

PROJECT REPORT

ON

**PROMOTION OF SUSTAINABLE WASTE MANAGEMENT IN HOUSEHOLDS
THROUGH HARITHA KARMA SENA IN VALAPPAD GRAMAPANCHAYATH**

*Submitted in partial fulfilment of the requirements for the award of degree of
Master of commerce of the University of Calicut*

Submitted by

ARDHRA K S

REG NO: AIAWMCM003

Under the guidance of

Dr. PRINCY FRANCIS

Assistant Professor and Research Guide

Research Department of Commerce

MES Asmabi College, P.Vemballur



MES ASMABI COLLEGE

P. VEMBALLUR- 680671

2022-2024

CERTIFICATE ON PLAGIARISM CHECK
MES ASMABI COLLEGE, KODUNGALLUR
(Affiliated To The University Of Calicut)

1.	Name of the Research Scholar/Student	ARDHRA K S		
2.	Title of the Thesis/paper	PROMOTION OF SUSTAINABLE WASTE MANAGEMENT IN HOUSEHOLDS THROUGH HARITHA KARMA SENA IN VALAPPAD GRAMAPANCHAYATH		
3.	Name of the supervisor	Dr. Princy Francis		
4.	Category	Master's Thesis		
5.	Department/institution			
6.		Introduction / Review of literature	Materials and Methods	Results/ Discussion/summary Conclusion
7.	Similar content (%) identified	-	-	-
	In case Overall similarity (%)	5%		
8.	Revised Check			
9.	Similar content (%) identified	5%		
10.	Acceptable Maximum limit			
11.	Software used	checker X		
12.	Date of Verification			

Issued by Librarian

Signature of the Researcher

Principal / HoD

Signature of the supervisor

Place:

Date:

Seal

CERTIFICATE

This is to certify that the project report entitled on **PROMOTION OF SUSTAINABLE WASTE MANAGEMENT IN HOUSEHOLDS THROUGH HARITHA KARMA SENA IN VALAPPAD GRAMAPANCHAYATH** is a bonafide record of project work carried out by **ARDHRA K S** in partial fulfilment of her Master of Commerce of the University of Calicut.

Place: P .Vemballur

Date:

Smt. CHITHRA P

M.Com, M.Ed

Head of Research Department of Commerce
MES Asmabi College,
P.Vemballur

CERTIFICATE

This is to certify that the project report entitled on **PROMOTION OF SUSTAINABLE WASTE MANAGEMENT IN HOUSEHOLDS THROUGH HARITHA KARMA SENA IN VALAPPAD GRAMAPANCHAYATH** is bonafide record of project work carried out by **ARDHRA K S** in partial fulfilment of her Master of Commerce of the University of Calicut.

Place: P. Vemballur
Date:

Dr. PRINCY FRANCIS
M.Com, Ph.D, B.Ed, NET, SET
Assistant Professor and Research Guide
Research Department of Commerce
MES Asmabi College P. Vemballur

DECLARATION

I, **ARDHRA K S**, hereby declare that report entitled on **PROMOTION OF SUSTAINABLE WASTE MANAGEMENT IN HOUSEHOLDS THROUGH HARITHA KARMA SENA IN VALAPPAD GRAMAPANCHAYATH** is bonafide record of project work carried out by me under the supervision and guidance of Dr. **PRINCY FRANCIS** Assistant Professor, M.E. S Asmabi College P.Vemballur. The information and data given in the report is authentic to the best of my knowledge.

Place: P. Vemballur

ARDHRA K S

Date:

ACKNOWLEDGMENT

*First of all, I am thankful to **GOD**, the Almighty for all his blessings showered upon me throughout my life and his grace, I could successfully complete the project work.*

*I am especially thankful to my project guide **Dr. PRINCY FRANCIS**, Assistant Professor of Research Department of Commerce, M.E.S Asmabi College, for her timely advice & farsighted and reflective supervision throughout the study and for the preparation of the project report.*

*I wish to express my sincere gratitude to Smt, **CHITHRA P**, Head of the Research Department of Commerce, M.E.S Asmabi College for the valuable suggestions and help.*

*I express my sincere gratitude to **Dr. A. BIJU**, the Principal of M.E.S Asmabi College, P. Vemballur, for the supportive research environment he always sustained in the department.*

*I express my gratitude to **Mrs. SALIHA P. I**, the librarian of M.E.S Asmabi College, P. Vemballur, for her support and timely guidance.*

I am grateful to the selected respondents who cooperated with me at the time of the survey.

I wish to express my sincere gratitude to all my teachers and non-teaching staff, for their motivation, support and guidance throughout the preparation of this project.

Finally, I express my sincere thanks to my parents, friends and relatives for their constant support and encouragement throughout the preparation of this project report.

ARDHRA K S

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE NO.
1	INTRODUCTION	1-6
2	REVIEW OF LITERATURE	7-15
3	THEORETICAL FRAMEWORK	16-30
4	DATA ANALYSIS AND INTERPRETATION	31-59
5	FINDINGS, SUGGESTIONS AND CONCLUSION	60-63
	BIBLIOGRAPHY	
	APPENDIX	

LIST OF TABLES

TABLE NO	TITLE	PAGE NO
4.1	Gender of respondents	31
4.2	Age of respondents	32
4.3	Number of family members	33
4.4	Occupation	34
4.5	Income of respondents	35
4.6	Awareness of waste disposal	36
4.7	Ranking household solid waste	37
4.8	Handling of food and other degradable waste	39
4.9	Sustainable waste management practices	40
4.10	Factors influencing sustainable waste management	41
4.11	Government policy support influencing sustainable waste management	42
4.12	Influence of family members influencing sustainable waste management	43
4.13	Infrastructural mechanism influencing sustainable waste management	44
4.14	Public support influencing sustainable waste management	45
4.15	Awareness programs influencing sustainable waste management	46
4.16	Concern about issues relating to solid waste management	47
4.17	Collection of Haritha Karma Sena	49
4.18	Providing waste to Haritha Karma Sena	50
4.19	Awareness of guidelines provided by Haritha Karma Sena	51
4.20	Visitation & waste collection of Haritha Karma Sena	52
4.21	Challenges of sustainable waste management	53

4.22	Separate recyclable materials from other waste	54
4.23	Aware of environmental impact of improper waste disposal	55
4.24	Reduce, reuse, recyclable household waste	56
4.25	Proper disposal methods for hazardous waste	57
4.26	Descriptive statistics	58

LIST OF FIGURES

FIGURE NO	TITLE	PAGE NO
4.1	Gender of respondents	31
4.2	Age of respondents	32
4.3	Number of family members	33
4.4	Occupation	34
4.5	Income of respondents	35
4.6	Awareness of waste disposal	36
4.7	Ranking household solid waste	38
4.8	Handling of food and other degradable waste	39
4.9	Sustainable waste management practices	40
4.10	Government policy support influencing sustainable waste management	42
4.11	Influence of family members influencing sustainable waste management	43
4.12	Infrastructural mechanism influencing sustainable waste management	44
4.13	Public support influencing sustainable waste management	45
4.14	Awareness programs influencing sustainable waste management	46
4.15	Concern about issues relating to solid waste management	47
4.16	Collection of Haritha Karma Sena	49
4.17	Providing waste to Haritha Karma Sena	50
4.18	Awareness of guidelines provided by Haritha Karma Sena	51
4.19	Visitation & waste collection of Haritha Karma Sena	52
4.20	Challenges of sustainable waste management	53
4.21	Separate recyclable materials from other waste	54
4.22	Aware of environmental impact of improper waste disposal	55
4.23	Reduce, reuse, recyclable household waste	56
4.24	Proper disposal methods for hazardous waste	57

INTRODUCTION

Sustainable waste management is crucial for environmental preservation and public health. In many communities, household waste management poses a significant challenge due to inadequate infrastructure and awareness. To address this issue, the concept of Haritha karma Sena emerges as a promising solution. Haritha karma Sena, translating to "Green Action Force," is a community-driven initiative aimed at promoting sustainable waste management practices at the household level. This project aims to introduce and implement the Haritha karma Sena model to effectively manage waste and foster a culture of environmental consciousness within households.

The earth's atmosphere is undergoing unprecedented changes due to pollutants generated by countless human and economic activities. Uncontrolled consumption exerts significant pressure on industrial processes, with most solid wastes originating from derived demand. While consumers directly demand goods to satisfy immediate needs, a considerable portion of solid waste results from indirect or derived demand, such as plastic wrappers or aluminium foil used as packaging materials. The indiscriminate use of these materials contributes to the accumulation of solid waste on the planet. Climate change, depletion of the ozone layer, and adverse effects on vegetation, soil, water, and other environmental issues stem from the long-range transport of pollutants, including acidifying substances, posing threats to our future world. Much of this damage is preventable, particularly through the efficient and responsible utilization of resources. Pollution of air, soil, and hazardous wastes presents significant challenges for governments today, requiring concerted efforts for resolution.

