

**WASTE MANAGEMENT OF HOUSEHOLDS IN ERNAKULAM
DISTRICT**

Dissertation submitted to

**St. Teresa's College (Autonomous), Ernakulam
(Affiliated to Mahatma Gandhi University, Kottayam)**

in partial fulfilment of the requirement for the award of the degree of
MASTER OF ARTS IN ECONOMICS

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MARCH 2023

CERTIFICATE

This is to certify that the dissertation titled “**WASTE MANAGEMENT OF HOUSEHOLDS IN ERNAKULAM DISTRICT** ” submitted in partial fulfillment of the requirement of MA Degree in Economics to St. Teresa’s College (Autonomous), affiliated to the Mahatma Gandhi University, Kottayam, is a record of bona fide research work done by the candidate under my supervision and guidance.

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DECLARATION

I hereby declare that the dissertation titled “**WASTE MANAGEMENT OF HOUSEHOLDS IN ERNAKULAM DISTRICT**”, submitted by me for the M.A. Degree in Economics is my original work .

Signature of the Supervisor

Signature of the Candidate

ACKNOWLEDGEMENT

I would like to take the opportunity to express my sincere gratitude to all the people who have help with sound advice and able guidance.

Above all, I am thankful to the Lord Almighty under whose divine guidance; I have been able to complete this study successfully.

I am profoundly indebted to my guide **Dr. Swathy Varma P.R.** for her immense support, unsurpassed expertise and immeasurable guidance throughout my dissertation.

I am deeply grateful to **Dr. Mary Liya C.A.** Head of the Department for her timely advice and support during the course of the study.

I would also like to thank each and every faculty member of the Department of Economics for their valuable and timely inputs during the course of the project.

Finally, I am short of words to express my gratitude to my friends and family for the support and encouragement which was a driving force to complete the study.

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CHAPTER 1

1.1 INTRODUCTION

“Waste not, want not” this old byword rings so true moment, as global leaders and original communities likewise decreasingly call for a fix for the so- called “throwaway culture.” But beyond individualities and homes, waste also represents a broader challenge that affects mortal health and livelihoods, the terrain, and substance.

Waste management refers to the collection, transportation, disposal, and recycling or treatment of waste materials. It involves various practices and strategies to ensure that waste is handled in an environmentally friendly and sustainable manner. Effective waste management is crucial for maintaining cleanliness, protecting public health, conserving resources, and minimizing the impact on the environment.

SDG Goal 12 recognizes the importance of sustainable waste management practices to reduce waste generation, promote recycling and reuse, and minimize the environmental impact of waste. It emphasizes the need for responsible consumption patterns and the efficient use of resources to achieve a more sustainable future.

Waste management in households is an important aspect of maintaining cleanliness and sustainability in any region, including Kerala. Kerala, a state in southern India, has taken several initiatives to manage waste effectively and promote sustainable practices. The state emphasizes the segregation of waste at the source itself. Households are encouraged to separate waste into different categories like organic waste, recyclables (plastics, paper, glass), and non-recyclables. This segregation helps in efficient disposal and recycling of waste.

Solid waste operation is a universal issue that matters to every single person in the world. And with over 90% of waste openly ditched or burned in low-income countries, it is the poor and most vulnerable who, are disproportionately affected. In recent times, landslides of waste dumps have buried homes and people under piles of waste. And it's the poorest who frequently live near waste dumps and power their megacity's recycling system through waste selecting, leaving them susceptible to serious health impacts.

In 2016, 5% of global emigrations were generated from solid waste operation, banning transportation. Solid waste operation includes the conditioning and action needed to manage waste from its commencement to its final disposal. This includes the collection, transport, treatment and disposal of waste, together with monitoring and regulation of the waste operation process and waste affiliated laws, technologies, profitable mechanism. Waste can be solid, liquid and gas each type has different system of disposal and operation. Waste operation practices are not invariant among countries, region, and artificial sectors can all take different approaches.

Ernakulam, located in the state of Kerala, India, is one of the major districts in the region and has implemented various waste management initiatives in households. Similar to the state's waste management approach, Ernakulam emphasizes the segregation of waste at the source. Households are encouraged to separate waste into different categories such as organic waste, recyclables (plastics, paper, glass), and non-recyclables. This helps facilitate proper disposal and recycling processes. Ernakulam has implemented a door-to-door waste collection system in residential areas. Trained waste collectors visit households to collect segregated waste directly from the doorstep. They provide separate bins for different types of waste and ensure proper disposal. These initiatives in Ernakulam aim to promote sustainable waste management practices, reduce the environmental impact of waste, and encourage residents to actively participate in waste segregation, recycling, and composting. The concerted efforts of the local authorities and community members contribute to a cleaner and more sustainable environment in the district.

1.2 REVIEW OF LITERATURE

Yash Pujara, Pankaj Pathak, Dr. Archana Sharma in their composition, it explain about the Solid Waste Management and it is published on 2019 in the Journal of Environmental Management. This composition concludes the formal handling and treatment of ISWM would minimize the landfilling, where LCA can be an cure to achieve sustainable development pretensions. Open jilting is a common practice for MSW disposal in ultimate of the Indian city piecemeal from the metro- cosmopolises. This practice poses significant environmental and health risks due to toxic and hothouse feasts(GHGs) emigration through direct combustion and/ or decay of wastes. therefore, integrated solid waste operation(ISWM) using different styles like, incineration, composting, anaerobic digestions, refuse derived energy, material recovery installation and aseptic landfilling, is important demanded.

Abhishek Dutta, Wanida Jinsart in their review, ‘ Waste generation and operation status in the fast- expanding Indian cities ’(2020) published in the Journal of the Air & Waste Management Association. In this paper, the core indicator of environmental pressure, i.e., per capita external solid waste(MSW) generation for the top 10 most vibrant Indian cities and their trend over the times has been caught on to understand the harshness of the problem. India is witnessing the conformation of multitudinous densely populated megacities where operation of burgeoning wastes, both external solid waste(MSW) and artificial dangerous waste(IHW), has come a truly critical issue. The city municipality are showing their incapacity to manage the waste efficiently. The study finds that the MSW generation per capita is adding in all the top 10 populated cities of the country. health hazards for the municipality dwellers. To fight the waste- related health hazards, the megalopolises the top 10 cities first demanded to launch" generators as segregators" program for effective handling of generated waste followed by pay- as- you- adventure(PAYT) system to discourage waste generation without any detention. This paper depicted the dismal MSW and IHW operation performance in vibrant Indian cities and proposed a strategy for realistic dimension and operation of waste.

Fauziah S.H., Agamuthu. P., in their study ‘Sustainable Household Organic Waste Management via Vermicomposting ’ published in Malaysian Journal of Science(2009). This study was aimed to find optimal experimental set- up to conduct small scale vermicomposting suitable for homes, since roughly 40- 50(wt) of the waste is putrescible element. adding waste generation in developing countries has alarmed authorities on waste disposal issues. therefore, various druthers have been looked into to reduce waste disposed into tip Among others are the bioremediation options which may allow the conversion of putrescible wastes into value added products analogous as compost, biogas and others. In conclusion, vermicomposting of organic factors set up in the MSW aqueduct can be fulfilled by taking into consideration vital factors analogous as acidity and presence of hindering factors. The identification of the most suitable conditions for vermicomposting will allow the performance of this necessary natural remedy to reduce waste and attack the problem in waste operation, particularly in developing countries.

Abhishek Kumar Awasthi , Mengmeng Wang, Zhishi Wang, Mrigendra Kumar Awasthi and Jinhui Li1, presented the brief overview one- waste operation in India in their composition, ‘E-waste operation in India Amini- review ’(2018) published in Waste Management & Research The Journal for a Sustainable circular Economy. Environmental deterioration and health trouble due to waste operation has come a serious issue in India. The major portion of e- waste reaches an unorganized- waste recycling sector and is also treated by using crude styles. This review composition presents a brief highlight one- waste operation status, legislation, and technology uses in India. The before Indian waste rules and regulation(‘E-waste(operation and handling) Rules, 2011 ’), has been seen to lack proper performance, and this reacted in multitudinous infelicitous practices(involving primitive styles used in the informal sector, and low position of periodic capacity in the formal sector recycler) still being in India. therefore, the latest e- waste rules and regulations(‘E-waste(operation), Rules, 2016 ’) need to be more executed. The present- waste operation needs to be more focused on

environmentally sound operation, by more active support from all the actors involved in the waste flux chain in India.

Mathangi Swaminathan in her composition, ‘ How Can India’s Waste Problem See a Systemic Change?.It was published in 2018 in the journal Economic and Political Weekly. She attempts to understand the being script of waste operation, impact of poor waste operation results, programs that have been framed to address it and the major systemic changes that need to be to insure this important public issue doesn’t turn into a public disaster. With two Indian metropolises leading the way in India moment, through source isolation and decentralised waste operation system, the central government should produce an applicable public frame to incentivise and cover perpetration by the countries. European countries have set clear marks, which India can borrow. Eventually, to catch the waste operation sector and induce the necessary behavioural change, citizen participation and engagement is the key. Building applicable institutional frame along with policy- position directions will help grease the necessary change.

Sunil Kumar, Stephen R. Smith, Geoff Fowler, Jyoti Kumar, Shashi Arya, Rena, Rakesh Kumar and Christopher Cheeseman explained in their study about the Challenges of waste operation in India. This paper reports on an transnational forum on ‘ Sustainable solid waste operation for metropolises openings in South Asian Association for Regional Cooperation(SAARC) countries ’. There are major issues associated with public participation in waste operation and there’s generally a lack of responsibility towards waste in the community. There’s a need to cultivate community mindfulness and change the station of people towards waste, as this is abecedarian to developing proper and sustainable waste operation systems. India faces challenges related to waste policy, waste technology selection and the vacuity of meetly trained people in the waste operation sector. Until these abecedarian conditions are met, India will continue to suffer from poor waste operation and the associated impacts on public health and the terrain.

