be utilised in order to safeguard the lowering trend of water levels in the district. Additionally, recharge structures should be developed in depression areas where water gets deposited during the rainy season. Because of this, the ground water reservoir will be refilled more quickly.
- Building bylaws in all of the blocks should include provisions requiring the installation of roof-top rainwater collection devices. This will assist in reversing the trend of declining water levels in the district.
- The old dug wells that have been abandoned can be cleaned up and put to use for recharging the ground water by taking advantage of the surface runoff that occurs during the monsoonseason.

Jhajjar District

- In the Jhajjar District, waterlogging can be prevented by taking the appropriate steps to lower the rate of recharge to the phreatic aquifer in the affected area and raise the rate at which it discharges water. The construction of surface drains, the lining of canals and water courses, village ponds, the most efficient use of irrigation water, afforestation along canals, drains, rails, and roads, and the pumpage of ground water to drains and canals are some of the remedial measures that have been suggested.
- Changing the cropping pattern from high water intensive crops to low water intensive crops like maize, wheat, and pulses may help prevent water logging. These crops include: maize, wheat, and pulses.
- The areas that are permanently flooded, particularly those that are located along the edges of canals, roads, drains, and ponds, can be employed for the development of fisheries.
- It is possible to drill shallow to deep tube wells in the most southwestern section of the area, reaching depths of up to 80 metres.

In the event of shallow tube wells, a pipe assembly made of PVC could be employed instead.

- It is necessary to notify the Jhajjar (stage of development 113 percent) and Salahwas (stage of development 105 percent) blocks of the district for registration of all ground water abstraction structures. Prior permission should also be sought from the Central Ground Water Authority before the construction of any tube well. The local populace will need to be taught about the implications of drawing water from the ground and the necessity of doing so for economic use.

Sonipat District

- The construction of shallow tube wells in regions near the active flood plains of the Yamuna that have a shallow water level can assist in increasing the available water supply in the area.
- In order to lessen the impact, certain regions that have been noticing a drop in water levels will need to be delineated, and rainwater collecting and artificial recharge procedures will need to be implemented on a large scale.
- Improvised subsurface drainage systems are utilised in regions that have shallow water levels and salt in the soil water.

Rohtak District

- Fish and prawn farming might be encouraged in saline water
- Awareness should be spread towards water conservation
- A separate agency or department could be created with technical staff from the concerned disciplines so that the water logging problem in the area may be tackled in a proper way.

Panipat District

- It is necessary to notify the district for regulation of all ground water abstraction structures, and the construction of any tube needs to be approved by the Central Ground Water Authority. This is required in order to comply with the regulations governing ground waterabstraction.
- Since natural recharge is insufficient to support such significant ground water extraction, it is recommended that artificial methods of ground water recharge be implemented in order to prevent the ground water level from falling much more.

Faridabad District

- In the Faridabad District, it is possible to cultivate crops with lower water requirements inplace of crops with higher water requirements.
- Building bylaws for the town of Faridabad should include provisions requiring theinstallation of rainwater collection systems on the rooftops of all new constructions.
- The old dug wells that have been abandoned should be cleaned up and put to use forrecharging the ground water by making use of the surface monsoon runoff.
- The concurrent use of groundwater and canal water of variable quality, which is mixedtogether in varying proportions.
- The recurrent use of water from canals and the low quality of the groundwater.
- The dug wells that have historically been utilised for the purpose of monitoring the water level in the area have either dried up or been abandoned in significant portions of the **Rewari District.**

Therefore, it is advised that shallow piezometers be installed.

- The water level ought to be monitored carefully, and readings of it ought to be taken at a variety of locations around the area. For this purpose, regular monitoring of ground water level should be accomplished by constructing 20 piezometers with a diameter of 152 millimetres (6 inches), 10 of which should be shallow (30 metres) and 10 of which should be deep (50 metres). These piezometers ought to be dispersed evenly over the area.

It is possible to map locations with high levels of fluoride and educate the public about the detrimental effects fluoride has on the human body. It is possible to use compact defluoridation plants, and water mixing is another something that can be done.

- It is necessary to notify the entire district for the registration of all ground water abstraction structures, and prior permission should be sought from the Central Ground Water Authority before constructing tube wells. This is required before the registration of any ground water abstraction structures.
- In order to alleviate pressure on the ground water, the construction of additional irrigation canals is strongly encouraged.