The minimization of wastes, especially hazardous waste, and the adoption of low-cost, non-waste technologies should be integral to an integrated waste management policy. This policy should encompass the full spectrum of waste's life cycle, including generation, collection, storage, treatment, reuse, and final disposal. Such a comprehensive approach, incorporating environmental protection strategies

alongside economic and industrial development, is crucial. Integrated waste management, the utilization of waste as a resource, and similar strategies are emphasized in this study. A concentrated and systematic approach to waste handling is imperative for resolving environmental challenges. The concept of wastemanagement has evolved dynamically, with contributions from environmentalists, sociologists, economists, administrators, and behavioural scientists, each offering unique perspectives. They view waste management from environmental, economic, and authoritative standpoints, considering it as a sustainable policy strategy, a resource, and a democratic approach, respectively. Today, waste management is perceived as a project, discipline, carrier, and process. While non-degradable solid waste requires extended disposal times, degradable solid waste presents a more immediate challenge, demanding timely management solutions.

Managing waste is a pressing global concern with far-reaching effects on the environment, public health, and resource preservation. With the increasing growth of populations and urbanization, the quantity of waste generated is steadily rising, presenting significant challenges for communities worldwide. In response to these challenges, the concept of sustainable waste management has emerged as a comprehensive strategy to tackle waste-related issues while minimizing harm to the environment and maximizing the efficient use of resources. This project aims to introduce and enforce sustainable waste management techniques within communities, concentrating on reducing waste generation, encouraging reprocessing and composting, and cultivating a culture of responsible consumption and disposal. Through a combination of educational initiatives, infrastructure enhancements, and community involvement, the project aims to establish a more sustainable and resilient waste management framework that benefits both individuals and the environment. This introduction will delve into the importance of sustainable waste management, outline the guiding principles of the project, and detail the objectives and anticipated outcomes of its implementation. By emphasizing the immediate need for action and the potential advantages of embracing sustainable waste management methods, this introduction lays the groundwork for a comprehensive and successful project strategy.

In today's rapidly evolving world, the need for sustainable practices has never been more critical. With environmental concerns looming large and waste management posing a significant challenge, communities worldwide are seeking innovative solutions to safeguard the planet for future generations. Among these communities is Valappad Gramapanchayath, where a concerted effort is underway to promote sustainable waste management practices within households. This introduction chapter sets the stage for our exploration into the promotion of sustainable waste management in Valappad Gramapanchayath, focusing specifically on the pivotal role played by Haritha Karma Sena. By providing an overview of the research topic, outlining the objectives, and highlighting the significance of the study, this chapter aims to lay a solid foundation for the ensuing investigation.

We begin by delving into the context of Valappad Gramapanchayath, offering insights into its demographic, socio-economic, and environmental landscape. Understanding the unique challenges and opportunities facing the community is crucial for contextualizing the need for sustainable waste management initiatives. Next, we articulate the research problem, delineating the gaps in knowledge and the pressing issues that drive our inquiry. By elucidating the questions, we seek to address and the objectives we aim to achieve, we provide clarity on the scope and purpose of our study. Furthermore, we underscore the importance of the study, emphasizing its potential implications for policy, practice, and community engagement. By elucidating the broader societal and environmental relevance of our investigation, we underscore the importance of our endeavor. Lastly, we provide an overview of the thesis, providing a roadmap for the reader to navigate through the subsequent chapters. Each chapter is designed to contribute to our overarching goal of understanding and promoting sustainable waste management practices in households through the lens of Haritha Karma Sena.

STATEMENT OF THE PROBLEM

In Valappad Gramapanchayath, there exists a pressing need to enhance sustainable waste management practices within households. Despite efforts to promote

environmental consciousness, there remains a gap in understanding the current practices and obstacles encountered by households in managing their waste sustainably. The absence of comprehensive data on the role of Haritha Karma Sena, a community-driven initiative, further complicates the development of effective waste management strategies. Therefore, the primary problem addressed by this research is the lack of insights into sustainable waste management practices among households, the contribution of Haritha Karma Sena, and the obstacles hindering the implementation of such practices. Identifying and addressing these issues are crucial steps towards fostering a cleaner, greener, and more environmentally sustainable community in Valappad Gramapanchayath.

The study is focused on the following questions?

- What are the sustainable waste management practices adopted by household?
- What are the role of Haritha Karma Sena in sustainable waste management practices?
- What are the major challenges faced by the household in sustainable waste management practices?

SIGINIFICANCE OF THE STUDY

The significance of this study lies in its potential to contribute valuable insights and recommendations for improving waste management practices in households, particularly in the framework of Valappad Gramapanchayath. By understanding the existing practices and the role of Haritha Karma Sena, the research can inform policymakers, local authorities, and community organizations about effective strategies for promoting sustainable waste management. Addressing the identified challenges can lead to the development of targeted interventions and policies aimed at enhancing waste reduction, recycling, and overall environmental sustainability at the grassroots level. Ultimately, the findings of this study have the potential to foster community engagement and collaboration towards achieving cleaner, healthier, and more sustainable living environments.

OBJECTIVES

- To know the sustainable waste management practices adopted by household.
- To identify the role of Haritha Karma Sena in sustainable waste management practices.
- To study the major challenges faced by the household in sustainable waste management practices.

HYPOTHESIS

- H₀: There are no significant challenges faced by the household in sustainable waste management practices.
- H₁: There are significant challenges faced by the household in sustainable waste management practices.

SCOPE OF THE STUDY

In this study the major concern is to analyses the —promotion of sustainable waste management in households through Haritha Karma Sena in Valappad Gramapanchayathl. The data has been collected from a sample of 100 households in the Valappad Gramapanchayath. The data has been collected from 1st February 2024 to 8th March 2024.

RESEARCH METHODOLOGY

The study is both analytical and descriptive in nature. Primary data were used for the study. Primary data were collected from the household of Valappad Gramapanchayath. In addition to this secondary data has also been collected for literature review from various journals, books, and websites. The population of the study consisted of the households of Valappad Panchayath and among these population, 100 respondents were taken as sample and collected the data through a questionnaire and face to face survey. Convenience sampling technique is used for the study. The collected data were analysed by using SPSS software.

LIMITATIONS OF THE STUDY

The limitation of the study includes the following:

- Information given by the respondents may be biased.
- Sampling error may occur.

CHAPTERISATION

The project report is divided in to five chapters

Chapter 1: This chapter deals with introduction, statement of the problem, objectives of the study, research methodology, limitations of the study and chapter scheme.

Chapter 2: This chapter deals with review of literature

Chapter 3: This chapter is deals with the theoretical framework. It reveals the concepts related to the study.

Chapter 4: This chapter is dedicated to the analysis and interpretation of the collected data.

Chapter 5: This chapter deals with findings, suggestions, and conclusion.

Onyinyechi Lilian Uche (2023): The case study employs a comparative analysis to assess systems for managing plastic waste in Kenya, Rwanda, and South Africa, evaluating regulatory frameworks, waste management, awareness campaigns, and recycling initiatives. Findings highlight diverse strategies, such as Rwanda's comprehensive waste management, Kenya's plastic bag ban, and South Africa's producer responsibility and recycling infrastructure. Challenges include inadequate infrastructure and limited resources, emphasizing stakeholder roles. Recommendations, aligned with substantive legitimacy theory, emphasize investing in infrastructure, public education, and collaboration for a comprehensive approach to sustainable plastic waste management. The study enhances understanding and emphasizes the importance of collaborative, holistic approaches for effective plastic waste regimes.

Rohantha Rukshan Jayasinghe, et.al. (2023): This study focused on plastic waste management in Sri Lanka, emphasizing factors contributing to waste generation and collection. A survey of registered recycling centers revealed a positive correlation between tourist arrivals and plastic waste production, while finding a negative correlation between precipitation and waste collection. HDPE, PVC, LDPE, and PP were frequently recycled, while PS and PET faced challenges. The study underscores the necessity for enhanced recycling facilities, government involvement, and increased efforts during tourist seasons. It urges heightened public awareness, private sector participation, and additional investments in recycling facilities for efficient management of plastic waste in Sri Lanka.

Jayanthi T. A., Babu Ambat (April 2023): Municipal Solid Waste Management is a critical concern for urban planners and policymakers in India, particularly in Kerala. The paper delves into current policies, legal frameworks, and resource availability for SWM. Emphasizing the shift towards decentralized waste management practices in Kerala, it explores strategies like source-level segregation, community composting, and bio methanation. The focus on recycling and circular economy practices, especially involving women for sustainability, is highlighted. The paper underscores the evolving institutional mechanism and the relevance of the World Bank-funded

Kerala's Solid Waste Management Initiative. It provides a comprehensive overview without losing key insights into challenges and implementation strategies.

Arsy Prodyanatasari, Jerhi wahyu Feranda (2023): The study discusses the challenge posed by plastic waste, a type of inorganic waste resulting from human activities that is hard to decompose, particularly if it's made of materials that don't naturally break down. The growing volume of plastic waste presents a threat to environmental sustainability, prompting the need for strategies to mitigate its impact. One such strategy involves repurposing plastic waste into useful products like planting materials. The study focuses on a community service initiative aimed at transforming plastic waste into planting media, with the goal of reducing environmental pollution, especially from non-biodegradable plastics. The methods employed include educational lectures and practical demonstrations. The initiative engaged 37 participants, including village officials, mothers involved in family welfare programs, and community leaders. Participants showed enthusiasm for learning about waste management and actively participated in activities such as creating planting media from recycled plastic. The study observed an increase in participants' understanding of efficient waste management methods. It highlights the significance of continuing similar activities to increase public awareness and knowledge, ultimately fostering a healthier and more sustainable environment.