Dhanalakshmi, Dr.Sankaranarayanan, K C conducted a exploration on the content ‘Study on Solid Waste Management An Economic Analysis with Respect to Ernakulam District ’(2011). The exploration was held in the Department of Applied

Economics, Cochin University of Science and Technology. This analysis which is based on the waste generation and waste disposal problems in Ernakulam District. The study on solid waste operation is an attempt to understand and identify the arising socio- profitable and environmental issues with emphasis on solid waste operation in Ernakulam quarter. The issues bandied in the thesis are, solid waste generation in the pot and cosmopolises in Ernakulam quarter, the units generating waste, the amount of waste generated by each unit in the study area, being and needed position of structure installations for optimum concurrence of waste and converting the waste into useable products, the present resource recovery and recycling conditioning available and the needed installations for profitable and terrain friendly styles of waste treatment, estimate the goods of resource recovery and solid waste operation on the base of a case study of Ernakulam quarter, environmental perception of people living near tip spots.

Dinesh Kannan R held a exploration- “ Household Solid Waste Management Practices in Chennai City of Tamil Nadu.”.The main end of the study is to examine the factors affecting effective solid waste operation practices and suggesting possible measures to attack the problem. Specifically, the experimenter aims at achieving the following objects to study the current status of solid waste operation in Chennai City, to study the characteristics of Chennai City solid waste by analysing physical, chemical and natural parameters, to study the possibility of recovery of accoutrements from the solid waste, to design the integrated solid waste operation system for Chennai City, to give functional guidelines for effective solid waste operation system.

1.2 STATEMENT OF THE PROBLEM

How a society should deal with the household waste which has an important policy problem. Legislation and policy range from schemes targeted specifically at households to those focusing on an economy wide effort to minimize waste. Solid Waste Management is one of the important functions of the Urban Local Bodies. This service

is falling too short of the asked position of effectiveness and satisfaction performing in problems of health, sanitation, and environmental declination due to lack of serious sweats by city/ megacity authorities, scrap and its operation has come a tenacious problem. Also, unsafe disposal of scrap and wastewater, coupled with poor hygiene is creating openings for transmission of conditions. Results to problems of waste operation are available. Still, a general lack of mindfulness of the impact of unattended waste on people's health and lives, and the wide perception that the results are not affordable have made communities and original authorities apathetic towards the problem.

The district of Ernakulam faces several challenges and issues related to waste management. Despite various initiatives taken by the local authorities and community, there are still areas that require attention and improvement. While waste segregation is promoted in Ernakulam, there is a need to address the issue of inadequate segregation at the source. Many households still struggle with proper waste segregation practices, leading to mixed waste streams that are challenging to manage effectively. Ernakulam, like many other regions, faces challenges in managing plastic waste effectively. Despite plastic bans, there might be a need to address issues related to the disposal and illegal use of plastic materials, as well as promoting sustainable alternatives and encouraging behaviour change among residents.

Addressing these challenges and issues is crucial to improve waste management practices in Ernakulam. It requires comprehensive planning, infrastructure development, enhanced public participation, and continuous monitoring and evaluation to ensure the effective and sustainable management of waste in the district.

1.4 SIGNIFICANCE OF THE STUDY

The study of waste management in Ernakulam holds significance in addressing environmental, health, and sustainability challenges, promoting resource conservation, empowering communities, and providing a basis for informed policy and decision-making. It can contribute to the development of a comprehensive and effective waste management system that benefits the environment, the community, and the overall well-being of the district.

The study helps to understand the awareness of people about household waste management and their concern towards issues caused by improper waste disposal. It also analysing the existing waste management practices and its efficiency. Waste generation is increasing at an alarming rate and in Ernakulam it is a serious issue. The present household waste management system is not efficient. Due to the growing public awareness and demand for proper waste management, governments are now including it in their policy making. Therefore, this study is relevant in analysing the efficiency of waste management services given by government.

Effective waste management practices are essential for environmental sustainability. Proper waste segregation, recycling, and disposal methods can reduce the environmental impact of waste, conserve resources, and minimize pollution of air, water, and soil. The study can identify areas of improvement and provide insights into enhancing waste management practices in Ernakulam, contributing to a cleaner and healthier environment.

1.5 OBJECTIVES

- To assess the current waste management practices of Ernakulum district.
- To evaluate the effectiveness of local bodies' waste management initiatives.
- To understand public awareness and participation in waste disposal in the selected area.

1.6 METHODOLOGY

1.6.1 SOURCES OF DATA

The study was both descriptive and analytical. Both primary and secondary data used for the study. Primary data collection includes personal interview, questionnaire method and observation method. Secondary data collected from direct sources like newspaper, magazines and journals.

1.6.2 AREA OF STUDY

The area of study was confined on the people residing in Ernakulam District. The study was conducted on a sample of 60 households in Ernakulam district. Of them,

11 samples were from Alangad Panchayath, 8 were belonging to Cochin Corporation, 6 from Choornikkara Panchayath, 4 from Kadungalloor Panchayath, 3 each from Varapuzha and Keezhmadu Panchayaths, 2 each from Kadamakudy, Kizhakkambalam, Kottuvally Panchayaths and Eloor, Aluva Municipalities. 1 each from Nedumbassery, Edathala, Thuravoor, Mookkannoor, Kavalangad, Poyya, Vadavukode-Puthencruz, Pindimana, Malayatoor- Neeleeswaram, Chengamanad, Aikkaranad, Vadakekkara Panchayaths and Thrikkakara, Perumbavoor, Piravom Municipalities. Primary data was collected by distributing questionnaires. The data were then edited and tabulated for the purpose of analysing them and simple statistical tools were used for percentage analysis.

1.6.3 SAMPLE SIZE AND SAMPLING TECHNIQUE

The sample size for this study is 60 households in Ernakulam District and simple random sampling method used to collect the data.

1.6.4 PERIOD OF STUDY

The study was carried out in 2022- 2023.

1.7.SCHEME OF THE STUDY

The present study is divided in to four chapters: the introductory part explains the concept of waste management. This chapter also contains the Review of Literature, Significance of study, Objectives, Limitation of study and Chapter scheme of study. The Second chapter explains the theoretical and conceptual framework of waste management and the profile of the study. The Third chapter consists of the data analysis and interpretation of the primary data collected from the respondents of the study and the Fourth chapter the findings, recommendation, suggestion, and conclusion.

1.8.Theoretical Background

Environmental Management: Waste management is closely tied to environmental management, which focuses on the sustainable use and conservation of natural resources. Environmental management theories provide frameworks for understanding the impacts of waste on ecosystems, biodiversity, and human health. Concepts such as

pollution prevention, life cycle assessment, and environmental impact assessment contribute to the theoretical foundation of waste management.

Sustainable Development: Waste management is an integral component of sustainable development, which seeks to balance social, economic, and environmental concerns. The theoretical framework of sustainable development emphasizes the need to minimize waste generation, promote recycling and resource recovery, and reduce the environmental impact of waste disposal. The waste hierarchy (reduce, reuse, recycle) and the principles of the circular economy align with the goals of sustainable development.

Extended Producer Responsibility (EPR): EPR is a theoretical concept that assigns the responsibility for managing the entire lifecycle of a product, including its waste, to the producers. It emphasizes the need for producers to take responsibility for the environmental impact of their products and implement measures to reduce waste generation and improve recycling. EPR frameworks and policies contribute to the theoretical understanding of waste management.

1.10. CONCEPTS/DEFINITIONS

Waste management: refers to the systematic collection, transportation, treatment, recycling, and disposal of waste materials generated by human activities.

Source Segregation: Source segregation refers to the practice of separating different types of waste at the point of generation. It involves categorizing waste into distinct streams, such as organic waste, recyclables (e.g., paper, plastic, glass, metal), and non-recyclables. Source segregation enables more efficient waste management, as it facilitates recycling, composting, and appropriate disposal of different waste types.

Recycling: Recycling involves the process of converting waste materials into new products or raw materials.

Composting: Composting is the biological decomposition of organic waste, such as food scraps and yard trimmings, into nutrient-rich compost. Composting provides a

natural way to recycle organic waste, reduce methane emissions from landfills, and produce a beneficial product that can be used as a soil amendment.

Solid waste : refers to any unwanted or discarded materials that are not liquid or gaseous in nature. It includes a wide range of materials generated from residential, commercial, industrial, and institutional sources. Solid waste can be classified into different categories based on its characteristics, such as organic waste, recyclable waste, hazardous waste, and inert waste.

1.10 LIMITATIONS

The main limitations of the study were following:-

- The availability of relevant data on waste management practices in Ernakulam was limited due to inadequate data collection systems, lack of standardized reporting mechanisms, or restricted access to certain data sources. It restrict the depth of the study's findings and analysis.
- The study's sample size and representativeness is limited, which could affect the generalizability of the findings.
- Respondents are reluctant to answer the questions properly.

CHAPTER II
WASTE MANAGEMENT

WASTE MANAGEMENT

Waste management refers to the process of collecting, treating, recycling, and disposing of waste materials in a manner that is safe, efficient, and environmentally friendly. It involves various practices and strategies to minimize the impact of waste on human health and the environment.

- **Waste Collection:** This step involves the collection of waste from various sources such as households, businesses, and industries. Waste is typically collected through curbside collection, dumpsters, or specialized collection services.
- **Segregation and Sorting:** Once collected, waste is sorted and segregated based on its type. Common categories include recyclables (such as paper, plastics, glass, and metal), organic waste (food scraps, yard waste), hazardous waste (chemicals, batteries, electronic waste), and general non-recyclable waste.
- **Recycling:** Recycling involves the processing of recyclable materials to create new products. It helps conserve natural resources, reduce energy consumption, and minimize the amount of waste sent to landfills. Recycling programs vary by location but commonly include materials like paper, cardboard, plastic bottles, aluminum cans, and glass.
- **Composting:** Organic waste, such as food scraps and yard trimmings, can be composted to create nutrient-rich soil amendments. Composting helps divert waste from landfills and reduces methane emissions while providing a valuable resource for gardening and agriculture.
- **Waste Treatment and Disposal:** Some types of waste require specialized treatment to minimize their environmental impact. This includes hazardous waste, medical waste, and certain industrial waste. Treatment methods may include chemical, biological, or physical processes to neutralize or detoxify the waste. If waste cannot be recycled or treated, it is disposed of in landfills or incinerators.