Mewat District

- The drainage of an excessive amount of surface runoff in the Mewat District
- The construction of shallow bore wells to achieve the same level of annual recharging. This will prevent the water table from rising too high and will lessen the impact of any evaporation that does occur.
- The planting of eucalyptus trees is permitted in areas where the depth of the water table is less than five metres. Both lowering the water table through rapid transpiration and providing economic support to local farmers will be accomplished as a result of this action.
- The management of irrigation by means of canals carrying fresh water Using the salty ground water for irrigation should be stopped immediately.
- Insist that the Taoru block and the Central Ground Water Authority be notified of and give their approval for any and all ground water abstraction structures that are built, as well as the installation of any tube wells. It is important to educate the local population about the implications of mining ground water as well as the necessity of using it for economic purposes.

Palwal District

- In order to stop the declining trends of water levels in the block, the technology of rooftop rainwater harvesting should be adopted, and recharge structures may also be constructed in depression areas where water gets accumulated during the rainy season. This would be a double measure to ensure that the problem is resolved. This will assist in improving therate at which ground water reservoirs are recharged.
- The old dug wells that have been abandoned can be cleaned up and put to use for recharging the ground water by taking advantage of the surface runoff that occurs during the monsoon season.
- The concurrent use of groundwater and canal water of variable quality, which is mixed together in varying proportions.
- In the overexploited block, it may be possible to grow crops that require a lower quantity of water in place of crops that require a higher quantity of water.

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"दक्षिणी हरियाणा में भूजल स्तर में वृद्धि, पेयजल आपूर्ति और कृषि सिंचाई के लिए अध्ययन"

सतीश कुमार, पीएच.डी. रिसर्च स्कॉलर, डिपार्टमेंट ऑफ सोशल वर्क, एमयूआईटी यूनिवर्सिटी, लखनऊ, यू.पी.

डॉ. तृप्ति सिंह, रिसर्च गाइड, एसोसिएट प्रोफेसर डिपार्टमेंट ऑफ सोशल वर्क, एमयूआईटी विश्वविद्यालय, लखनऊ, यू.पी.

सार:-

दक्षिणी हरियाणा में गिरते जल स्तर और पेयजल आपूर्ति और कृषि सिंचाई के लिए पानी की उपलब्धता में भी भारी कमी है। यह समस्या शहरों के साथ-साथ गांवों में भी मौजूद है। यह पत्र दक्षिणी हरियाणा में जल स्तर बढ़ने की स्थिति को विच्छेदित करता है और असंख्य चुनौतियों को हल करने की सिफारिश करता है। घटता भूजल स्तर आज हम सब के लिए अत्यंत चिंता का विषय है क्योंकि यह किसी स्थान विशेष की समस्या न होकर पूरे प्रदेश की ज्वलंत समस्या है। पिछले कई दशकों से उद्योगों, खेती-बाड़ी, विकास कार्यों व अन्य उपयोगों में भूगर्भिय जल पर हमारी निर्भरता बढ़ती जा रही है। इस कारण भूमिगत जल के अंधाधुंध दोहन से भू-जल स्तर निरंतर तेज़ी से घटता जा रहा है। संयुक्त राष्ट्र संघ ने अपनी वार्षिक वर्ल्ड वाटर डेवलप्मेंट रिपोर्ट में कहा है कि पानी के उपयोग के तरीक़ों और प्रबंधन में कमियों के कारण 2030 तक दुनिया को जल संकट का सामना करना पड़ सकता है। हमारे देश में अधिकांश फसलें भूजल के भरोसे होती है। वर्तमान परिवेश में बढ़ते शहरीकरण, आधुनिकीकरण, औद्योगीकीकरण, कृषि मशीनिकरण और वैज्ञानिक प्रगति की वजह से भूजल पर दबाव बढ़ता जा रहा है।