Lia Muliawaty, R. Taqwaty Firdausijah & Willya Achmad (2022): This study investigates sustainable development policy implementation in Bandung, focusing on waste management. Utilizing qualitative methods, including observation, interviews, and literature review, the analysis reveals that existing waste management policies, while aligned with central and regional regulations, conflict with Law No. 18 of 2018 by treating waste as a regional income source. The study advocates for a comprehensive sustainable development policy in waste management, incorporating environmental, economic, social, and technical aspects to harmonize development with environmental preservation.

AE Torkayesh, B Malmir & MR Asadabadi (2021): Choosing waste disposal technology in municipal solid waste (MSW) management is critical for long-term environmental and economic impacts. This study proposes using the stratified Multi-Criteria Decision-Making (MCDM) technique to address the uncertainty associated with future criteria weightings. The stratified MCDM, combined with the best-worst approach (stratified BWM), is employed to rank available technologies. By structuring uncertainty through states in different strata, this approach enhances long-term decision-making in waste management. The research aims to encourage prospective uses of the stratified Best-Worst Method (BWM) in complex decision-making scenarios.

Junting Zhang et al. J Environ Manage. (2021): This review examines 45 recent Life Cycle Assessment (LCA) studies on MSWM systems globally, emphasizing the relationship between practical management strategies and LCA results. The selected literature covers diverse regions and emphasizes the significance of a comprehensive system boundary. Results from the 45 cases reveal a 33%-154% environmental benefit in Global Warming Potential (GWP) with integrated solid waste management replacing single treatment methods. Key concerns include the impact of management strategies on organic and recyclable waste, the growing significance of waste collection and transportation, and the need for multi-impact assessments. The study suggests focusing on local limitations, environmental considerations, and management chains for effective, cost-effective, and culturally appropriate MSWM improvements.

Sonil Nanda & Franco Berruti (2020): Sonil Nanda emphasizes the correlation between waste composition and income levels, noting that low to middle-income populations predominantly generate paper, metals, and glass waste. The management of such waste involves various processes, including recycling, incineration, waste-to-energy conversion, composting, and landfilling, with Nanda expressing support for the latter. In her review, Nanda delves into the impact of landfill conditions—covering construction, geometry, weather, temperature, moisture, pH, biodegradability, and hydrogeological factors—on the generation of landfill gases and leachate. She expands her analysis to cover essential elements like waste volume reduction, resource

reclamation, transformation of discarded materials into valuable resources, safeguarding the environment, and restoration of sites, all of which play roles in urban advancement. Furthermore, Nanda provides thorough examinations of landfill categorizations and engineered adaptations, addressing their functions, processes, and potential for resource recovery.

Antonies A Zorpas (2020): In alignment with the 1957 Treaty of Rome's commitment to environmental protection, strategies within waste management are crucial to achieving 2050 targets. Focused on enhancing quality of life and fostering citizen engagement, these strategies employ green resources, environmental management systems, and various activities to reduce environmental impacts. This paper outlines a comprehensive methodology for developing, implementing, and monitoring waste management strategies at local or central levels. It serves as a valuable tool for policymakers, consultants, and professionals involved in household and food waste prevention, material reuse, and overall solid waste management, contributing to the European Green Deal objectives.

Ljiljana Rodić, David C. Wilson(2017): Solid waste management (SWM) stands as a critical utility service lacking for over 2 billion people, directly impacting 12 of the UN Sustainable Development Goals (SDGs). This study delves into the governance aspects of SWM, particularly focusing on the essential elements of waste collection and disposal governance. Employing a transdisciplinary approach, the research synthesizes insights from literature with input from stakeholders worldwide, as a component of the authors' collaboration with the UN Environment Programme (UNEP) for the 2015 Global Waste Management Outlook. The study underscores the need for a blend of strategies to ensure universal waste collection and regulated disposal. While municipalities bear the legal obligation for service provision, diverse service providers play a role in fostering an efficient SWM system. Adequate financing mechanisms are vital for sustaining these services, tailored to local contexts of affordability and community willingness to pay. Given the behavioral shifts required from citizens and municipal bodies, effective communication and

collaboration among stakeholders are crucial facilitators. The study also highlights the significance of capacity building to bolster SWM efforts.

F Cucchiella, I D'Adamo, M Gastaldi (2016): Managing municipal solid waste (MSW) is a global challenge for sustainability. Waste to Energy (WTE) technology aligns with EU energy and climate policies while maintaining high reuse and recycling rates. This study assesses WTE feasibility using strategy and social analyses. Results indicate potential for a 150 kt electrical WTE plant, yielding profits of €25.4 per kiloton and avoiding 370 kgCO₂eq per ton of treated waste. Energy recovery ranges from 21% to 25%, minimizing disposal and preserving resources for the future.

Paul. H. Brunner & Helmut Rechberger (2015): Waste incineration, evolving for volume reduction and hygiene, is vital for hazardous material destruction and valuable metal concentration. Coupled with prevention and recycling, waste-to-energy facilities, featuring advanced pollution controls, aid in environmental goals. Incinerators transform residues into secondary metal sources, making them integral to sustainable waste and environmental management decisions.

Joshua Reno (2015): Joshua Reno's work underscores that waste transcends being a mere symptom of human quests for meaning or a technical challenge for sanitary engineers and public health officials. Waste management reveals the pivotal role of disposable and transient items in discussions surrounding materialism, existence, marginalized labor, and movements for environmental justice. Reno examines criticisms regarding exploitation and the unmet expectations of modernity and imperial structures. His conclusion emphasizes that waste generation extends beyond human concerns, intertwining in the existence of non-human creatures and influencing the shared future of our planet.

AthanasiosC. Karmperis, et,al, (2013): This paper examines prevalent decision support models in solid waste management, primarily categorized within three frameworks: life-cycle assessment, cost-benefit analysis, and multi-criteria decision-making. The analysis explores the strengths, shortcomings, and critical issues of these

frameworks, while also considering potential combinations and extensions. Acknowledging the significance of sustainability encompassing environmental, economic, and social aspects in waste management, the paper introduces the waste operation logrolling game as a dedicated decision support framework for the development of future models.

Lilliana Abarca Guerrero, Ger Maas, William Hogland (2012): Waste management obstacles in developing nations stem from increased waste generation, straining municipal budgets due to high management costs and a lack of understanding of critical factors. A literature analysis from 2005 to 2011, focusing on *Waste Management Journal* and *Waste Management and Research*, revealed limited quantitative data. This research spanned 30 urban areas in 22 countries across four continents, using a variety of methods to identify stakeholders and analyse influencing factors. The outcomes provide a valuable framework for planning and enhancing urban waste management infrastructures.

Daniel Hoornweg, Perinaz Bhada-Tata (2012): The provision of solid waste management is a fundamental responsibility of every megacity government, with considerable variations in service quality, environmental implications, and associated costs. As the world advances towards its urban future, the production of municipal solid waste (MSW), a significant by-product of civic life, is surging at a pace outstripping urbanization rates. Presently, estimates indicate that approximately 3 billion residents are generating 1.2 kg of waste per person per day. Projections for 2025 suggest a further increase, with an anticipated 4.3 billion civic residents generating about 1.42 kg/capita/day pertaining to urban solid waste.

Lorenzo Giusti (2009): This review assesses global waste trends, focusing on municipal solid waste in various regions, including the EU, OECD countries, and China. It explores the health impact of waste management, emphasizing MSW while considering bioaerosol exposure and pathogens from composting and sewage treatment. The review briefly addresses the effects of radioactive waste. Numerous epidemiological studies on waste facility employees and residents reveal inconclusive evidence of adverse health outcomes near such facilities. Strong proof links sewage

treatment plants to a heightened risk of gastrointestinal issues. To enhance epidemiological studies' reliability, the review advocates prospective cohort studies with robust statistical power, direct human exposure measurements, and health biomarkers.

Fauziah S.H., Agamuthu. P, (2009): The 2009 study in the Malaysian Journal of Science aimed to optimize small-scale vermicomposting for homes, addressing the challenge of putrescible waste (40-50% of total). Amid growing waste concerns in developing countries, the research explored bioremediation options, emphasizing the need to consider acidity, and hindering factors for successful vermicomposting in solid waste systems.

Ashok V. Shekdar (2008): The study addresses solid waste management (SWM) in Asian countries, emphasizing compatibility with societal nature. Aligned with global sustainability trends, the focus is on 3R technologies (reduce, reuse, recycle). Economic variations impact the degree of improvement, with high-income countries leading in incorporating expensive 3R technologies. The paper pragmatically assesses SWM expectations in Asia, analysing current situations and future trends. It conceptually evaluates sustainability issues and proposes an integrated approach, including national policies, technology, financial management, and public participation. The suggested action plan framework is adaptable across diverse country-specific scenarios

Capatina Camelia and Simonescu Claudia Maria (2008): It seems like the article mentioned focuses on waste management in rural areas of Gorj County, Romania. The ecological priority list addresses issues related to surface and underground water pollution, as well as atmospheric pollution. The study emphasizes the benefits of proper waste management for the landscape, highlighting waste gathering, transfer, collection, biological treatment, and storage. Ultimately, the conclusion suggests that efficient methods of waste management can lead to long-term economic benefits, including improved public health, protection of natural resources, and reduction of water and air contamination.