- **Waste-to-Energy:** In some cases, waste can be used as a source of energy through processes like incineration or anaerobic digestion. These methods can generate electricity or heat while reducing the volume of waste.
- **Public Awareness and Education:** Promoting waste reduction, recycling, and proper waste management practices is crucial. Public awareness campaigns and educational programs help inform individuals about the importance of waste management and encourage responsible waste disposal.
- **Waste Management Regulations:** Governments and environmental agencies often implement regulations and policies to manage waste effectively. These regulations may include waste disposal guidelines, recycling targets, and penalties for improper waste handling.
- **Efficient waste management practices** are essential for minimizing pollution, conserving resources, and protecting human and environmental health. It is a shared responsibility that involves individuals, businesses, communities, and governments working together to reduce waste generation and promote sustainable waste management strategies.

2.1. SOLID WASTE AND ITS MANAGEMENT

Waste can be considered as a demon with multiple heads. When we try to address one of the issues, numerous further complex issues arise, and it becomes a vicious circle. At times it seems that the situation will go out of hand and won't be suitable to address the issue of waste. Still, determined action can address the issue of waste, way should be taken in methodical and regular manner and those results should be espoused which are sustainable as well as terrain friendly.

Accordingly to The United Nations Statistics Division (UNSD) (UN Statistics Division, 2011) "Wastes are accoutrements that aren't high products (that is products produced for the request) for which the creator has no farther use in terms of his/ her own purposes of product, metamorphosis or consumption, and of which he she wants to dispose". The Basel convention outlined waste as (UNEP, 2004) "Substances or objects which are inclined or are intended to be disposed or are needed to be disposed of by the vittles' of public laws".

The term solid waste operation substantially refers to the complete process of collecting, treating, and disposing of the solid wastes. In the waste operation process, the wastes are collected from the different sources and are disposed of. This process includes transportation, analysis, legal procedures, along with monitoring and administering regulations. There are a number of principles related to the waste operation system, but a generally accepted conception is one of the ‘ Hierarchy of Waste Management ’.

2.2. CATEGORIES OF WASTE

1. Organic waste: Kitchen waste, waste from food medication, vegetables, flowers, leaves, fruits, and request places.
2. Combustibles :Paper, wood, dried leaves, packaging for relief particulars etc. that are largely organic and having low humidity content.
3. . Non-combustibles: Essence, drums, Barrels, bottles, monuments etc
4. Toxic waste: Old medicines, paints, chemicals, bulbs, spray cans, fertilizer and pesticide containers, batteries, shoe polish.
5. Recyclables: Paper, glass, metals, plastics.
6. Ashes or Dust: Residue from fires that are used for cooking.
7. Construction waste: Rubble, roofing, broken concrete etc.
8. Dangerous waste: Oil, battery acid, medical waste, artificial waste ,sanitarium waste.
9. Dead creatures: Carcasses of dead livestock or other creatures.
10. Bulky waste: Tree branches, tires etc.
11. Soiled waste: Hospital waste such as cloth soiled with blood and other body fluids.

2.3 SOURCES OF SOLID WASTE :

Every day, tonnes of solid waste are disposed of at colourful tip Spots. This waste comes from homes, services, diligence, and colourful other agrarian affiliated conditioning. These tip spots produce foul smell if waste is not stored and treated duly. It can contaminate the girding air and can seriously affect the health of humans, wildlife, and our environment. These are major sources of solid waste:

1.Residential: It is the important source of solid wastes. The scrap from these places includes food wastes, plastics, paper, glass, leather, cardboard, essence, yard wastes, ashes and special wastes like big ménage particulars similar as electronics, tires, batteries, old mattresses and used oil painting.

2.Industrial: Industrial diligence are known to be one of the biggest contributors to solid waste. They include light and heavy manufacturing diligence, construction spots, fabrication shops, canning shops, power and chemical shops wastes These wastes which create the solid wastes in environment.

3.Commercial: Commercial facilities and market installation are yet another source of solid waste today. Marketable structures and installations, in this, refer to hotels, markets, restaurants, go-downs and various stores wastes. Some of the solid wastes generated from these places include plastics, food wastes, essence, paper, glass, wood, cardboard accoutrements , special wastes and other dangerous wastes..

4.Institutional: Some of the common solid wastes attained from these places include glass, rubber waste, plastics, food wastes, wood, paper, essence, cardboard accoutrements, electronics as well as colourful dangerous wastes

5.Construction and Demolition Areas: Construction and demolition sites also contribute to the solid waste problem. Construction sites include new construction sites for buildings and roads, road repair sites, building renovation sites and building demolition sites. Some of the solid wastes produced in these places include steel materials, concrete, wood, plastics, rubber, copper wires, dirt and glass.

6. Municipal Services: The urban centres also contribute immensely to the solid waste crisis in most countries today. Some of the solid waste brought about by the municipal services include street cleaning, wastes from parks and beaches, wastewater treatment plants, landscaping wastes and wastes from recreational areas, including sludge.

7. Treatment Plants and Sites: Heavy and light manufacturing plants also produce solid waste. They include refineries, power plants, processing plants, mineral extraction plants and chemical plants. Among the wastes produced by these plants, there are industrial process wastes, unwanted specification products, plastics, metal parts, just to mention a few.

8. Agriculture: Crop farms, orchards, dairies, vineyards and feedlots are also sources of solid wastes. Among the wastes they produce are agricultural wastes, spoiled food, pesticide containers and other hazardous materials.

9. Biomedical: This refers to hospitals and biomedical equipment and chemical manufacturing firms. In hospitals, there are different types of solid wastes produced. Some of these solid wastes include syringes, bandages, used gloves, drugs, paper, plastics, food wastes and chemicals. All these require proper disposal or else they will cause a huge problem for the environment and the people in these facilities.

2.4 FUNCTIONAL ELEMENTS OF SOLID WASTE MANAGEMENT

The functional elements of solid waste management are the following:-

1. Waste generation: Those activities in which materials are identified as no longer being of value and are either thrown away or gathered for disposal.

2. Storage: Those activities associated with the handling, storage and processing of solid waste wastes at or near the point of generation.

3. Collection: Those activities associated with the gathering of solid wastes and the hauling wastes after collection to the location where the collection vehicle is emptied.

4. Transportation: Those activities associated with the transfer of wastes from the smaller collection vehicle to the larger transport equipment and the subsequent transport of the wastes, usually over a long distance to the disposal site.

5. Processing and recovery: Those techniques, equipment and facilities used both to improve the efficiency of the other functional elements and to recover usable materials, conversion products or energy from solid wastes.

6. Disposal: Those activities associated with ultimate disposal of solid wastes including those waste collected and transported directly to the landfill site, semisolid waste from waste water treatment plants, incinerator residue, compost or other substances from various solid waste processing plants that are of no further use.

2.5 GOALS OF WASTE MANAGEMENT

- To ensure the protection of the environment through effective waste management measures.
- To protect the health and wellbeing of people by providing an affordable waste collection service.
- Grow the contribution of the waste sector to GDP.
- Increase number of jobs within waste services, recycling and recovery sectors.
- To protect the health of the urban population, particularly that of low income groups who suffer most from poor waste management.
- To promote environmental conditions by controlling pollution and to ensure the sustainability of ecosystems in the urban region.
- To generate employment and income.

- To support urban economic development by providing the required waste management services and guaranteeing the efficient use and conservation of valuable materials and resources.

2.6 METHODS OF SOLID WASTE MANAGEMENT

- **Sanitary landfill:** This involves the jilting of wastes into a tip . The base is prepared of a defensive filling, which serves as a hedge between wastes and ground water and prevents the separation of poisonous chemicals into water zone. Waste subcaste are subordinated to contraction and latterly carpeted with an earth subcaste. Soil that's non- pervious is preferred to alleviate the vulnerability of accidental leakage of the poisonous chemicals. tip should be created in places with low ground water position and far from source of flooding. still a sufficient number of professed man power is needed to maintain sanitary landfill.
- **Incineration:** This system involves the burning of solid wastes at high temperature until the wastes are turned into ashes. Incinerators are made in such a way that they don't give of extreme quantum of heat when burning solid wastes. Incinerators that reclaim heat energy through furnace and boiler are called waste to energy shops. Waste with a high spicy value and low position of adulterants impurity can be used the artificial shops, as an volition to fossil energies. Incinerators must have a stovepipe gas treatment system.
- **Recovery and recycling:** Recycling or recovery of resources is the process of taking useful but discard particulars for the coming as. Plastic bags, drums, gas and holders are frequently recycled automatically since, in numerous situations, they're likely to be scarce goods. Traditionally, these particulars are reused and gutted before they're recovering. Down cycling refers to the metamorphosis of waste to accoutrements of lower quality than the originally used materials.

- **Composting:** It involves corruption of organic wastes to stay accumulated in a hole for a long period of time. The nutrients rich compost can be used as factory ordure. still the process is slow and consumes a significant quantum of land. Biological reclaiming extensively improves the fertility of the soil. Due to lack of acceptable space for tips ,bio-degradable yard waste is allowed to putrefy in a medium designed for the purpose.
- **Pyrolysis:** This is a system of solid waste operation whereby solid wastes are chemically perished by heat without the presence of oxygen. It generally occurs under pressure and at temperature of over to 430 degree celcius. The solid wastes are changed into feasts, solid residue of carbon and ash and small amounts of liquid.
- **Tube gasification:** Tube gasification is an terrain friendly waste disposal method is used to convert commodity recyclables uprooted from solid waste in the tip into the energy. The carbon grounded accoutrements are exposed to high temperature and converted to syngas, a gas which can either be directly burned or further meliorated into chemicals and advanced grade energies.

2.8 WASTE MANAGEMENT AND SUSTAINABLE DEVELOPMENT

2.8.1 The challenge of sustainable waste management

Waste is a global issue if it isn't duly dealt with, it poses a trouble to public health and the terrain. It is a growing issue linked directly to the way society produces and consumes. It concerns everyone. Waste operation is one of the essential mileage services bolstering society in the 21st Century, particularly in civic areas. Waste operation is an introductory mortal need and can also be regarded as a introductory mortal right. It ensures proper sanitation and solid waste operation ranks alongside the provision of drinkable water, sanctum, food, energy, transport and dispatches; all are essential to society and to the frugality as a whole.