दूसरी तरफ़ ग्लोबल तापक्रम बढ़ने से मृदा सतह में वाष्पन व पौधों में वाष्पोत्सर्जन दर में बढ़ोतरी होती है। जिसके परिणामस्वरूप भूमि में नमी की कमी होने से भूजल स्तर भी प्रभावित होता है। इसके अलावा जलवायु परिवर्तन के कारण वर्षा की कमी व उसके बदलते पैटर्न का भी भूजल स्तर की कमी का एक प्रमुख कारण कम वर्षा और बर्फ़बारी में लगातार आ रही गिरावट है। एक और बड़ा कारण प्रदेश के अनेक भागो में बढ़ते शहरीकरण की वजह से कंक्रीट सतह वाली, होती जा रही ज़मीन बरसात के पानी को नही सोख पाती है। जिस कारण वर्षा का अधिकांश भाग इधर उधर बहकर नष्ट हो जाता है। वास्तव में आम नागरिक, सरकार, किसान, उद्योग जगत और भूजल माफिया भूजल से अपनी आमदनी तो बढ़ाना चाहते है, पर भूजल बचा रहे इसके लिए कोई प्रयास नही करते है। प्रदेश में पानी के परम्परागत स्रोत कम वर्षा व बेतरतीब दोहन के चलते ख़त्म होते जा रहे है इस कारण भूजल स्तर घटता जा रहा है। **(संदर्भ 1)**

कीवर्ड:- भूजल, जल-स्तर, कृषि, सिंचाई, जलापूर्ति, किसान, खेती,

परिचय:-

हरियाणा सरकार द्वारा जल संरक्षण को प्रोत्साहन देने के प्रयास के बावजूद, कृषि प्रधान राज्य में भूजल संकट गहराता जा रहा है। केंद्रीय भूजल बोर्ड की ताजा रिपोर्ट के अनुसार, दशकीय आंकड़े एक चिंताजनक प्रवृत्ति दर्शाते हैं, जिसमें हरियाणा के 76 प्रतिशत क्षेत्रों में भूजल स्तर में गिरावट देखी जा रही है। 2010 से 2020 के दशक के उतार-चढ़ाव की व्याख्या से पता चलता है कि 66 प्रतिशत कुओं में भूजल स्तर में गिरावट आई है, जो सभी 22 जिलों में पड़ने वाले राज्य के लगभग 76 प्रतिशत क्षेत्र को कवर करता है। रिपोर्ट के अनुसार, राज्य के 34 प्रतिशत क्षेत्र को कवर करने वाले 40 प्रतिशत कुओं से 0-2m की सीमा में जल स्तर में गिरावट दर्ज की गई है। हरियाणा के 16 प्रतिशत क्षेत्र को कवर करने वाले 12 प्रतिशत कुओं से 2-4 मीटर के बीच जल स्तर में गिरावट दर्ज की गई है, जबकि कुरुक्षेत्र, कैथल, करनाल के कुछ हिस्सों को कवर करने वाले 14 प्रतिशत कुओं और राज्य के 26 प्रतिशत क्षेत्र में 4

मीटर से अधिक की गिरावट देखी गई है। , पानीपत, सोनीपत, भिवानी, चरखी दादरी, पलवल, रेवाड़ी, गुरुग्राम और महेंद्रगढ़, मेवात और फरीदाबाद जिलों में प्रमुखता से होता है।

पिछले कुछ वर्षों में, मनोहर लाल खट्टर के नेतृत्व वाली हरियाणा सरकार ने धान-समृद्ध क्षेत्रों में किसानों को मक्का, दालों जैसी कम पानी की खपत वाली फसलों को उगाने के लिए प्रोत्साहित करने के लिए आकर्षक योजनाओं की घोषणा की है, ताकि जल स्तर में लगातार गिरावट को दूर किया जा सके। हालांकि, किसान राज्य में धान-गेहूं चक्र में उलझे हुए हैं, और धान, पानी की खपत करने वाला होने के नाते, अक्सर राज्य भर में भूजल में तेजी से गिरावट के लिए दोषी ठहराया जाता है। हरियाणा में जल स्तर की गहराई के पैटर्न के बारे में विस्तार से बताते हुए, CGWB**(संदर्भ 2)** डेटा से पता चलता है कि जनवरी 2020 के दौरान भूजल स्तर की गहराई सोनीपत जिले के लाथ डीडब्ल्यू में न्यूनतम 0.64 मीटर bgl से लेकर भिवानी जिले के सिंघानी Pz में अधिकतम 94.77 m bgl दर्ज की गई है।