Goddu Vijaya Kumar, Davvuri Kavita and Bakki Vidya Kaumudini (2007): The authors conducted a critical analysis of healthcare waste management in India and England, utilizing primary and secondary data. Their research involved literature reviews, audits, and questionnaire surveys, specifically focusing on healthcare waste management practices in Andhra Pradesh State, India. The study highlights a potential ongoing issue with the rise in healthcare waste quantities and its mishandling, raising concerns for the future.

Huang Qifei, Wang Qi, Dong Lu, Beidiu Xi, Zhou Binyan (2006): The study on waste management in China highlights its environmental importance. Chinese law categorizes solid waste into three types: industrial, municipal, and hazardous. In 2002, 136.5 million tons of municipal solid waste (MSW) were collected, with 945 million tons of industrial solid waste (ISW) generated. MSW facilities include 528 landfills and 78 composting plants. Mining-generated MSW constitutes 27.5%, and hazardous waste management involves 44% generation, 13.5% storage, 15.4% disposal, and 93% total hazardous waste.

Haskarlianus Pasang, Graham A. Moore, Guntur Sitorus (2006): This study critically assesses municipal solid waste management in Jakarta, Indonesia, emphasizing perspectives from researchers and practitioners. Key obstacles identified include insufficient stakeholder involvement in planning, unskilled personnel, the absence of long-term strategies, and poor coordination between authorities and neighbourhood associations responsible for primary collection. Surprisingly, the study finds that a lack of resources is perceived as the least significant impediment. The crucial role of neighbourhood associations in daily waste collection and area cleanliness is highlighted. The study suggests that a neighbourhood-based waste management strategy, as opposed to a community-based approach, holds promise for Jakarta, offering practical insights and potential long-term solutions.

Shan-shan Chung, Chi-sun Poon (1998): This study delves into municipal solid waste (MSW) management challenges in urban mainland China, particularly focusing on Guangzhou's escalating waste generation rates in comparison to Hong Kong. The

paper draws attention to China's struggle in meeting fundamental waste management needs while highlighting the significance of tackling both high and low-level requirements simultaneously. Through an examination of waste management systems and the composition of municipal solid waste in Guangzhou and Hong Kong, the research offers valuable observations and underscores the necessity for a well-rounded strategy to prevent undermining local informal waste recovery mechanisms. Additionally, it emphasizes the unique features of mainland China's waste management system, urging caution when interpreting Chinese waste statistics.

J.M. Lusugga Kironde, Michael Yhdego (1997): This review investigates urban solid waste management in Tanzania, with a specific focus on governance dynamics, especially as observed within the Dar es Salaam City Council. The analysis considers central–local government relationships, as well as interactions with international, national, and community entities. Identified impediments include corruption, strained political relations, privatization challenges, and political apathy, with resource scarcity considered the least significant. The study evaluates waste management governance in terms of public participation, privatization, citizen rights, accountability, transparency, and financial efficiency. Proposing a shift from command-and-control to partnership-based approaches, the study advocates for a community-based solid waste management strategy for wider adoption, emphasizing a strategic four-step process: elaboration, trial, evaluation, and extension to other neighbourhoods.

BACKGRUOND OF THE STUDY

Haritha Karma Sena is a professional team assigned with the responsibility of collection, transportation, processing, recycling / disposal, and management of waste materials in association with respective LSGs. There are 28 Haritha karma Sena members in 20 wards of valappad gramapanchayath involved in solid waste management interventions.

They implement a comprehensive door-to-door collection system for non-biodegradable materials from both households and institutions, successfully collecting user fees from the majority of beneficiaries. Monthly collections are efficiently completed within the first ten days, with materials sorted into 18 categories and handed over to private agencies and recycling firms. Approximately 4 tons of plastic, along with various other non-biodegradable items, are gathered monthly according to a predetermined schedule. Valappad Gramapanchayath has rapidly elevated waste management standards, overcoming initial challenges such as reluctance to collect user fees, which hindered sustainability and led to improper waste disposal and accumulation at the Material Collection Facility (MCF). However, with the appointment of a new Gram Panchayath Secretary in 2020 and the support of Haritha Kerala Mission, efforts resumed, including the formation of a Haritha Karmasena Consortium and training sessions for members to enhance their skills.

Under the leadership of Gramapanchayath President Shinitha Ashiq since January 2021, significant strides have been made in improving waste management:

- Restarting door-to-door collection with user fees
- Rehabilitating the MCF destroyed by fire
- Adjusting user fees for affordability and revenue balance
- Establishing mini MCFs for efficient waste storage
- Procuring vehicles for transportation
- Partnering with private agencies for disposal
- Implementing financial management and welfare measures

These initiatives highlight a proactive stance toward waste management enhancement, emphasizing collaboration, financial sustainability, and member welfare to establish a robust framework for effective waste management in Valappad Gramapanchayath.

In Valappad Gramapanchayath, the study focuses on three key objectives: understanding household waste management practices, assessing the Haritha Karma Sena's role in promoting sustainability, and analyzing challenges encountered in waste management. By investigating these aspects, we aim to uncover effective strategies, community involvement, and obstacles hindering sustainable waste management efforts within the community.

Sustainable Waste Management

Sustainable waste management refers to the systematic approach of handling, treating, and disposing of waste in a manner that minimizes environmental impact, conserves resources, and promotes long-term ecological balance. It involves strategies aimed at reducing waste generation, maximizing reuse and recycling, and responsibly managing waste that is produced. Sustainable waste management practices prioritize conserving natural resources, minimizing pollution and greenhouse gas emissions, and safeguarding human health and the environment. Additionally, sustainable waste management often incorporates principles of the circular economy, where materials are kept in use for as long as possible through recycling, re-manufacturing, and re-purposing, thus minimizing the need for virgin resources and reducing waste sent to landfills or incineration. Sustainable waste management endeavours to prolong the usage of materials and minimize the amount of solid waste destined for landfills or incineration. However, within our current linear economic model, waste generation commences even before the manufacturing of products. Hence, a comprehensive approach to sustainable waste management necessitates considering the entire lifespan of a product to mitigate the adverse environmental, social, and economic consequences of contemporary consumption patterns.

The precise definition of sustainable waste management becomes pivotal in refining and enhancing our current waste management frameworks. Whether concentrating on waste reduction during end-of-life stages or integrating waste minimization into the production process from inception, novel waste management strategies are imperative to effectively handle existing waste streams while simultaneously curbing the overall waste output. Sustainable waste management constitutes a pivotal component of the overarching circular economy concept. It represents a systemic strategy for economic advancement that diverges from the conventional take-make-waste paradigm, striving to decouple growth from the utilization of limited resources. By addressing the shortcomings of a linear consumption model, sustainable waste management not only addresses broader societal issues but also provides targeted remedies for the multifaceted problems associated with waste. Numerous factors play a role in shaping the design and execution of a solid waste management system. These factors differ from one region to another and can greatly affect the efficiency and longevity of waste management approaches.

Listed below are the factors influencing the solid waste management system, encompassing its design, establishment, and operation:

1. Institutional Factor:
2. Social Factors
3. Financial Factors
4. Economic Factors
5. Technical Factors
6. Environmental Factors

1. **Institutional Factors:** Institutional factors impacting the solid waste management system encompass regulations and policies enabling the government to efficiently execute Integrated Solid Waste Management. Measures that can be pursued in this regard include:

- Formulate national and/or provincial policies and pass laws concerning standards and procedures for sustainable waste management.
- Define the responsibilities and functions of each tier of government.
- Guarantee that local governments have the requisite authority and resources to implement an Integrated Solid Waste Management (ISWM) plan.

The existence and implementation of legal and regulatory frameworks are crucial in influencing solid waste management approaches. Legislation and regulations oversee waste pickup, disposal, recycling, and the development of waste management facilities. Robust regulations and their enforcement foster appropriate waste management procedures and stimulate the uptake of sustainable waste management methods.

2. **Social Factors:** Social factors affecting the solid waste management system include local customs, cultural norms, and religious practices, which can be influenced or altered through continuous public education campaigns. Understanding these factors is vital for understanding waste generation and disposal patterns. Local authorities should ensure community involvement in all stages of management planning to promote awareness, participation, and acceptance. The level of public awareness and engagement in waste management practices greatly influences the effectiveness of waste management systems. Educating and involving the public in waste reduction, recycling, and proper waste disposal practices can lead to improved waste management behaviors. Public involvement in decision-making processes regarding waste management and community-led initiatives can enhance the overall effectiveness of waste management systems.
3. **Financial Factors:** This remains the primary concern during the implementation of an Integrated Solid Waste Management (ISWM) plan. It is essential to identify or establish sources of funding to sustain the Solid Waste Management (SWM) plan financially. In this regard, local authorities should identify potential funding sources for SWM, including general revenues, user

fees, and contributions from the private sector, government funding, and grants or loans from international agencies. The availability of financial resources and infrastructure significantly impacts the implementation and longevity of waste management systems. Inadequate financial resources can hinder the establishment of waste collection networks, treatment facilities, and recycling infrastructure. Therefore, ensuring sufficient budget allocations and implementing effective funding mechanisms are essential to ensure the sustainable operation of waste management systems.