Despite this, the public and political profile of waste operation is frequently lower than other mileage services. Unfortunately, the consequences of doing little or indeed

nothing to address waste operation can be veritably expensive to society and to the frugality overall. In the absence of waste regulations and their rigorous perpetration and enforcement, creators of waste tend to conclude for the cheapest available course of action. For illustration, ménage solid waste may be ditched in the road, on vacant land, or into rainspouts, aqueducts or other conduits, or it may be burned to reduce the vexation of accumulating piles of waste. By description, unbridled waste is not managed and therefore not measured, making it delicate to estimate the size of the problem and the scale of the associated costs. still, the substantiation suggests that in a middle- or low- income megacity, the costs to society and the frugality are about five to 10 times what sound solid waste operation(SWM) would bring per capita. It's dramatically cheaper to manage waste now in an environmentally sound manner than to clean up in unborn times the “ sins of the history ”.

2.8.2 The Sustainable Development Goals

Sustainable development means that it is a development that meets the requirements of present generations without compromising the requirements of future generations. This description underlines the intergenerational liabilities placed on the earth's occupants.(Ian Goldin and L. Allen, 1995). Sustainable development is a pattern of social, profitable and development which optimizes the profitable and societal benefits available in the present, without spoiling the likely eventuality for analogous benefits in the future. A primary thing of sustainable development is to achieve a reasonable and equitably distributed position of profitable well- being that can be eternalized continually for numerous mortal generations.

At the World Summit on Sustainable Development in 2002, Governments reaffirmed the significance of solid waste operation. They called for precedence attention to be given to waste minimization, exercise and recovering. They also called for the development of environmentally sound disposal installations, including technology to convert waste into energy.The 17 Sustainable Development pretensions(SDGs), which are an critical call for action by all countries- developed and developing- in a global cooperation. They fete that ending poverty and other losses must go hand- in- hand with

strategies that ameliorate health and education, reduce inequality, and goad profitable growth – all while diving climate change and working to save our abysses and timbers.

The 17 sustainable development Goals(SDGs) to transfigure our world(1) No Poverty,(2) Zero Hunger,(3) Good Health and Well- being,(4) Quality Education,(5) Gender Equality,(6) Clean Water and Sanitation,(7) Affordable and Clean Energy,(8) Decent Work and profitable Growth,(9) Assiduity, Innovation and structure,(10) Reducing Inequality, (11) Sustainable metropolises and Communities,(12) Responsible Consumption and product,(13) Climate Action,(14) Life Below Water,(15) Life On Land,(16) Peace, Justice, and Strong Institutions,(17) Partnership of the goals.

In Sustainable Development Goals(SDGs), it was decided to make metropolises and mortal agreements inclusive, safe and flexible and sustainable. Under sustainable development , member countries agreed to insure sustainable consumption and product patterns. In there agreement that ‘ by 2030, value per capita global food waste at the retail and consumer situations and reduce food losses along product and force claims, including post – crop losses”.

2.8.3 Moving from waste management to resource management

Multitudinous developed countries have made great strides in addressing waste operation, particularly since the terrain came onto the international program in the 1960s, and there are multitudinous good practice samples available for the international community to learn from. still, the original focus was on waste after it had been discarded, whereas now attention has moved upstream, addressing the problem at its source through, for illustration, designing out waste, preventing its generation, reducing both the quantities and the uses of dangerous substances, minimising and reusing, and, where residuals do do, keeping them concentrated and separate to save their natural value for recycling and recovery and preventing them from contaminating other waste that still has profitable value for recovery. The thing is to move the fundamental thinking down from “ waste disposal ” to “ waste operation ” and from “ waste ” to “

resources ” — hence the streamlined language “ waste and resource operation ” and “ resource operation ”, as part of the “ circular economy ”.

Low- and middle- income countries still face major challenges in achieving universal access to waste collection services, barring uncontrolled disposal and burning and moving towards environmentally sound operation for all waste. Addressing these challenges is made indeed more delicate by forecasts that major cosmopolises in the lowest income countries are likely to double in population over the coming 20 or so years, which is also likely to increase the original political priority given to waste issues. Low- and middle- income countries need to contrive and apply innovative and effective programs and practices to promote waste prevention and stem the grim increase in waste per capita as husbandry develops. Waste operation is an issue that impacts multitudinous corridors of society and the economy. It has strong liaison to a range of other global challenges analogous as health, climate change, poverty reduction, food and resource security and sustainable production and consumption. The political case for action is significantly strengthened when waste operation is viewed as an entry point to address a range of analogous sustainable development issues, multitudinous of which are delicate to attack. Waste operation is well bedded within the Sustainable Development Goals (SDGs), being included either explicitly or implicitly in further than half of the 17 pretensions. Thus a strong argument can be made for the strategic significance of perfecting waste operation, insofar as conduct also will contribute to progress towards a range of SDG targets. Setting and covering global targets for waste operation will thus contribute significantly to attaining the SDGs.

2.9 WASTE MANAGEMENT IN INDIA

Waste operation is a major problem for numerous of the civic agglomerations in our country. Effective SWM is a big challenge in metropolises which are formerly facing resource failure like lower land space and veritably high population, performing in high population viscosity. This high population viscosity generates thousands of tons of external solid waste daily. There are numerous reasons which are directly and laterally contributing to the enormous volume of the solid waste worldwide and getting one of

the most important environmental problems for the global community. Some of the crucial contributors in this problem are exponential increase in population, magpie natural resource exploitation, profitable and artificial development, increased per capital income and consumerism. Indiscriminate and unsustainable operation of resources has not only stressed out our natural coffers but created imminence of huge waste generation. The quantum of waste generated has direct relating with the quantum of resource exploitation.

Solid Waste Management in India which is poor because of best methods doesn't involved in the waste collection to disposal are not being used. There is a lack of training in SWM and the avail exponential increase in population, prattler natural resource exploitation, profitable and artificial development, increased per capital income and consumerism. Indiscriminate and unsustainable operation of coffers has not only stressed out our natural coffers but created imminence of huge waste generation. The quantum of waste generated has direct relating with the quantum of resource exploitation of good waste operation professionals is limited. There is also a lack of responsibility in current SWM systems throughout India. External authorities are responsible for managing MSW in India but have budgets that are shy to cover the costs associated with developing proper waste collection, storage, treatment and disposal. The lack of strategic MSW plans, waste collection/ insulation and a government finance nonsupervisory frame are major walls to achieving effective SWM in India. Limited environmental awareness combined with low provocation has inhibited invention and the handover of new technologies that could transform waste operation in India. Public stations to waste are also a major barricade to perfecting SWM in India.

Indian laws concerning wastes and waste management in India:

1. The water (Prevention and Control of Pollution) Act, 1974
2. The water (Prevention and control of pollution) Rules, 1975
3. The water (Prevention and Control of Pollution) Cess Act, 1977
4. The Environment (Protection) Act, 1986

5. The Public Liability Insurance Act, 1991
6. The National Environment Tribunal Act, 1995
7. The National Appellate Authority Act, 1997
8. The Municipal Solid Wastes (Management and Handling) Rules, 2000
9. Batteries (Management and Handling) Rules, 2001
10. National Green Tribunal Act, 2010
11. Solid Waste Management Rules 2016
12. Plastic Waste Management Rules 2016
13. e-Waste (management) Rules, 2016
14. Bio-Medical Waste Management Rules, 2016
15. Construction and Demolition Waste Management Rules, 2016
16. Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules 2016.

The current situation is that India relies on inadequate waste infrastructure, the informal sector and waste dumping. There are major issues associated with public participation in waste management and there is generally a lack of responsibility towards waste in the community. There is a need to cultivate community awareness and change the attitude of people towards waste, as this is fundamental to developing proper and sustainable waste management systems. Sustainable and economically viable waste management must ensure maximum resource extraction from waste, combined with safe disposal of residual waste through the development of engineered landfill and waste-to-energy facilities. India faces challenges related to waste policy, waste technology selection and the availability of appropriately trained people in the waste management sector. Until these fundamental requirements are met, India will continue

to suffer from poor waste management and the associated impacts on public health and the environment.

2.10. WASTE MANAGEMENT IN KERALA

As per the 12th schedule of the Constitution of India, Solid Waste Management is the responsibility of the Original Governments(Urban and Rural). The Government of Kerala came out with a Solid Waste Management Policy, 2018, and has also created institutions at the state position to support service delivery. Either, the state government has gathered livelihood improvement programs also linked to the SWM sector to ensure the force of force for the collection of waste and treatment. As part of the SWM Policy 2018, the GoK has charted “ My Waste My Responsibility ” philosophy and has also requested Extended Patron Responsibility. These have been laid down with a focus on creating a circular economy around solid waste, domestic treatment of biodegradable waste, reducing the overall waste generation, and perfecting societal knowledge towards the terrain. IMAGE design was launched on 21st October 2001 by the Indian Medical Association, Kerala State Branch and the IMAGE plant, the Common Biomedical Waste Treatment and Disposal Facility(CBMWTF) .

Suchitwa Mission(SM) pivotal function is to serve as the Technical Support Group in the waste operation sector under the LSG Department(LSGD). The vision of Suchitwa Mission is ‘ waste-free Kerala with the defiled terrain, public hygiene, and cleanliness with a better quality of life leading to bettered health and general good, profitable earnings, better aesthetic surroundings, and overall environmental improvement.

The Mission is anticipated to:

- Function as the technical support group for LSGIs in the waste operation sector .
- help in achieving total sanitation content by LSGIs.
- furnishing policy, strategy, planning, performance and monitoring support for Solid and Liquid Waste Management.

- Organizing IEC campaigns and Capacity structure exertion in Sanitation and Waste Management sector.
- Promotion of Green Protocol, compliance by individualities, institutions, and various orders of Government.

Part in SWM The Mission is the nodal agency for administering Swachh Bharat operations(SBM- both communal and pastoral) which is a centrally patronized sanitation scheme with 60 backing from the Government of India. Its objects are- elimination of open defecation; eradication of manual scavenging; modern and scientific SWM; change of behavior for healthy sanitation practices; creation of an terrain for private sector participation and capacity structure.

Haritha Keralam Mission - HKM (meaning Green Kerala Mission) is an umbrella mission combining three submissions of sanitation and waste management; water resources rejuvenation and conservation; and sustainable agriculture. The global objective of this umbrella mission is to regain Kerala's past glory and pride in its clean environment, ample water resources, and abundant farm supplies which were organic by default.