इस अवधि के दौरान, आठ कुओं में बहुत उथले (0-2 मी) जल स्तर की स्थिति देखी गई और इस समूह में राज्य के दो प्रतिशत क्षेत्र में जल जमाव की स्थिति का संकेत मिलता है। यह राज्य के झज्जर, हिसार, अंबाला, सोनीपत और रोहतक जिलों में अलग-अलग हिस्सों में भी देखा गया। दूसरी ओर, 21 प्रतिशत कुओं में उथले जल स्तर (2-5 मी) देखा गया और इसने मुख्य रूप से मध्य हरियाणा में 10 प्रतिशत क्षेत्र को कवर किया और फतेहाबाद, यमुनानगर, अंबाला, पंचकुला जिलों में पैच के रूप में। मुख्य रूप से मध्य हरियाणा के लगभग 20 प्रतिशत क्षेत्र को कवर करने वाले 20 प्रतिशत कुओं में मध्यम जल स्तर (5-10 मी) पाया गया। जबकि करनाल, कैथल, यमुनानगर, अंबाला, पंचकुला, जींद, फतेहाबाद, सिरसा, हिसार, भिवानी, चरखी दादरी, गुरुग्राम और रेवाड़ी में पड़ने वाले लगभग 27 प्रतिशत कुओं और 30 प्रतिशत क्षेत्र में 10-20 मीटर का मध्यम गहरा जल स्तर देखा गया।

जिलों में 19 प्रतिशत कुओं में 20-40 मीटर गहरे जल स्तर दर्ज किए गए हैं। भिवानी, चरखी दादरी और महेंद्रगढ़ जिलों में पड़ने वाले पांच प्रतिशत कुओं और छह प्रतिशत क्षेत्र में और कुरुक्षेत्र, कैथल, फतेहाबाद और सिरसा जिलों में अलग-अलग हिस्सों में बहुत गहरा जल स्तर (> 40 मीटर) पाया गया। मार्च 2020 तक, 1227 भूजल अवलोकन कुएं थे, जिसमें हरियाणा में सीमित या अर्ध-सीमित जलभृतों की निगरानी के लिए 53 गहरे पीजोमीटर के अलावा फाइटिक एक्वीफर्स की निगरानी के लिए 521 डगवेल और 653 पीजोमीटर शामिल थे, सीजीडब्ल्यूबी की रिपोर्ट में बताया गया है। दशकीय आंकड़ों ने यह भी संकेत दिया कि राज्य में भूजल स्तर में बहुत उत्साहजनक वृद्धि नहीं हुई है। राज्य में 34 प्रतिशत कुओं और सिर्फ 24 प्रतिशत क्षेत्र में जल स्तर में वृद्धि देखी गई है। राज्य के 21 प्रतिशत क्षेत्र को कवर करने वाले 27 प्रतिशत कुओं में 0-2 मीटर की सीमा में जल स्तर में वृद्धि देखी गई है, राज्य के चार प्रतिशत कुओं में 2-4 मीटर की वृद्धि और राज्य के दो प्रतिशत से कम क्षेत्र में वृद्धि देखी गई है। हरियाणा के सिर्फ एक प्रतिशत क्षेत्र को कवर करने वाले सिर्फ तीन प्रतिशत कुओं में 4 मी देखा गया है।

कभी हराभरा था दक्षिण हरियाणा, आज है प्यासा:-

पांच दशक पूर्व तक लहलहाने वाला दक्षिण हरियाणा आज सूखे की मार झेल रहा है। कहीं खारा पानी है तो कहीं मीठा पानी है तो जमीन के बहुत नीचे। हालात यह हो गई है कि दक्षिण हरियाणा के अधिकांश क्षेत्र आज सूखे की मार झेल रहे हैं। ऐसे में यदि राजस्थान से आने वाली नदियों का पानी फिर से दक्षिण हरियाणा में आने लगे तो यहां की धरती फिर से हरीभरी हो सकती है। 1 जनवरी 1966 से पूर्व तक संयुक्त पंजाब के समय राजस्थान और पंजाब में राजस्थान से निकलने वाली साबी, कृष्णावती और दोहान नदियों के लिए समझौता हुआ। इसमें इन नदियों पर बांध बनाकर पानी का आधा बंटवारा करने का निर्णय किया गया। कृष्णावती पर बांध बना भी लिया गया, लेकिन हरियाणा को उसके हिस्से का पानी नहीं दिया गया। इस संबंध में 1973 में दोनों राज्यों के सिंचाई विभाग के अधिकारियों की बैठक भी हुई। उसका भी कोई नतीजा नहीं निकल सका। अब सवाल यह है कि यदि इन तीनों नदियों का पानी फिर से हरियाणा में आने लगे तो हमारी प्यासी धरती फिर से सोना उगल सकती है।