4. **Economic Factors:** Economic factors affecting the solid waste management system should be distinguished from the factors mentioned earlier, as they pertain to the financial outcomes of Integrated Solid Waste Management (ISWM) plans. This includes considerations such as job creation, support for local businesses and tourism, political advantages, and so forth. To evaluate these aspects, local authorities must assess the initial capital investment requirements and the ongoing operational and maintenance costs associated with various waste management initiatives. Additionally, they should gauge the public's ability and willingness to pay for these services and evaluate activities based on their effectiveness in waste management and potential for employment generation. The rapid pace of urbanization and economic development leads to increased waste generation due to higher consumption rates and industrial activities. Consequently, urban areas often require more advanced waste management systems to handle larger waste volumes and address diverse waste streams.
5. **Technical Factors:** These factors involve identifying the required equipment and facilities for implementing the Integrated Solid Waste Management (ISWM) plan, with particular attention to their location. This decision-making process considers geological factors, transportation distances, and expected waste generation, forming the basis for the placement and design of different equipment and facilities. Advances in waste management technologies and innovations play a crucial role in improving waste management systems. Technologies like waste-to-energy conversion, composting, anaerobic

digestion, and advanced sorting and recycling systems enhance waste treatment and resource recovery processes. Technological progress has the potential to promote more efficient and sustainable waste management practices.

6. **Environmental Factors:** Each Integrated Solid Waste Management (ISWM) plan carries significant implications for natural resources, human health, and the broader environment. All Solid Waste Management (SWM) activities, whether landfilling or incineration, must take into account the environmental impacts of these actions and strive to mitigate their effects on human health and the local ecosystem. To accomplish this, local authorities must establish protocols to protect groundwater and drinking water and ensure compliance with national standards to minimize risks to human health. Environmental considerations underscore the importance of sustainable waste management practices. The need to reduce environmental footprints, including pollution, greenhouse gas emissions, and soil and water contamination, shapes waste management strategies. Prioritizing waste reduction, recycling, and resource recovery efforts helps alleviate environmental pressures.

Waste management in households encompasses strategies aimed at reducing waste generation, promoting recycling, and minimizing negative environmental impacts. Studies reveal that factors like socio-economic status, housing characteristics, and personal behaviours significantly influence household waste management practices. Key aspects of sustainable waste management in households include:

1. **Avoidance and Reduction:** Encouraging consumers to buy products with minimal packaging, choosing durable goods over disposable items, and adopting a circular economy mind-set to extend the life cycles of products

Waste management

Waste management encompasses the collection, treatment, and safe disposal of diverse waste materials with a focus on environmental responsibility. It includes tasks such as garbage collection, recycling, composting, landfill management, and energy recovery. By reducing pollution stemming from improper disposal methods like open burning or dumping into water bodies, waste management safeguards air quality and prevents the release of harmful toxins into ecosystems.

Importance of Waste Management

- **Environmental Protection:** Effective waste management prevents contamination of the air, water, and soil, thereby minimizing the discharge of hazardous substances into the environment. This reduction in harmful emissions helps mitigate adverse impacts on ecosystems, wildlife, and human health.
- **Resource Conservation:** It entails the recycling and reuse of materials, thereby decreasing the demand for fresh raw materials. This preservation of natural resources and power promotes more sustainable production methods.
- **Energy Savings:** Several waste management methods, including recycling and waste-to-energy techniques, produce renewable energy or harness energy from waste. This diminishes dependence on fossil fuels and contributes to the fight against climate change.
- **Lowering Emissions of Greenhouse Gases:** Effective waste management practices, which encompass recycling and composting, decrease methane releases from landfills and lessen the necessity for energy-intensive manufacturing of new materials, consequently aiding in the mitigation of climate change. It can result in the spread of diseases, contamination of water sources.
- **Aesthetic Improvement:** Effective waste disposal practices and cleanliness enhance the aesthetic appeal of the environment, improving residents' standard of living and attracting tourism.

- **Economic Benefits:** It generates employment opportunities in recycling, waste pickup, processing and associated sectors while concurrently lowering expenses associated with waste clean-up, disposal, and environmental rehabilitation.

Solid waste

Solid waste denotes any materials that are discarded or no longer needed, encompassing a variety of items such as paper, plastics, glass, food scraps, and similar items. It encompasses the diverse array of waste produced by households, businesses, schools, industries, and other entities. Solid waste can be further classified into categories including municipal solid waste (MSW), industrial waste, commercial waste, agricultural waste, and specialized forms like electronic waste (e-waste). According to the Resource Conservation and Recovery Act (RCRA), Solid waste encompasses all types of trash or refuse, sludge from industrial plants, and other disposed materials, irrespective of their physical form. Effective management of solid waste is essential for safeguarding the environment, enhancing public health, conserving resources, and ensuring compliance with regulations. Solid waste encompasses any form of discarded material, including garbage, refuse, and unwanted items that have lost their utility. Its origins span a range of sources, including households, businesses, educational institutions, medical facilities, and other entities. This waste can be classified based on its point of origin, such as municipal solid waste, healthcare waste, and electronic waste. The most common type of solid waste, municipal solid waste, includes everyday items discarded by households. This comprises paper, plastics, food scraps, textiles, packaging, yard waste, and household hazardous materials such as batteries and cleaning products. Solid waste may exist in solid, liquid, semi-solid, or gaseous states. Managing solid waste involves techniques like source reduction, recycling, storage, collection, transportation, processing, and disposal. Inadequate disposal practices can result in negative health impacts, environmental degradation, marine pollution, and obstruction of waterways, leading to flooding and the transmission of diseases such as cholera and malaria.

Sources of Solid Wastes

- Solid domestic garbage.
- Solid waste material from various industries.
- Solid agricultural waste.
- Plastics, glass, metals, e-waste, etc.
- Medical waste.

Solid waste management

Solid waste management typically encompasses the entire cycle of gathering, treating, and eliminating solid waste. Within the waste management procedure, solid wastes are collected from various origins and subsequently disposed of. This operation encompasses collection, transportation, treatment, examination, and disposal of the waste, requiring vigilant oversight to ensure adherence to stringent regulations and guidelines.

Solid waste management involves the systematic management of solid waste through safe and sustainable methods, including collection, treatment, and disposal. This process encompasses various stages such as generation, storage, collection, transportation, treatment, and final disposal. The main goal of solid waste management is to protect public health and the environment by reducing associated risks. Poor waste management practices can lead to air, water, and soil pollution, as well as the spread of diseases and other health dangers. Typical solid waste disposal methods include landfilling, incineration, composting, and recycling. Achieving effective solid waste management necessitates collaboration among diverse stakeholders, including individuals, communities, governmental bodies, and private organizations. Organizations such as the World Bank and the United Nations Environment Programme (UNEP) are crucial contributors, providing financial assistance, technical knowledge, and guidance for solid waste management projects worldwide.

The Importance of Solid Waste Management

1. Environmental Protection: Proper solid waste management prevents pollution of air, soil, and water bodies. Uncontrolled dumping or improper disposal of waste can lead to contamination of natural resources, degradation of ecosystems, and harm to wildlife.

2. Public Health: Inadequate waste management poses significant health risks. Accumulation of waste can attract pests and vermin, serving as breeding grounds for disease vectors like mosquitoes and rats. Improper disposal methods, such as open burning, release harmful pollutants into the air, leading to respiratory issues and other health problems among nearby populations.

3. Resource Conservation: Effective waste management promotes resource conservation through recycling, reuse, and recovery of materials. By redirecting waste away from landfills and incineration, valuable resources like metals, plastics, and organic matter can be recovered and reintegrated into the production cycle, reducing the demand for virgin resources.

4. Energy Recovery: Proper waste management includes processes like waste-to-Energy (WtE) conversion, where energy is recovered from non-recyclable waste through methods like incineration or anaerobic digestion. This helps by rerouting waste from landfills and incinerators for energy generation and contributes to sustainable energy production.

5. Reduction of Greenhouse Gas Emissions: Landfills are significant sources of methane, a potent greenhouse gas contributing to climate change. Effective waste management methods, like capturing and utilizing landfill gas, can reduce methane emissions, thus aiding in the fight against climate change.

6. Economic Benefits: Implementing efficient waste management systems can lead to economic gains through job creation in waste collection, sorting, recycling, and

disposal sectors. Additionally, resource recovery and energy generation from waste can generate revenue streams and reduce waste management costs in the long term.

7. Community Well-being: Clean and well-managed environments improve the residents' quality of life. Proper waste management contributes to aesthetic improvements, reduces odors and nuisances associated with waste, and fosters community pride and cohesion.

8. Regulatory Compliance: Many jurisdictions have laws and regulations governing waste management to safeguard the health of the public and the environment. Adhering to these regulations is crucial to evade fines, legal consequences, and damage to the reputation of businesses and local governments.

Haritha Karma Sena

It is a specialized team comprising Green Technicians and Green Supervisors, primarily composed of members from the Kudumbashree Women's initiative. Their main responsibility revolves around gathering, transporting, processing, recycling, and appropriately disposing of waste materials in cooperation with the relevant Local Self Governments (LSGs) and Suchitwa Mission. The Karma Sena comprises skilled Kudumbashree Women dedicated to promoting sustainable waste management across Kerala. Their duties involve gathering non-biodegradable waste from residences and businesses, sorting it into various categories, and either recycling or properly disposing of it. Additionally, they offer advice on handling organic waste, managing compost, and renting eco-friendly equipment. It was established in 2013 by the Kerala Government as part of the broader Haritha Kerala Mission, HKS aims to advance the state's cleanliness and environmental sustainability objectives. The mission seeks to achieve several key objectives:

1. Kerala into a state free from waste accumulation.
2. Advocate for and implement sustainable waste management practices.
3. Generate employment opportunities within the waste management sector.