Some of the goals set by HKM are:

- To sensitize the citizens about their duties and responsibilities under the SWM Rules 2016;
- Create a new sanitation culture in society by encouraging people to adopt responsible waste management methods
- Make available to the local bodies, solutions for complex waste management problems.
- To ensure the sustainability of scientific waste management practices under the leadership of local governments
- Encourage decentralized waste management at source; where it is not possible, to make available community-level facilities under the leadership of neighbourhood groups and local bodies.
- Explore the recycling of Non-Biodegradable Wastes

- Encourage decentralized liquid waste management where feasible
- In large cities like Thiruvananthapuram, Kochi and Kozhikode implement modern centralized waste management arrangements, alongside source processing.

IV. Haritha Karma Sena (HKS); the Green Task Force which can either be drawn from the existing Kudumbashree units or any other self- help groups or any NGO/local entrepreneur. The selected group will be imparted training by Haritha Sahaya Sthapanam (HSS); the Green Facilitators who are selected for their technical competence. Apart from building the capacity of HKS, HSS is also expected to provide technical assistance in SWM to the ULBs for which they will maintain technical experts, trained technicians, and coordinators. HKM has the responsibility for

- Selection and deployment of HSS
- Empanelment of agencies for waste management and organic vegetable farming
- Evaluate the SWM activities based on reports received from the districts
- Empanelment of service providers who will supply raw materials required for SWM
- Assist ULBs in concluding contracts with Clean Kerala Company (CKC) for taking over the non-biodegradable waste from MCFs run by ULBs
- Assisting ULBs in finding suitable locations for setting up RRFs in association with CKC.

V. Clean Kerala Company Limited (CKCL) CKCL is mandated to address issues connected with the management of NBDW– more specifically plastic waste only. It has a leadership role in establishing Material Collection Facility (MCF) in Municipal wards/panchayats and Resource Recovery Facility (RRF) in Block Panchayats and Municipalities/Corporations. It helps by providing part finance and standardizing the equipment suppliers, rates, etc. so that local bodies can setup RRF by arranging shredding machines, baling machines, and dust removers; CKCL also organizes to train

the workers who operate the machines; ensures the maintenance of the machines and assists in marketing the products of RRF. CKS also has a mandate for E-Waste Collection and Management.

VI. State Disaster Management Authority Kerala Disaster Management Authority (KSDMA) was established in May 2007 under the Disaster Management Act, 2005 which was enacted immediately after the Indian Ocean Tsunami of December 2004. After the 2018 floods, it is recognized that disaster has to be mainstreamed and sectors cannot work in silos and are closely interdependent. The August 2018 floods demonstrated that SWM has impacted in the following manner:

- Large scale littering of non-biodegradable waste has led to clogging of drains, canals, and rivers thereby contributing to the sudden flooding of areas which had not known floods even during earlier extreme climate events
- Post floods, the ‘disaster waste’ in the form of mattresses, furniture, clothes, and carcasses lead to public health problems unless addressed urgently and scientifically.

VII. Kerala State Pollution Control Board (KSPCB) KSPCB currently monitors the compliance levels to environmental safety at various levels. KSPCB is the centrally authorized regulator responsible for monitoring under the SWMR2016. Monitoring Solid Waste Management - Section 16 of the Solid Waste Management Rules, 2016 lays down the scope and responsibility for monitoring by KSPCB. Key responsibilities include:

- Enforcement of these rules in the State through local bodies and review implementation at least twice a year in coordination with DUA/ LSGD
- Monitor environmental standards and adherence to conditions specified in the rules; ▪ Issue authorization to a local body or an operator of a facility within 60 days, stipulating compliance criteria and environmental standards
- Suspend for sufficient reason/renew the authorization for the next five years
- Monitor the compliance of standards prescribed for treatment technology

- Give directions to local bodies on safe handling and disposal of domestic hazardous waste

- Regulate the inter-state movement of waste.

VIII. Department of Environment, Forests and Climate Change Environment Department is the nodal department for planning, promotion, coordination, and overseeing the implementation of Central and State environmental protection and conservation policies and programs. The Directorate also serves as the nodal agency in formulating climate changerelated schemes, plans, programs, and their execution. Department of Environment is also responsible for promulgating the EPR framework as well as is empowered to issue directions to implement the Plastic waste management rules, 2016. Consequently, the department of environment has issued government order banning the use of single-use plastic in the state of Kerala and for E-waste management in the State; among others.

2.11 WASTE MANAGEMENT IN ERNAKULAM DISTRICT

Ernakulam, also known as Kochi, is a major city and the administrative headquarters of Ernakulam district in the state of Kerala, India. Waste management in Ernakulam follows a comprehensive approach to ensure proper collection, treatment, and disposal of waste.

The development of Ernakulam is based on the progress of Cochin City, which is the biggest city in Kerala in terms of volume of trade. Also, Kochi is one of the metropolitan cities in India. The Ministry of Environment and Forest, Government of India has identified Kochi as one of the areas with high pollution potential. Based on the Environmental Statistics (2002) the report stated that in Kochi the collection efficiency is less than the national average of 60 per cent.

The factor that contributes the major proportion of waste generation is population, population density, residential, commercial, industrial and institutional activities. The

activities identified as the main waste producers are residential, industrial, commercial, institutional and bio medical institutions. Residential waste includes solid waste generated by population as well as waste generated through daily domestic and household activities. Industries through their production processes release certain amount of toxic and other solid wastes into the environment. Commercial and institutional activities also contribute to waste generation in the city. The bio medical waste is the solid waste generated by hospitals and other health institutions.

The commercial activities contribute to the maximum waste generation in comparison to other activities is a result of man's day to day domestic and commercial chores. The industrial and biomedical units in city contribute to the hazardous waste generation. Among the industries the most polluting ones are oil refineries, electroplating and service stations. The waste generated by these industries is toxic and hazardous in character. However, no proper disposal techniques are available for the industrial waste generation in the city. In the case of hazardous waste management with the initiative of the Kerala State Industrial Development Corporation and the Industries Department, the Government is planning to have a common facility at a central place in the State. Another type of hazardous waste generated in city is by bio-medical activity. Some of the waste generated by medical centres in the city is infectious in nature. The waste requires a safe mode of disposal, with least or minimum exposure to people. At present the waste are collected by Indian Medical Association from the hospitals by conservancy staff to the treatment plant in Palakkad.

The inadequacy of sanitary workers complicates the management of waste disposal. The garbage is handpicked or using basket and is transported to dumping yard. The vehicles have a scheduled route from where waste is collected. These vehicles do not cover narrow lanes and streets and so the sanitary workers must do the work in such areas also. The lanes and streets are often seen with un-cleared solid waste for a number of days. The number of vehicles and trips available are not sufficient for eliminating the problems connected with waste management. There is absolute requirement for additional number of vehicles for the efficient coverage of the regions.

The transfer stations or collection points are environmentally degrading. This temporary collection points facilitate vehicles to unload solid waste. The waste should be moved from there within 48 hours of arrival to landfill sites. In many cases waste has not been cleared for days. The waste generated from Kochi Corporation is collected for treatment at Brahmapuram treatment plant. In two municipal areas viz., Kalamassery and Paravur doorto-door collection is done from a central area. The operation and maintenance cost in such cases is being recovered from beneficiaries. No systematic solid waste management practices have been carried out to dispose the quantum of solid wastes generated in municipalities in Ernakulam. The collection point creates unhealthy environment especially for people residing nearby. The waste from collection point is removed by vehicles and transported to landfills. The study area has inadequate number of vehicles. The need is only to change vehicle pick up schedule so as to have a complete waste collection structure.

The fresh water sources in and around Ernakulam are polluted due to illegal dumping of solid waste and untreated sewage in to water course. Industries should properly treat the waste according to Pollution Control Board norms before discharging it into water course. Often bio-medical wastes are mixed with municipal solid waste. So there is a need for a common incinerator for treatment of biomedical waste in Ernakulam region.

CHAPTER III

**ANALYSIS OF WASTE MANAGEMENT OF HOUSEHOLDS IN
ERNAKULAM DISTRICT**

TABLE 3.1

AGE COMPOSITION

| AGE | FREQUENCY | PERCENTAGE |
|-------------|-----------|------------|
| 15-30 years | 50 | 83.33% |
| 30-45 years | 4 | 6.66% |
| 45-60 years | 6 | 10% |

Source: Primary data

The above table reveals that, 50 out of 60 respondents (or approximately 83.3%) belong to the age group between 15-30. 4 out of 60 respondents (or approximately 6.7%) belong to the age group between 30-45. 6 out of 60 respondents (or approximately 10%) belong to the age group between 45-60.

TABLE 3.2

SEX COMPOSITION

| SEX COMPOSITION | | |
|-----------------|-----------|------------|
| SEX | FREQUENCY | PERCENTAGE |
| FEMALE | 42 | 70% |
| MALE | 18 | 30% |

Source: Primary data

Out of 60 respondents, 42 of them were female and the rest 18 were male respondents.

TABLE 3.3

NUMBER OF FAMILY MEMBERS

| FAMILY MEMBERS | FREQUENCY | PERCENTAGE |
|----------------|-----------|------------|
| Below 4 | 8 | 13.33% |

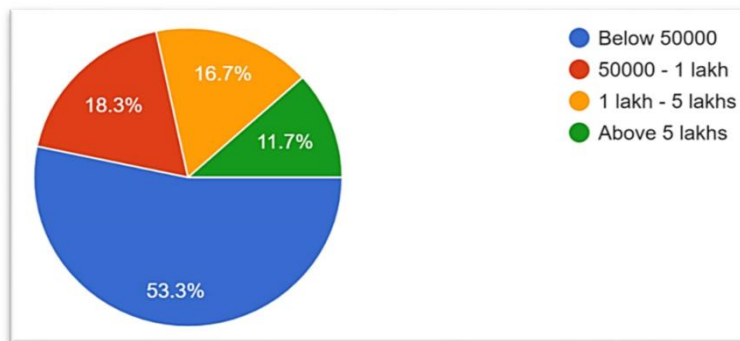
| | | |
|---------|----|-------|
| 4-8 | 51 | 85% |
| Above 8 | 1 | 1.66% |

Source: Primary data

Out of the samples collected from 60 households, 8 households have members below 4, 51 households have members between 4-8 and 1 family have above 8 members.