राजस्थान से साबी नदी में बाढ़ का पानी आता था। इससे पूरे रेवाड़ी, पटौदी, कोसली, दिल्ली के डाबा क्षेत्र से होता हुआ यमुना नदी में गिरता था। कृष्णावती से नांगली चौधरी, निजामपुर, नारनौल और डहीना का क्षेत्र प्रभावित होता था। वहीं दोहन के पानी से दोहन पच्चीसी के गांवों में पानी आता था। लेकिन इन तीनों नदियों पर बांध बनाने के बाद हरियाणा को इसका पानी मिलना बंद हो गया। तीनों नदियों में आना वाला यह बरसाती राजस्थान के पहाड़ों से आता था। इन नदियों से यह पानी राजस्थान से होकर दक्षिण हरियाणा में पहुंचता था। लेकिन जब यह पानी मिलना बंद हो गया तो दक्षिण हरियाणा में सूखे की स्थिति पैदा हो गई। अब सारे के सारे पानी का लाभ राजस्थान ही ले रहा है। वहीं प्राकृतिक संसाधनों को रोकना भी गैर कानूनी है।

दक्षिणी हरियाणा में गंगा नदी का पानी लाने के लिए उपाय:-

नदी बोर्ड अधिनियम 1956 की धारा 4 के तहत गंगा और यमुना जैसी अंतरराज्यीय नदियों के लिए नदी बोर्ड बनाकर दक्षिणी हरियाणा में पानी लाने का पत्र है । नदी बोर्ड अधिनियम 1956 की धारा 4 के तहत गंगा और यमुना जैसी अंतरराज्यीय नदियों के लिए नदी बोर्ड बनाने का प्रावधान था। नदी प्रवाह क्षेत्र वाले राज्यों के परामर्श से केंद्र सरकार सर्वसम्मति से इस बोर्ड का गठन कर सकती है। इस कानून के तहत गठित बोर्ड इतने शक्तिशाली होंगे कि उन्हें नदियों के प्रदूषण के लिए जल आपूर्ति के संबंध में नियम और दिशानिर्देश बनाने का अधिकार है। **(संदर्भ 3)** इसके अलावा, बोर्डों के पास नदियों के किनारे पौधे लगाने, नदी बेसिन के विकास की योजना बनाने और उनके कार्यान्वयन की निगरानी करने की शक्ति भी होगी। अभी तक किसी भी सरकार ने इस कानून को लागू कर नदी बोर्ड बनाने की जहमत नहीं उठाई।

नदी बोर्ड अधिनियम 1956 की धारा 4 के तहत, नदी बोर्ड निम्नलिखित कार्य करता है:

1. अंतर्राज्यीय नदी जल का समुचित उपयोग, नियंत्रण एवं संरक्षण।
2. सिंचाई, जलापूर्ति या जल निकासी योजनाओं का संचालन और संवर्धन।
3. बाढ़ नियंत्रण योजनाओं का संचालन और संवर्धन।
4. शिपिंग पर संचालन और प्रचार।
5. मृदा अपरदन नियंत्रण और वृक्षारोपण को बढ़ावा देना।
6. अंतर्राज्यीय नदियों में जल प्रदूषण का नियंत्रण।
7. राज्य सरकारों को सलाह देना।
8. नदी घाटियों और घाटियों के विकास की योजना बनाना।
9. राज्यों को नदी बेसिन योजनाओं के कार्यान्वयन की लागत की रिपोर्ट करना।
10. योजनाओं की प्रगति की निगरानी करना। **(संदर्भ 4)**

क्रियानवयन:-

केंद्र ने 1995 में एक प्रस्ताव के जरिए अपर यमुना बोर्ड बनाया (जिसके तहत राजस्थान को यमुना के पानी की आपूर्ति का प्रावधान है)। इसका काम नदी के पानी में राज्यों का हिस्सा था, लेकिन हरियाणा को अभी तक पानी मिलने का इंसाफ नहीं मिला है. द्वितीय प्रशासनिक सुधार आयोग ने भी अपनी रिपोर्ट में दक्षिण अफ्रीका, फ्रांस, चीन का उदाहरण दिया, जहां जल के बेहतर प्रबंधन के लिए नदी घाटियों के लिए राष्ट्रीय कानून या तंत्र बनाए गए हैं। **(संदर्भ 5)**