4. Educate the public on the significance of effective waste management.

The Haritha Karma Sena advances sustainable waste management through diverse initiatives and endeavours aimed at fostering a cleaner and more eco-friendly environment in Kerala. Below are some methods through which they are accomplishes this:

•**Collection and Sorting:** Primarily composed of Kudumbashree Women, undertakes the collection, transportation, processing, recycling/disposal, and supervision of waste items in collaboration with local self-governments and the Suchitwa Mission. They collect non-biodegradable waste from homes and businesses, sort it according to its properties, and ensure its appropriate recycling or disposal.

•**Awareness and guidance:** The group offers advice to households regarding organic waste management, installation of composting systems for residences and institutions, and the provision of essential equipment for organic waste disposal at the point of origin. They also facilitate collection of non-biodegradable waste from households and educate the public on the significance of effective waste management.

•**Income Generation:** In addition to waste collection, the karma sena prioritizes creating opportunities for income generation among its members. They implement sustainable income generation models, including training green technicians and gardening assistants, advocating for rooftop vegetable cultivation, repairing and managing bio-bins for localized waste treatment, distributing compost collected from households to nurseries and farms, and manufacturing alternative environmentally friendly products like cloth and paper bags.

•**Training Programs:** Members participate in training programs focused on solid waste management, which include instruction on various aspects such as waste collection, segregation, transportation, recycling, adding value to waste materials, ensuring health and safety, adhering to labour regulations, promoting gender equality, and receiving practical training on waste management applications. These training

initiatives are designed to improve their proficiency in sustainable and scientifically sound waste management techniques.

•**Technological Integration:** The Haritha Karma Sena employs technology like the App to optimize solid waste management procedures. This digital tool enables Sena members to conduct door-to-door waste collection, monitors resource recovery facilities, coordinates waste management services from the ward to the state level, facilitates real-time information exchange, and enables public reporting of pollution concerns to local authorities.

Haritha Karma Sena- A Kudumbashree initiative in Solid Waste Management-a Kerala Model

The Kudumbashree Mission –Haritha Karma Sena -will work together with Haritha Keralam Mission, Suchitwa Mission and Clean Kerala Company for a garbage-free state. Local bodies are responsible for selecting members of the Haritha Karma Sena. These individuals collect non-biodegradable waste, particularly plastic, from households and institutions, charging a nominal fee for their services. The collected waste is sent to grading units for recycling after being segregated based on its characteristics. Various types of waste, including plastics, paper, metals, and electronic waste, are sorted accordingly. Tattered plastic is provided to local bodies for road construction by the Clean Kerala Company. Each member of the Kudumbashree initiative visits a minimum of 250 households to collect non- biodegradable waste. Apart from waste collection, members are also involved in activities such as manufacturing environmentally friendly materials, maintaining waste disposal mechanisms, organic farming, and renting out eco-friendly equipment. Kudumbashree, primarily a women's organization, was established in Kerala in 1998 to empower women and alleviate poverty through community-based self-help groups. It operates as a joint initiative of the Kerala government and NABARD, aiming to showcase women's capabilities and opportunities for advancement. The movement has become a catalyst for various developmental and welfare programs for rural women, including solid waste management initiatives in collaboration with local bodies, the

Haritha Keralam mission, Suchitwa Mission, and Clean Kerala Company. Initially, 22,119 Kudumbashree workers were deployed as members of the Green Task Force (Haritha Karma Sena) across 689 local bodies in the state. This initiative has grown into one of the largest social enterprises for women, with nearly 4 million members covering over 50% of households in Kerala, serving as a successful model for social entrepreneurship.

The operational approach and key features of Kudumbashree's Haritha Karma Sena (Green Army)

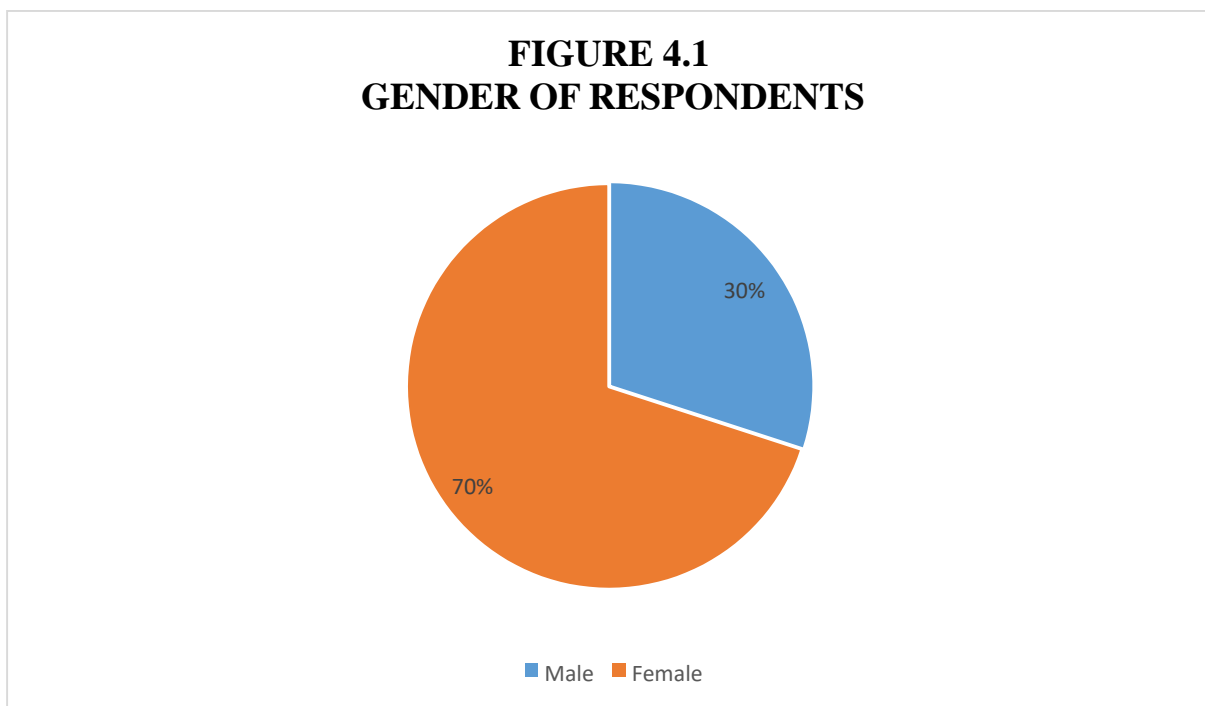
- The primary goal of Haritha Karma Sena's plan strategy is to achieve a waste-free Kerala.
- Operating as a green army, they function almost entirely on a voluntary basis.
- Solid waste collection begins right at the doorstep of households.
- Waste sorting occurs at the primary collection point, with households following the guidelines provided by the voluntary workers of Green Army.
- Their primary focus in waste collection is plastics, and they designate specific days for collecting plastics and other waste based on convenience.
- They utilize modern technology for efficient solid waste collection.
- The state-wide presence of Haritha Karma Sena spans across 941 Grama Panchayaths and 93 municipal and corporation areas.
- The total membership in Haritha Karma Sena amounts to 36,306 members. They are overseen and guided by Kudumbashree and Swachhata Mission.
- These workers undergo training in various fields including Green Protocol, Swap Shop, and Water Conservation to become a skilled labour force.

- According to current statistics, the Sena has gathered 7,883,942 tons of plastic from households and 765,290 tons from shops and institutions.
- Plastics collected from households are stored at Material Collection Facility centers.
- A nominal fee is levied, with rural households paying Rs. 40, urban households Rs. 50, and merchant shops Rs. 100 per month. The collected user fees are utilized to compensate the workforce.
- Usable materials from sorted waste are directed to Swap Shops, promoting waste reuse, and turning waste into wealth.
- Income generation occurs through various channels including user fees, selling reusable materials through Swap Shops, and selling sorted non-reusable materials.
- Services are provided to Green Enterprises and those adhering to the Green Protocol.
- The Haritha Karma Sena maintains connections with Kudumbashree, Clean Kerala Company as its technical service provider, the Employment Guarantee Mission (MGNREGA) as a labour force provider.
- Electric three-wheelers are utilized for ease of mobility, aligning with the Green Protocol.