FIGURE 3.1

ANNUAL INCOME RANGE OF THE RESPONDENTS

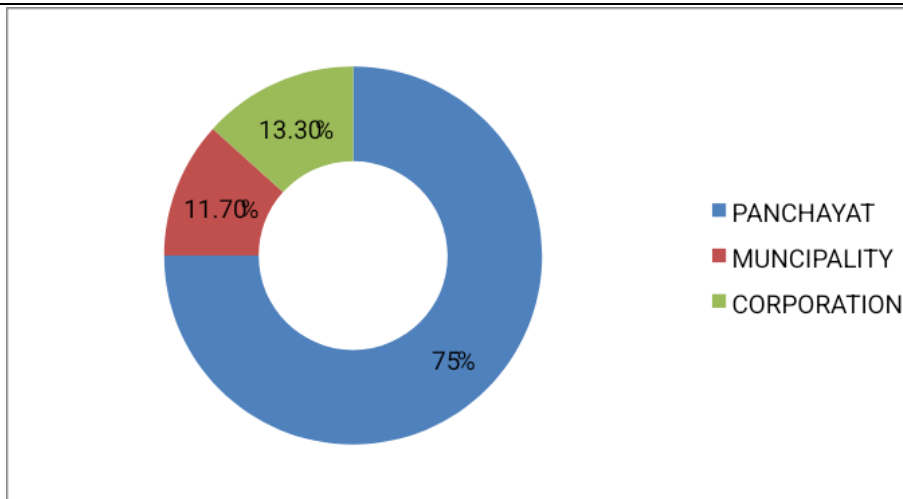


Source: Primary data

Half of the respondents were belonging to low-income groups. Out of the 60 samples collected, 32 of them have annual income below Rs.50000, that is, 53.3%. 11 of them have annual income between Rs.50000- 1 lakh and 10 have annual income between Rs.1-5 lakhs, that is, 18.3% and 16.7% respectively. The remaining 7 have income above Rs.5 lakhs annually, that is, 11.7%.

FIGURE 3.2

PLACE OF RESIDENCE

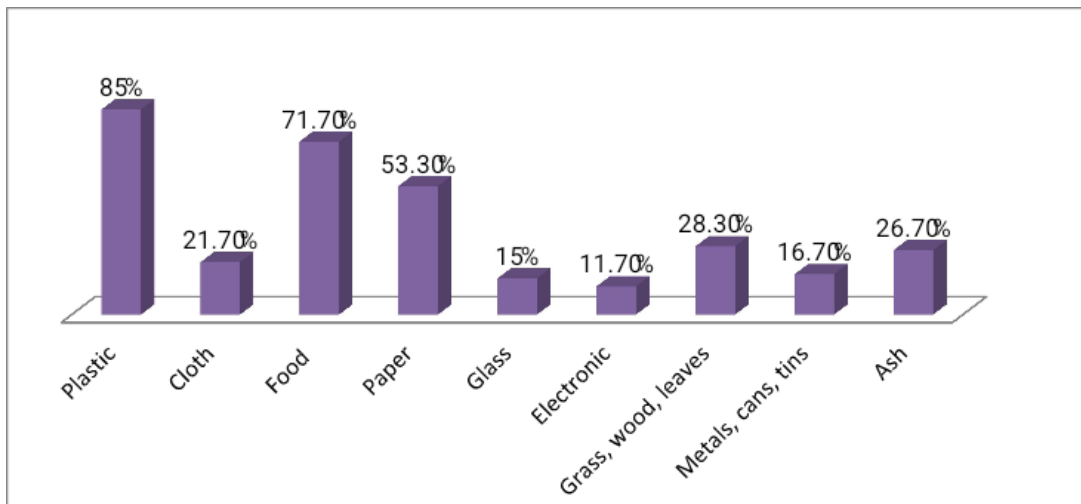


Source: Primary data

Out of the data collected from 60 households, 45 of them were from various panchayaths, 7 from various municipalities and 8 from Cochin Corporation, that is, 75%, 11.7% and 13.3% respectively.

FIGURE 3.3

MAJOR TYPES OF WASTES FROM HOUSEHOLDS

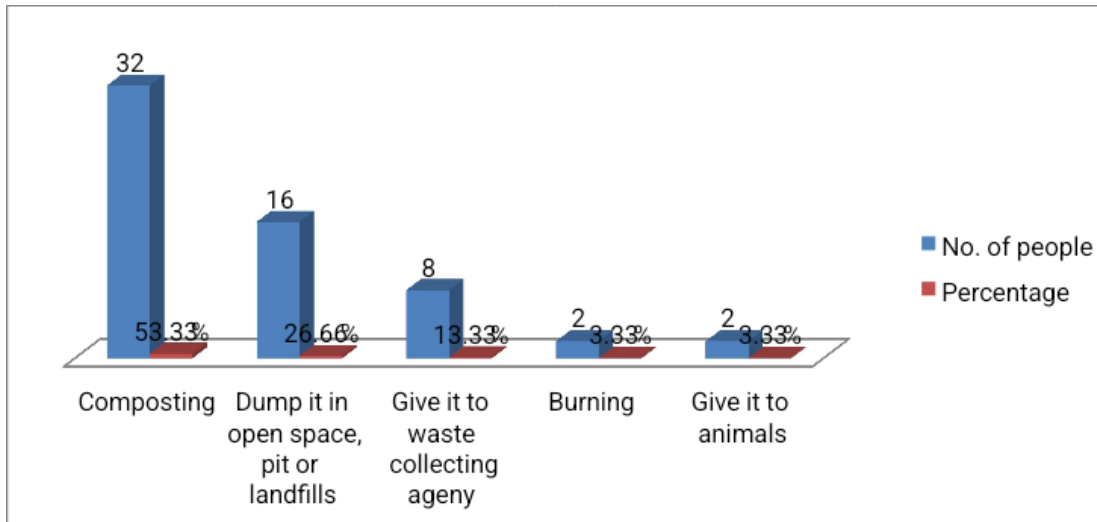


Source: Primary data

Based on the responses from the 60 households, the major types of wastes generated from respondents houses are as follows, along with the corresponding percentages: Plastic: 85% of households reported generating plastic waste. Food waste: 71.7% of households reported generating food waste. Paper: 53.3% of households reported generating paper waste. Grass, wood, leaves: 28.3% of households reported generating waste from grass, wood, or leaves. Ash: 26.7% of households reported generating ash waste. Cloth: 21.7% of households reported generating cloth waste.

FIGURE 3.4

METHODS OF KITCHEN WASTE DISPOSAL

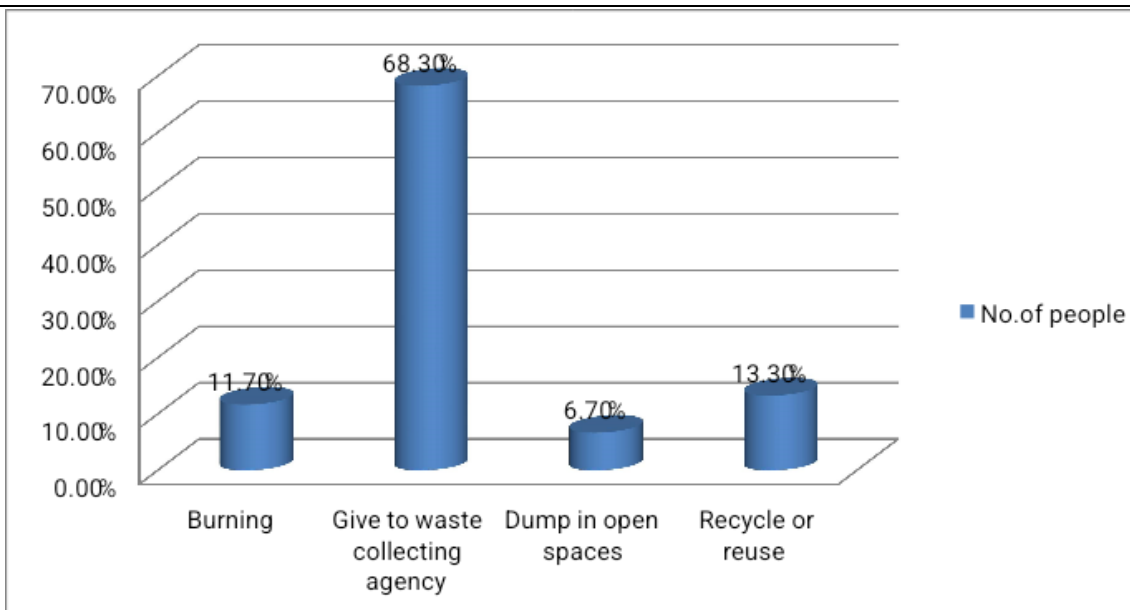


Source: Primary data

Out of the 60 samples: 32 respondents (or approximately 53.3%) dispose of their kitchen waste through composting. 16 respondents (or approximately 26.7%) dump their kitchen waste in open spaces, pits, or landfills. 8 respondents (or approximately 13.3%) give their kitchen waste to collecting agencies. 2 respondents (or approximately 3.3%) burn their kitchen waste. 2 respondents (or approximately 3.3%) give their kitchen waste to animals.

FIGURE 3.5

DISPOSAL OF PLASTIC AND OTHER WASTES

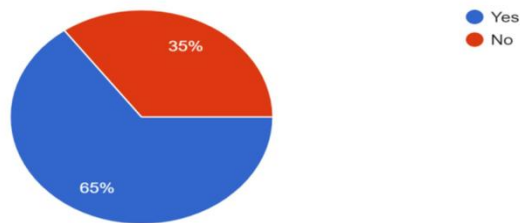


Source: Primary data

Out of the samples collected from 60 houses: 41 respondents (or approximately 68.3%) give their plastic and other wastes to waste collecting agencies. 8 respondents (or approximately 13.3%) recycle or reuse the wastes. 7 respondents (or approximately 11.7%) burn the wastes. 4 respondents (or approximately 6.7%) dump the wastes in open spaces.