नदी बोर्ड अधिनियम 1956 की धारा 4 **(संदर्भ 6)** के तहत गंगा नदी का पानी दक्षिणी हरियाणा में निम्न के लिए लाया जा सकता है:-

1. भूमि अधिग्रहण की कोई आवश्यकता नहीं है क्योंकि राष्ट्रीय राजमार्ग भूमि पहले से ही उपलब्ध है।
2. भूमि संबंधी कोई विवाद नहीं।
3. किसानों की जमीन की जरूरत नहीं।
4. भूमि को लेकर राज्यों में कोई विवाद नहीं है क्योंकि राष्ट्रीय राजमार्ग की भूमि भारत सरकार की संपत्ति है।
5. बहुत कम लागत पर और कम समय में (लगभग 500 करोड़ से कम), दक्षिणी हरियाणा, पूर्वी राजस्थान को हमेशा भरपूर पानी मिल सकता है।

गंगा पर स्थित अनूप शहर स्थान पर लिफ़्टिंग विधि द्वारा पानी लिफ़्ट किया जा सकता है उसके बाद की भोगोलिक स्तिथि इस प्रकार है:-

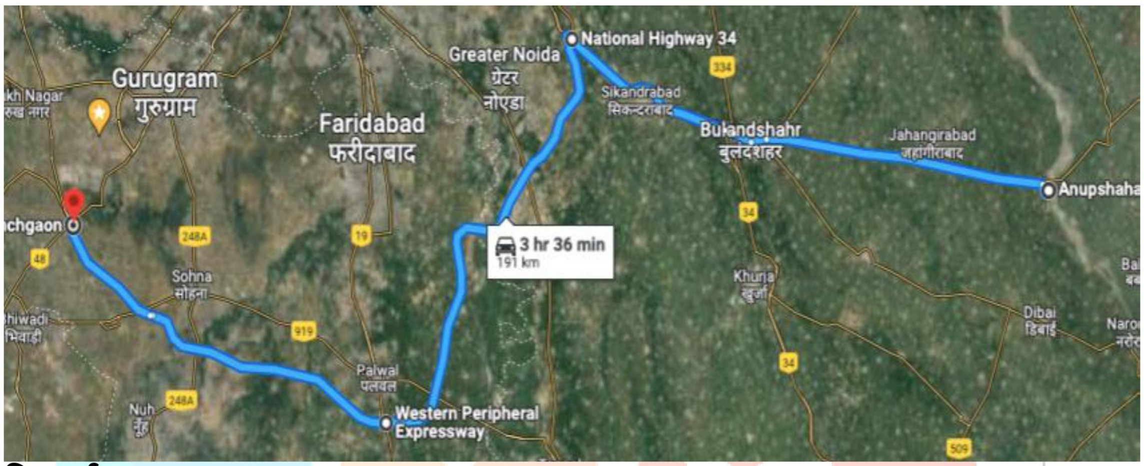
समुद्र तल से ऊँचाई:-

1. अनूप शहर (उत्तर प्रदेश) 182 मीटर
2. दादरी (उत्तर प्रदेश) 216 मीटर
3. पलवल (हरियाणा) 199 मीटर
4. सोहना 212 मीटर
5. पचगांव 217 मीटर
6. गुरुग्राम 217 मीटर
7. पटौदी 140 मीटर
8. झज्जर 220 मीटर
9. चरखी दादरी 225 मीटर
10. नूह 199 मीटर
11. फिरोजपुर झिरका 205 मीटर
12. रेवाड़ी 241.95 मीटर

13. धारूहेड़ा 244 मीटर
14. महेंद्रगढ़ 262 मीटर
15. नारनौल 318 मीटर
(संदर्भ 7)

दूरी:-

1. अनूप शहर (उत्तर प्रदेश) गंगा नदी (एनएच 34) से दादरी (KGP) तक = 71 किलोमीटर
2. दादरी (उत्तर प्रदेश) से पलवल (हरियाणा) (KGP) तक = 64.5 किलोमीटर
3. पलवल से पचगांव KMP तक = 55 किलोमीटर
   (संदर्भ 8)