TABLE 4.1
GENDER OF RESPONDENTS

Gender	No. of response	Percentage (%)
Male	30	30
Female	70	70
Total	100	100

Source: Primary data

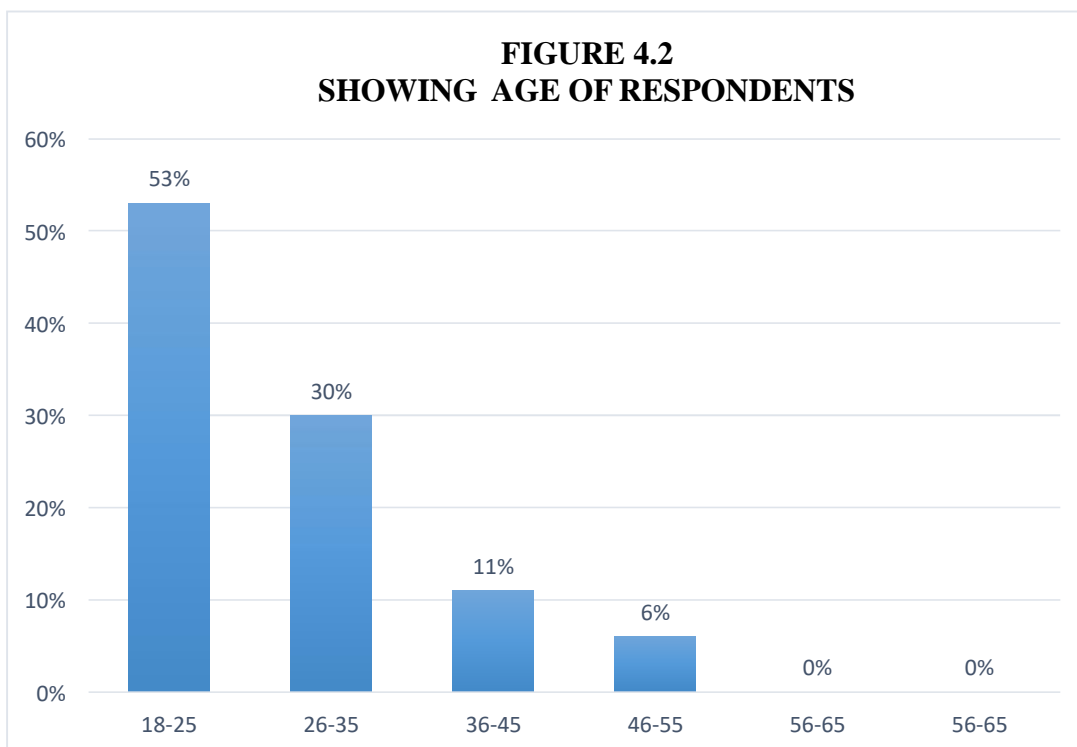


Interpretation: The table provides a descriptive breakdown of respondents based on gender. Out of 100 respondents in total, 30% are male (30 individuals) and 70% are female (70 individuals). This distribution illustrates the gender composition of the respondents surveyed.

TABLE 4.2
AGE OF RESPONDENTS

Age (in years)	No. of response	Percentage (%)
18-25	53	53
26-35	30	30
36-45	11	11
46-55	6	6
56-65	0	0
56-65	0	0
Total	100	100

Source: Primary data

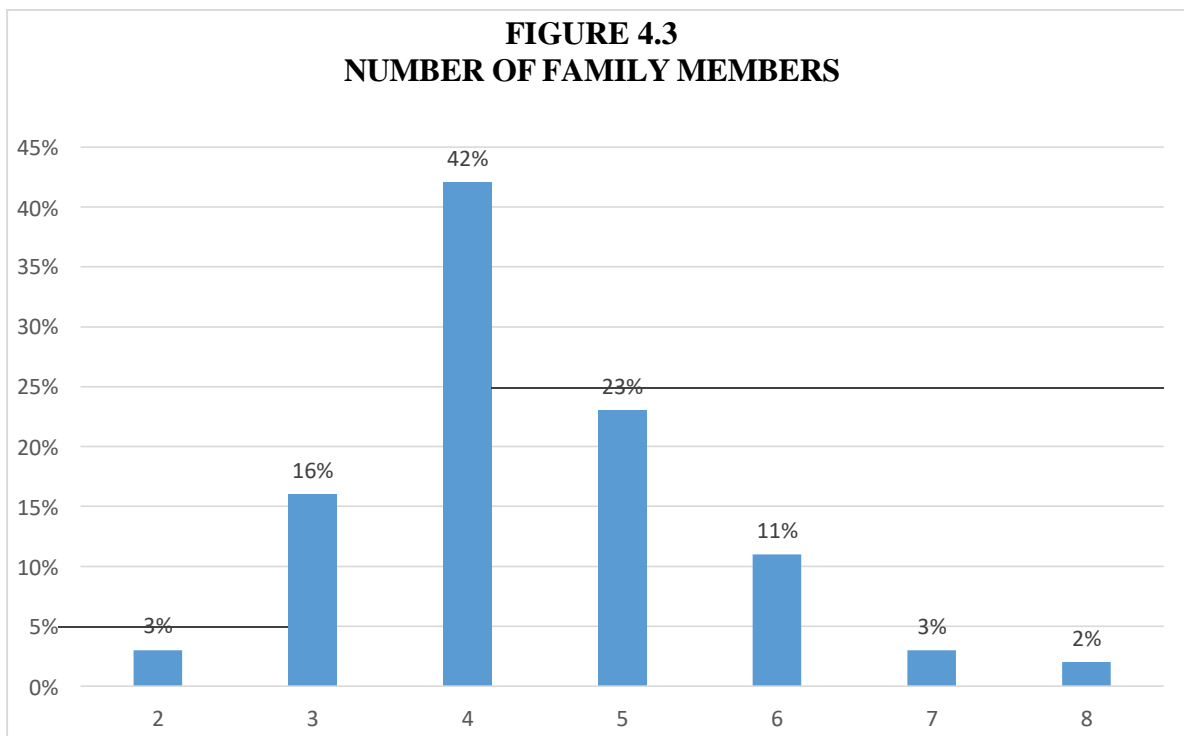


Interpretation: This table presents a descriptive breakdown of respondents based on their age groups. Among the 100 total respondents, the majority, comprising 53%, fall within the 18-25 age range. Following closely behind, 30% of respondents are aged between 26 and 35 years. Those aged 36 to 45 years represent 11% of the respondents, while individuals aged 46 to 55 years constitute 6% of the surveyed population. Notably, there are no respondents within the 56-65 age group, indicating a gap in representation for this particular demographic.

TABLE 4.3
NUMBER OF FAMILY MEMBERS

Number of family members	No. of responses	Percentage (%)
2	3	3
3	16	16
4	42	42
5	23	23
6	11	11
7	3	3
8	2	2
Total	100	100

Source: Primary data

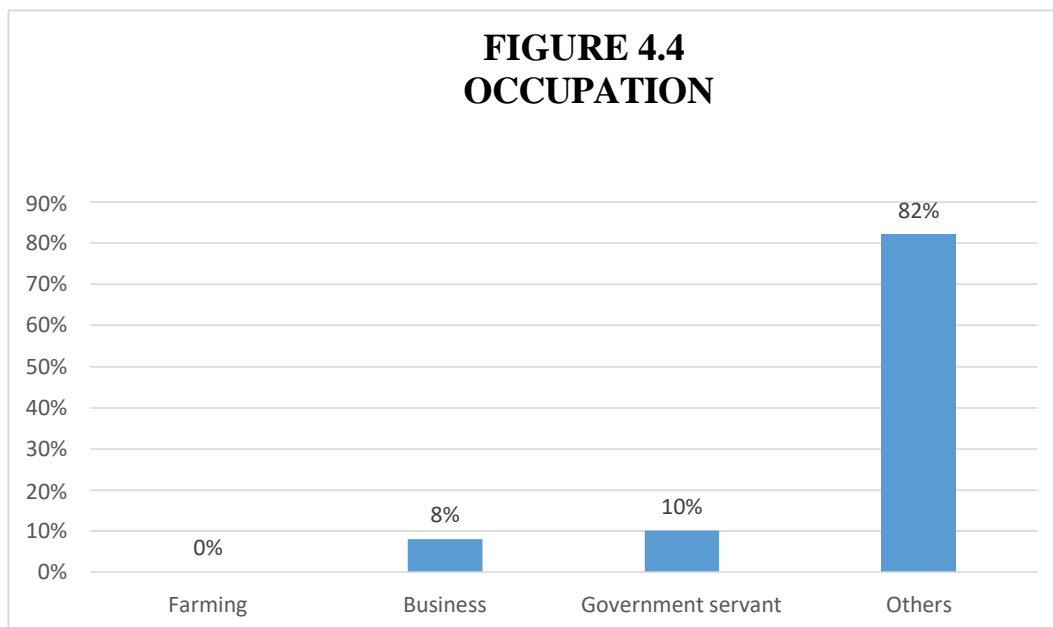


Interpretation: This data provides insights into the distribution of family sizes among the surveyed population. The majority of respondents have four family members, followed by five family members. The responses span a range of family sizes, offering a comprehensive view of the diversity within the surveyed population.