FIGURE 3.6

INCIDENCE OF THROWING RESIDENTIAL WASTE IN PUBLIC PLACES

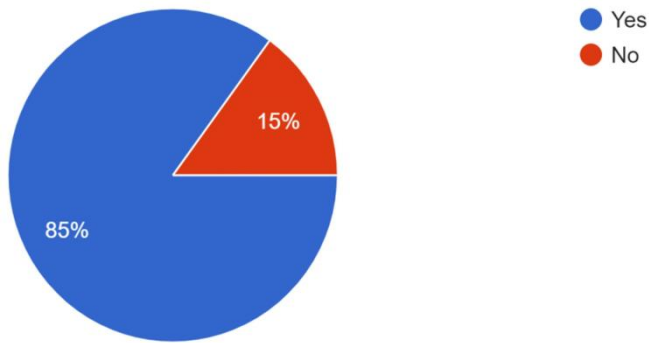


Source: Primary data

Out of the 60 respondents: 65% of respondents (or approximately 39 respondents) have seen dumping of residential waste in streets, sewage, rivers, and other public places. 35% of respondents (or approximately 21 respondents) have not seen such incidents.

FIGURE 3.7

USAGE OF TEMPORARY WASTE STORAGE

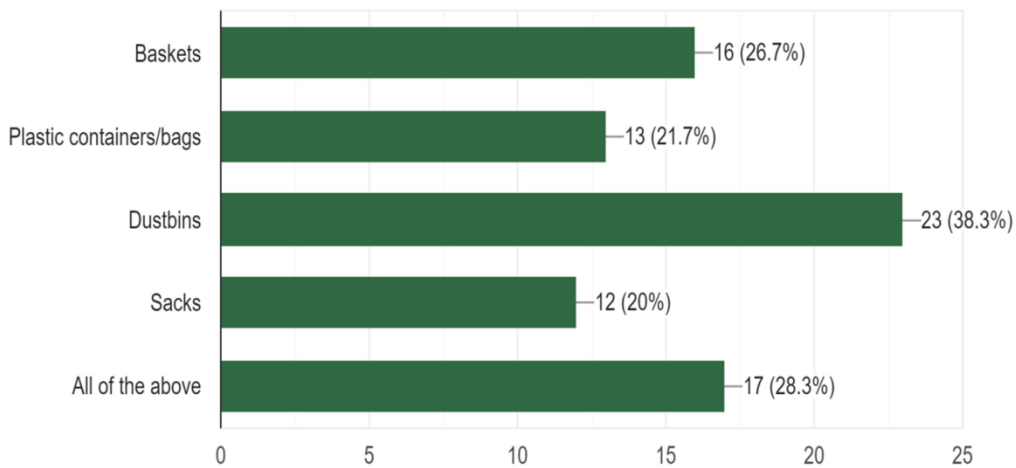


Source: Primary data

Out of 60 samples, 85% of the people have been using temporary waste storage while 15% of them do not have temporary waste storage.

FIGURE 3.8

TYPES OF STORAGE

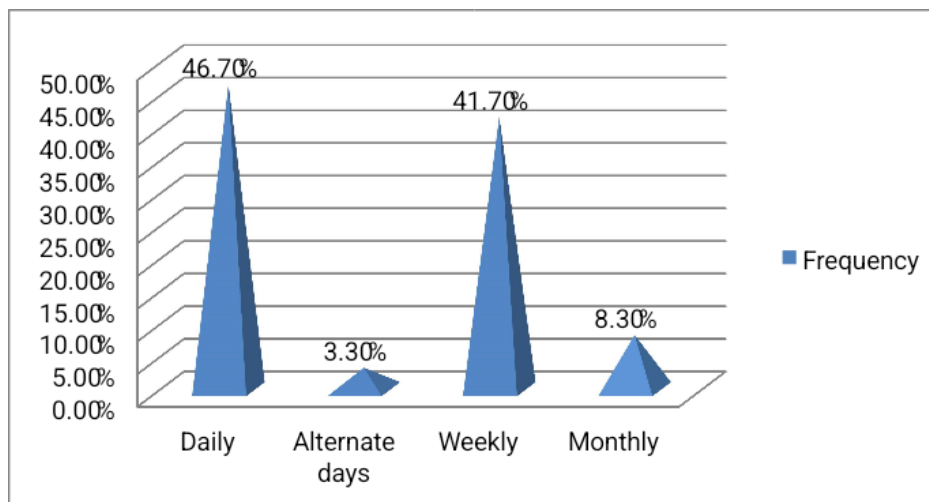


The graph shows the distribution of respondents' usage of different waste disposal methods is as follows: 38.3% of respondents (or approximately 23 respondents) are using dustbins.

Source: Primary data

26.7% of respondents (or approximately 16 respondents) are using baskets. 21.7% of respondents (or approximately 13 respondents) are using plastic container bags. 20% of respondents (or approximately 12 respondents) are using sacks. 28.3% of respondents (or approximately 17 respondents) are using a combination of all of the above methods.

FIGURE 3.9
FREQUENCY OF WASTE DISPOSAL

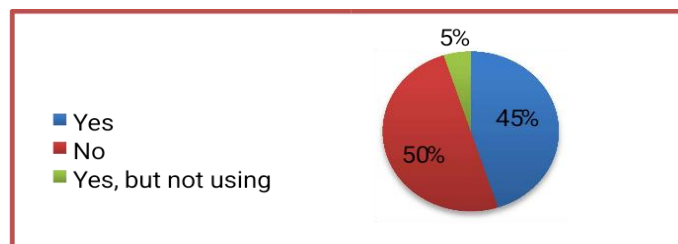


Source: Primary data

Out of 60 responses, 46.7% people dispose their waste daily, 3.3% dispose on alternate days, 41.7% dispose off their waste weekly and 8.3% people dispose their waste monthly.

FIGURE 3.10
AVAILABILITY OF REGULAR GARBAGE COLLECTION

Out of the 60 samples collected: 45% of houses (or approximately 27 households) have regular garbage collection. 50% of houses (or approximately 30 households) do not have regular garbage collection. 5% of houses (or approximately 3 households) have regular Out



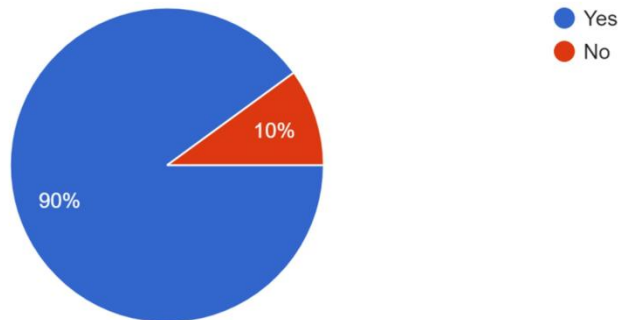
Source: Primary data

out of the 60 samples collected: 45% of houses (or approximately 27 households) have regular garbage collection. 50% of houses (or approximately 30 households) do not have regular garbage collection. 5% of houses (or approximately 3 households) have regular garbage collection but do not use it.

FIGURE 3.11

| REASON | FREQUENCY | PERCENTAGE |
|--|-----------|------------|
| Do not have proper understanding about waste segregation | 10 | 50% |
| Do not realise the importance of waste segregation | 2 | 10% |

SEPARATION OF WASTE AT HOME



Source: Primary data

Out of 60 respondents, 90% separate different types of waste at home and 10% do not separate different types of waste at home.

TABLE 3.4

REASONS FOR NOT PRACTICING WASTE SEGREGATION

| | | |
|---|---|-----|
| Do not consider waste segregation as their responsibility | 7 | 35% |
| Laziness | 1 | 5% |

Source: Primary data

Out of the total respondents, the main reasons for non-participation in waste segregation among the respondents are as follows: 50% of respondents (or approximately 30 respondents) do not have a proper understanding of waste segregation. 35% of respondents (or approximately 21 respondents) do not consider waste segregation as their responsibility. 10% of respondents (or approximately 6 respondents) do not realize the importance of waste segregation. 5% of respondents (or approximately 3 respondents) are lazy to separate waste. These reasons indicate a lack of awareness, responsibility, understanding, or motivation among the respondents when it comes to waste segregation.

TABLE 3.5

AWARENESS AND CONCERN ABOUT WASTE MANGEMENT

| AREAS | YES | | NO | |
|--|-----------|------------|-----------|------------|
| | FREQUENCY | PERCENTAGE | FREQUENCY | PERCENTAGE |
| Aware about the importance of waste management | 58 | 96.70% | 2 | 3.30% |
| Aware of whether the wastes are disposed off in an environmentally safe manner | 50 | 83.30% | 10 | 16.70% |
| Concerned about the environmental and health impacts of waste | 58 | 96.70% | 2 | 3.30% |
| Aware of the relation between consumption pattern and waste generation | 44 | 73.30% | 16 | 26.70% |

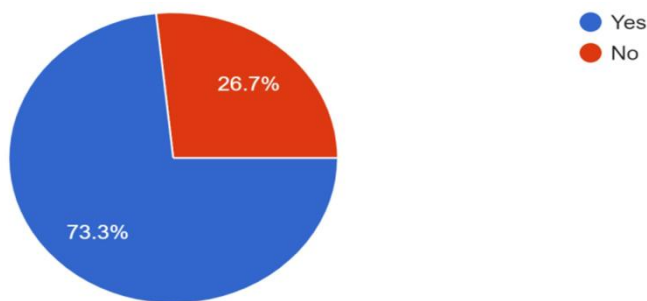
Source: Primary data

Out of 60 samples, 96.7% are aware about the importance of waste management only 3.3% are not aware about this. 83.3% of people are aware about whether the collected wastes are disposed of in an environmentally safe manner, 16.7% are unaware about this. 96.7% of

people are concerned about the environmental and health impacts of wastes. There is only very few percentage of people who are not concerned about the environmental and health impacts of wastes, that is, 3.3%. 73.3% of people are aware about the wastes generated in their house are affected by or related to their consumption pattern. 26.75% of people are unaware about this fact.

FIGURE 3.12

DIFFICULTY DUE TO WASTE



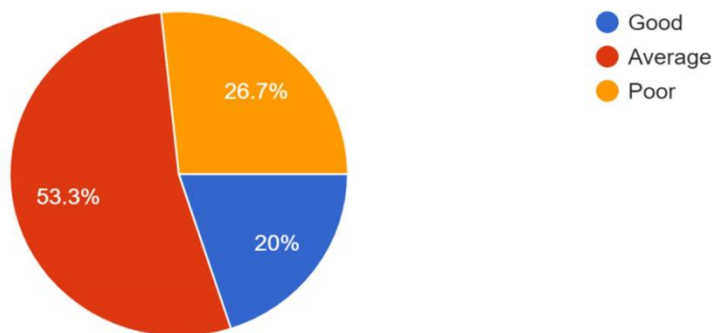
Source:

Primary data

Out of 60 samples, majority of people have faced difficulties due to waste, that is, 73.3% and 26.7% have not faced any difficulties due to waste.