निष्कर्ष:-

वर्तमान में दक्षिणी हरियाणा में पानी की कमी को देखते हुए उपरोक्त पत्र के द्वारा और अन्य महत्वपूर्ण विषयों को ध्यान में रखते हुए तथा और गहन अध्यन करते हुए इस प्रोजेक्ट की व्यवहारिकता की बहुत ही भौतिक संभावनाए है जिससे करोड़ों नागरिकों तथा जीवों का जीवन प्रभावित हो सकता है । यदि समय रहते हम ने भूजल के संरक्षण पर विशेष जोर नहीं दिया तो भविष्य में गंभीर खाद्य समस्या, पेयजल संकट में विभिन्न आपदाओं का सामना करना पड़ सकता है । जल संकट एक विश्वव्यापी समस्या है अतः जल संकट की समस्या से निपटने के लिए असरदार कार्य व्यापक तौर पर करने की आवश्यकता है । भविष्य में भूजल संरक्षण के लिए हमें खेती में सिंचाई जल का विवेकपूर्ण उपयोग करना होगा, जिससे जल संकट जैसी गम्भीर समस्याओं से मुक्ति मिल सके। भूजल की बर्बादी को लेकर सख्त कायदे कानून बनाए जाने चाहिए इस संबंध में जन जागरूकता बहुत जरूरी है लोगों को बताना होगा कि भूजल की एक बूंद को मृदा स्तर पर पहुंचाने में वैज्ञानिकों व किसानों को कितना पसीना बहाना पड़ता है । साथ ही इसे आपके घर व किसानों के खेतों तक पहुंचाने में कितना श्रम व पूंजी खर्च होती है । जल संरक्षण और जल की समस्या को दूर करने के लिए हम प्रतिवर्ष 22 मार्च को भी विश्व जल दिवस मनाते हैं । इस अवसर पर पानी बचाने से लेकर सब को पानी पहुंचाने की बात होनी चाहिए । अतः हम सब को संरक्षण पूर्ण प्रौद्योगिकियों का प्रयोग कर बेहतर भूजल प्रबंध पर जोर देना होगा । अंत में हम यह कह सकते हैं कि बचाव उपचार से कहीं ज्यादा अच्छा है अगर भूजल बचा रहा तो इससे सभी बचे रहेंगे । **(संदर्भ 9)**

संदर्भ

1. अक्तूबर-दिसम्बर 2017 राजभाषा विशेषांक, पेज 15 जल प्रौद्योगिकी केंद्र, नई दिल्ली-110012
2. CGWD रिपोर्ट 05.07.2021
3. द रिवर बोर्ड्स एक्ट, 1956 अधिनियम संख्या 1956 का 49 [12 सितंबर, 1956] दादरा और नगर हवेली (w. e. f. 1- 7-65) में विस्तार किया गया और लागू किया गया। 1963 का 6, एस. 2 और एसएच. I. अधिनियम पांडिचेरी में 1.10.1963 को रेग के माध्यम से लागू होता है। 1963 का 7, एस. 3 और एसएच। I. अधिसूचना ईएल- I- 452 (17) 57, दिनांक 11-5- 57, गज के तहत 15- 5- 1957 को लागू हुआ। भारत का, खंड I, असाधारण, पृष्ठ- 165)
4. द रिवर बोर्ड्स एक्ट, 1956 अधिनियम संख्या 1956 का 49 [12 सितंबर, 1956]
5. केंद्र सरकार ने संकल्प संख्या 10(66)/74-आईटी दिनांक 11.3.95 के तहत ऊपरी यमुना नदी बोर्ड का गठन किया
6. द रिवर बोर्ड्स एक्ट, 1956 अधिनियम संख्या 1956 का 49 [12 सितंबर, 1956]
7. google.com
8. google.com
9. अक्तूबर-दिसम्बर 2017 राजभाषा विशेषांक, पेज 20 जल प्रौद्योगिकी केंद्र, नई दिल्ली-110012

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To,
SATISH KUMAR

Subject: Publication of paper at International Journal of Creative Research Thoughts.

Dear Author,

With Greetings we are informing you that your paper has been successfully published in the International Journal of Creative Research Thoughts - IJCRT (ISSN: 2320-2882). Thank you very much for your patience and cooperation during the submission of paper to final publication Process. It gives me immense pleasure to send the certificate of publication in our Journal. Following are the details regarding the published paper.

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One day Online National Conference

'All-Inclusiveness of Chhatrapati Shri Shivaji Maharaja'

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on Saturday 19th February 2022.