FIGURE 3.13

EVALUATION OF WASTE MANAGEMENT SERVICES OF LOCAL BODIES



Source: Primary data

Out of 60 samples, 20% of respondents evaluated that the efforts of their local government in providing waste management services is good, 53.3% of them answered it as average and 26.7% of them evaluated it as poor. This data shows that majority of local governments do not provide efficient waste management services.

FIGURE 3.14

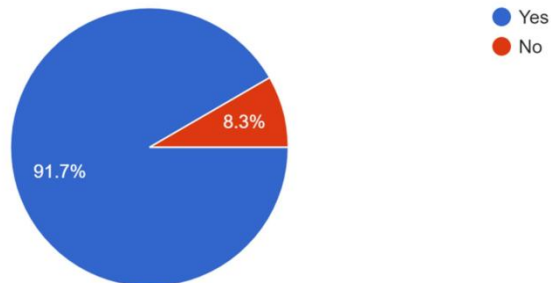


Source: Primary data

The opinions on the responsibility of waste management among the respondents are as follows: 5% of respondents (or approximately 3 respondents) believe that waste management is the responsibility of private waste collectors. 25% of respondents (or approximately 15 respondents) believe that waste management is the responsibility of local governments. 10% of respondents (or approximately 6 respondents) believe that waste management is the responsibility of households. 60% of respondents (or approximately 36 respondents) believe that all of the above mentioned (private waste collectors, local governments, and households) are equally responsible for waste management. These opinions reflect a range of perspectives on who should bear the responsibility for waste management, with some emphasizing specific stakeholders and others recognizing the shared responsibility among different entities.

FIGURE 3.15

WASTE MANAGEMENT AS MANDATORY

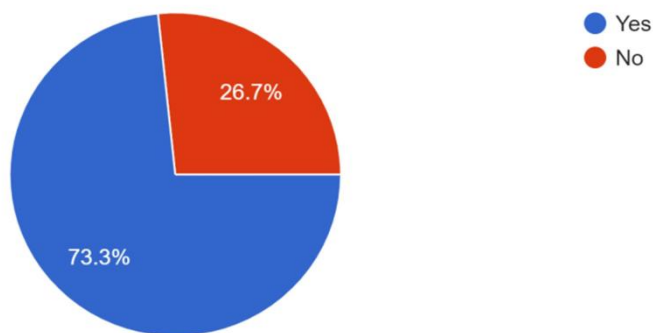


Source: Primary data

Out of 60 samples, 91.7% of people answered that government should make waste management mandatory in all local bodies. Only 8.3% of people are against of this majority opinion. This shows the importance of government and local bodies in the field of household waste management. The wastes generated by the households can be effectively managed by the government through the arrangements that are made in the local bodies for the waste management.

FIGURE 3.16

WILLINGNESS TO PAY FOR WASTE COLLECTING SERVICE



Source: Primary data

Out of 60 samples, majority of people are willing to pay for the private/public waste collectors services in order to improve waste management practice. Only 26.7% of people are unwilling to pay for the services of private/public waste collectors.

TABLE 3.6

WILLINGNESS TO PARTICIPATE IN VARIOUS WASTE DISPOSAL METHODS

| METHODS | READY | | NOT READY | |
|--|-----------|------------|-----------|------------|
| | FREQUENCY | PERCENTAGE | FREQUENCY | PERCENTAGE |
| Bio-composting | 37 | 61.70% | 8 | 13.30% |
| Source separation of waste | 24 | 40% | 8 | 13.30% |
| Practice of 3Rs (reduce, reuse, recycle) | 35 | 58.30% | 8 | 13.30% |

Source: Primary data

The analysis reveals the following findings regarding the awareness and practice of waste management among households in Ernakulam district: 61.7% of respondents (or approximately 37 respondents) are willing to practice bio-composting at home, indicating a positive inclination towards sustainable waste management. 40% of respondents (or approximately 24 respondents) are ready to separate waste from home, showing a willingness to engage in waste segregation practices. 58.3% of respondents (or approximately 35 respondents) are willing to practice the methods of reduce, reuse, and recycle, highlighting an awareness of the importance of waste reduction and recycling. However, 13.3% of respondents (or approximately 8 respondents) are not ready to practice the above-mentioned waste management methods, suggesting a potential barrier to widespread adoption of sustainable waste management practices.

CHAPTER IV

FINDINGS, RECOMMENDATIONS AND CONCLUSION

4.1 MAJOR FINDINGS

The major findings from this study are the following: -

Overall, the study provides a good picture of waste management practices in Ernakulam district, showcasing both the efficiency and drawbacks of current practices. It emphasizes the role of households in sustainable waste management and highlights the potential contributions that the government can make towards promoting and supporting such practices.

- 45% of houses have regular garbage collection, 50% of them do not have regular garbage collection and 5% of them have regular garbage collection, but they do not use it.
- 90% separate different types of waste at home and 10% do not separate different types of waste at home.
- Half of the respondents do not have proper understanding about waste segregation. 35% of them do not consider waste segregation as their responsibility, 10% of them do not realise the importance of waste segregation and 5% of them are lazy to separate waste.
- Majority of the respondents are aware about the importance of waste management and the environmental and health impacts of wastes.
- Majority of people are unsatisfied of the waste management in their locality.
- Most of them consider waste management as the responsibility of the government.
- Majority of people are willing to pay for the private/public waste collectors services in order to improve waste management practice.

- Majority of people are willing to practice waste management methods such as biocomposting, reuse, recycling, source separation etc.
- The analysis reveals the following findings regarding the awareness and practice of waste management among households in Ernakulam district: 61.7% of respondents (or approximately 37 respondents) are willing to practice bio-composting at home, indicating a positive inclination towards sustainable waste management. 40% of respondents (or approximately 24 respondents) are ready to separate waste from home, showing a willingness to engage in waste segregation practices. 58.3% of respondents (or approximately 35 respondents) are willing to practice the methods of reduce, reuse, and recycle, highlighting an awareness of the importance of waste reduction and recycling. However, 13.3% of respondents (or approximately 8 respondents) are not ready to practice the above-mentioned waste management methods, suggesting a potential barrier to widespread adoption of sustainable waste management practices.

4.2 RECOMMENDATIONS AND SUGGESTIONS

The following suggestions are made in the light of the survey results:-

- The residents should practice 3 R's which is termed as Reduce, Reuse, Recycle, in order to control the generation of household wastes.
- The residents should practice organic methods of waste disposal such as vermin culture, biogas plants etc. These organic methods of waste disposal are more ecofriendly to nature. Government may give subsidies for the promotion of composting.
- Deposit-refund scheme for cans and drinking bottles in EU and UK is a commendable scheme for waste management, as it incentivizes the consumer to return the bottle or can for which he/she is compensated, and it reduces pressure on landfills, increasing the life cycle of the product. The deposit refund scheme if applied to all products will greatly

increase the rate of recycling, and it is easily replicable across different localities and regions, as the mechanism remains the same.

- Promote decentralised waste management and 100 per cent segregation at all wards of local bodies.
- Affordable rates for waste collecting services.

4.3 CONCLUSION

Solid waste management is a major problem in Ernakulam district. Households play a major part in waste generation. Unlike industrial, commercial and biomedical wastes, household waste can be easily controlled, without much formalities and precautions. Therefore reducing the amount of wastes from households and its proper disposal should be the primary goal of governments. Efficient management of residential waste may have considerable impact on the total waste generation.

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QUESTIONNAIRE

To elicit information on “*WASTE MANAGEMENT OF HOUSEHOLDS IN ERNAKULAM DISTRICT*”. We request you to kindly answer all the questions.

1). Name:

2). Age:

3). Gender:

- a. Male
- b. Female
- c. Other

4). Number of family members:

5). Annual income:

- a. Below 50000
- b. 50000 - 1 lakh
- c. 1 lakh - 5 lakhs
- d. Above 5 lakhs

6). Place of residence:

- a. Panchayat
- b. Municipality
- c. Corporation

7). Name of your local body:

8). What are the major wastes generated in your household?

- | | | |
|---------|---------------------|--------------------------|
| Plastic | Electronic | <input type="checkbox"/> |
| Food | Grass, leaves, wood | <input type="checkbox"/> |
| Cloth | Metals, tins, cans | <input type="checkbox"/> |
| Paper | Ash | <input type="checkbox"/> |

Glass

9). How do you dispose of your kitchen waste?

- a. Dump it in open space
- b. Give it to waste collecting agency
- c. Composting
- d. Others : _____

10). How do you manage your plastic and other waste?

- a. Burn it
- b. Give it to waste collecting agency
- c. Dump it in open places
- d. Recycle or reuse
- e. Others : _____

11). Have you ever seen wastes from residential houses being thrown away (dumped) on the streets, in sewage, or in nearby water bodies?

Yes No

12). Do you have a temporary waste storage in your house?

Yes No

13).What kind of storage do you use?

- Baskets
- Plastic containers/bags
- Dustbins Sacks
- All of the above

14). How frequently do you dispose of your waste?

- a. Daily
- b. Weekly
- c. Monthly
- d. Other : _____

15). Do you have regular garbage collection in your area?

Yes No

16). Do you separate different types of waste at home?

Yes No

17). If No, then what are the reasons for you not separating the waste?

- a. Don't have proper understanding about waste segregation
- b. Did not think waste separation as my responsibility
- c. Did not realize the importance of waste separation at home
- d. Others: _____

18). Are you aware of the importance of waste management?

Yes No

19). Are you aware of whether the collected wastes are disposed of in an environmentally safe manner?

Yes No

20). Are you concerned about the environmental and health impacts of waste?

Yes No

21). Have you ever faced any difficulty due to waste?

Yes No

22). Do you know that the wastes generated in your house are affected by or related to your consumption pattern?

Yes No

23). How do you evaluate the efforts of your local government in providing waste management services?

- a. Good
- b. Average
- c. Poor

24). Who do you think is responsible for waste management?

Local self-government bodies

Private waste collectors