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on

"आधुनिक सन्दर्भ में महात्मा गाँधी का दर्शन, विचारधारा और भारतीय राजनीति"

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Certified that **Satish Kumar, Research Scholar** of **Maharshi University, Lucknow** has participated in the one day National Webinar on **'आधुनिक सन्दर्भ में महात्मा गाँधी का दर्शन, विचारधारा और भारतीय राजनीति'** jointly organized by Gandhi Study Centre & Department of Political Science, Govt. PG College, Gangapur City, held on 29 January 2022.

His/Her active participation is well appreciated.

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National Web Conference

10 April, 2022

Revolutionary Changes and Struggle Journey
Dr. B. R. Ambedkar and E.V.R. Periyar

उत्तराखण्ड राज्य

Organised By :

Pt. PurnaNand Tiwari Govt. Degree College, Doshapani,Nainital

M.B. Govt. P.G. College, Haldwani, Nainital, Uttarakhand

Certificate of Appreciation

This is To Certify That

Satish Kumar

Has actively participated in the National Web Conference on the topic "Revolutionary Changes and Struggle Journey : Dr. B. R. Ambedkar and E.V. R. Periyar " on 10 April, 2022.

Dr. M. C. Arya	**Dr. Azara Praveen**	**Dr. N. S. Bankoti**	**Dr. Jyoti Tamta**
Organising Secretary	**Principal/Inaugurator**	**Principal/Chief Patron**	**Co-ordinator**

Rayat Shikshan Sanstha's

Laxmibai Bhaurao Patil Mahila Mahavidyalaya, Solapur.

Department of History and IQAC

CERTIFICATE

This is to certify that Dr./Mr./Mrs. Satish Kumar of Maharshi University Lucknow has actively participated in One Day National Seminar entitled 'Mahatma Jyotiba Phule & Enlightenment Movement in India' held on 11th April, 2022 organized by Laxmibai Bhaurao Patil Mahila Mahavidyalaya, Solapur, Maharashtra.

Mr. Dasharath Rasal Convener & Head, Department of History	**Mrs. Nilofar Tamboli** Co-ordinator, IQAC	**Dr. Ravsaheb Dhawan** I/c Principal Laxmibai Bhaurao Patil Mahila Mahavidyalaya, Solapur.

Certificate No. ......1110.........

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has participated in one week national workshop on **'Econometrics for Research in Economics (EFRIE-2022)'** from **April 25-29, 2022;** organized by the Department of Economics, School of Business and Management Studies, Central University of Haryana, Mahendergarh.

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(Dr. Ajeet Kr. Sahoo)

Workshop Director
(Prof. Ranjan Aneja)

Aai Sanskar Foundation, Maharashtra

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This is to certify that

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Research Scholar, Maharshi University Lucknow

has participated in the One Day National level e-Conference on **"Dr. Babasaheb Ambedkar's Contribution towards Right to Life, Individual Liberty and Growth of Unity and Integrity of the Nation."** Held on Sunday, May 8, 2022 at 10:30 A.M. To 2:00 P.M.

Dr. Shinde D. k.	Prof. Kadam V. M.	Dr. Shakil Shaikh
Coordinator, IQAC	Convnor & Secretary, ASF	Principal

S.N.: CUH/159

Certificate of Participation

This is to certify that

Mr. satish kumar

Research Scholar,Maharishi University of Information Technology, Lucknow

Has Participated in the National Webinar on *"Commemorating Unsung Heroes of Indian Freedom Movement"* organised by Department of History, Mihir Bhoj P.G.College, Dadri-Greater Noida, Uttar Pradesh on "Kranti Diwas" on 10th May 2022.

Sh. Surya Prakash
Head,Department of History

Prof. Sanjiv Kumar
Patron & Principal

National Web Conference

22 May, 2022

"Tobacco : Threat To Our Environment"

Organised By : Department of NSS & NCC

P.N.T. Govt. Degree College, Doshapani, Nainital

M.B. Govt. P.G. College, Haldwani, Nainital, Uttarakhand

Certificate of Appreciation

This is To Certify That

Satish Kumar

Has actively participated in the National Web Conference on the topic "Tobacco : Threat To Our Environment" on Sunday 22 May, 2022.

Dr. M. C. Arya	**Dr. Azara Praveen**	**Dr. N. S. Bankoti**	**Dr. Jyoti Tamta**
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