TABLE 4.4
OCCUPATION OF RESPONDENTS

Occupation	No. of responses	Percentage (%)
Farming	0	0
Business	8	8
Government servant	10	10
Others	82	82
Total	100	100

Source: Primary data

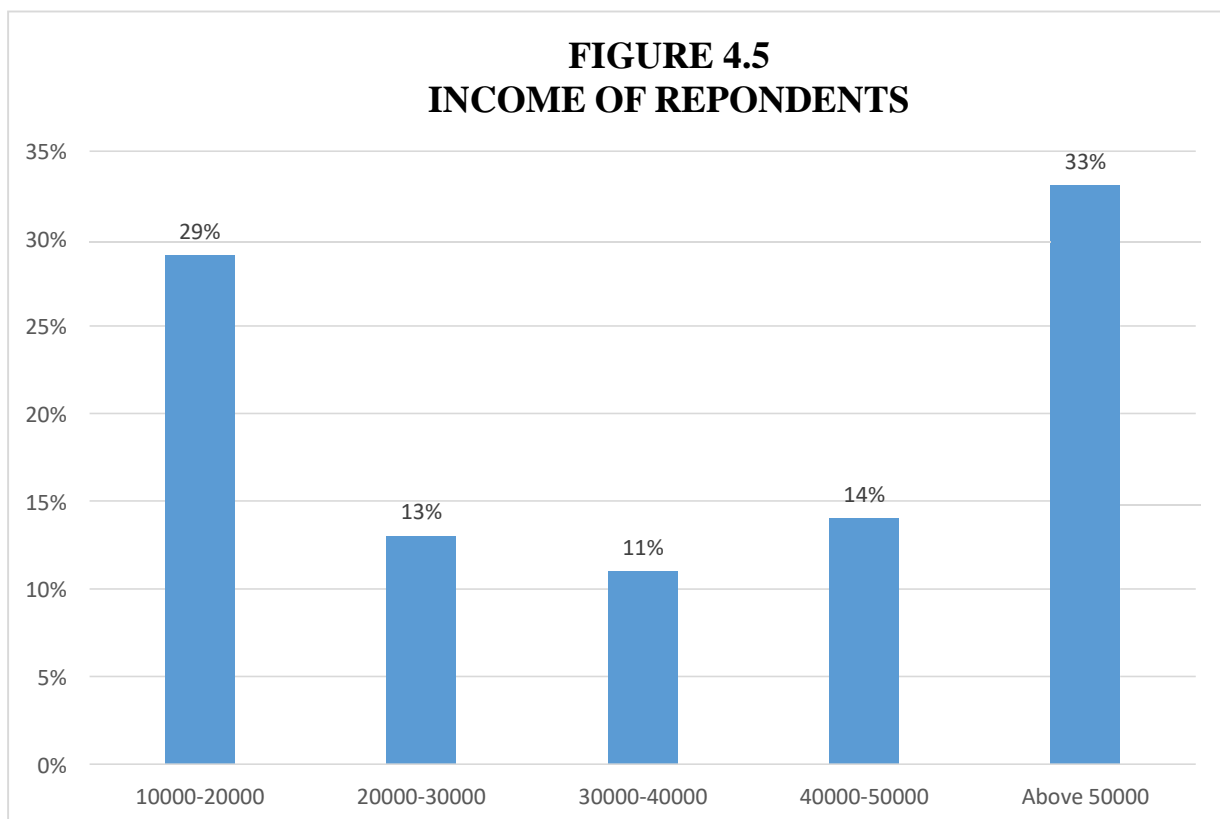


Interpretation: There are no respondents who reported farming as their occupation, accounting for 0% of the total respondents. 8 respondents, making up 8% of the total respondents, identified themselves as involved in business. 10 respondents, constituting 10% of the total respondents, indicated they work as government servants. The majority of respondents, 82 in total, representing 82% of the total respondents, fall under the category of "Others" for their occupation. This breakdown provides insights into the diverse occupational backgrounds of the surveyed population. The data highlights a significant portion of respondents in unspecified occupations, with fewer individuals involved in business or government service.

TABLE 4.5
INCOME OF RESPONDENTS

Income	No. of Responses	Percentage (%)
10000-20000	29	29
20000-30000	13	13
30000-40000	11	11
40000-50000	14	14
Above 50000	33	33
Total	100	100

Source: Primary data

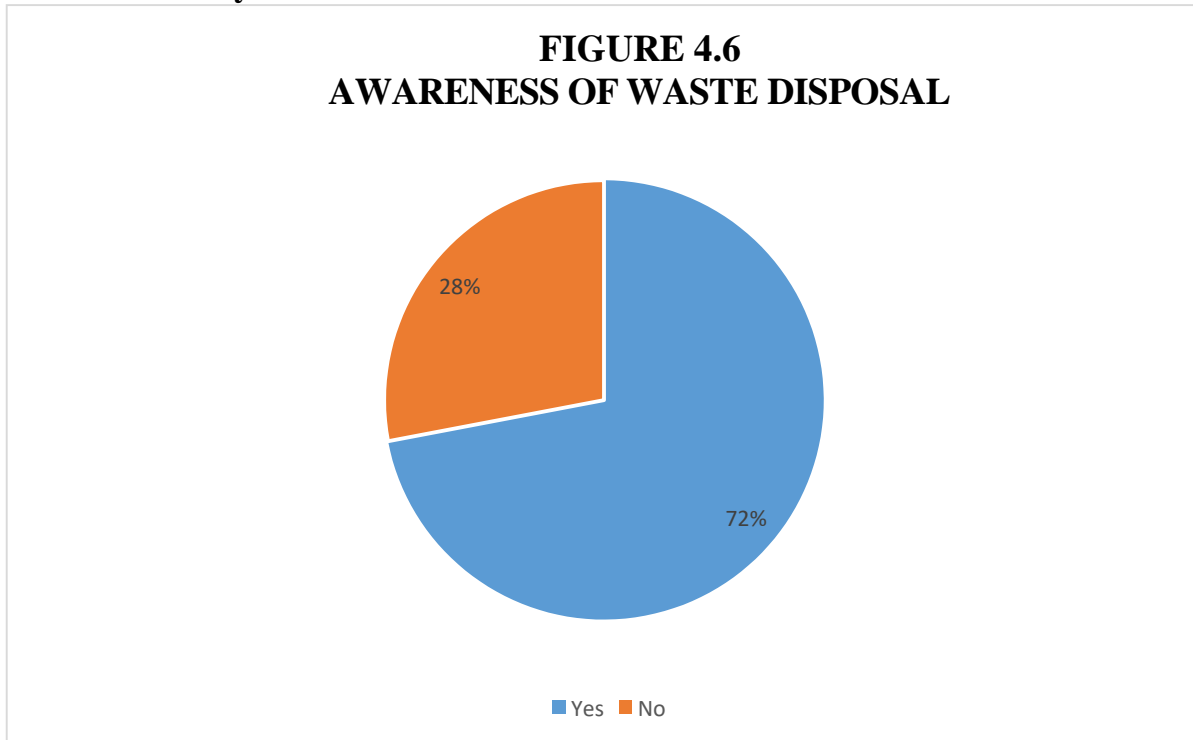


Interpretation: The table illustrates income distribution among respondents. The majority earn over 50,000, comprising 33% of the total responses. A significant portion falls within the 10,000-20,000 range, accounting for 29%. In contrast, fewer respondents fall within the 20,000-50,000 range, with percentages ranging from 11% to 14%. Overall, the data highlights the prevalence of higher-income earners alongside notable proportions of individuals earning moderate to lower incomes.

TABLE 4.6
AWARENESS OF WASTE DISPOSAL

Awareness	No. of Responses	Total
Yes	72	72
No	28	28
Total	100	100

Source: Primary data



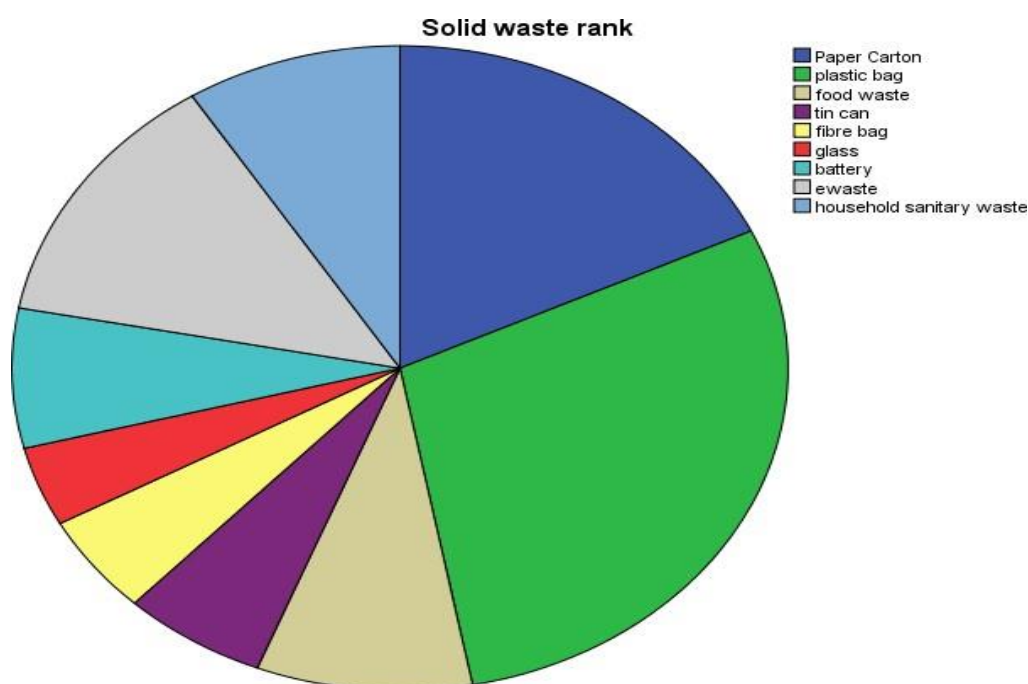
Interpretation: The Table 4.6 presents the awareness levels of waste disposal among respondents. Of the total 100 responses, 72 individuals are aware, while 28 are not. This indicates a higher awareness rate, with 72% of respondents acknowledging waste disposal practices. Conversely, 28% lack awareness.

TABLE 4.7
RANKING OF HOUSEHOLD SOLID WASTE

Solid waste	Frequency	Rank
Plastic bag	29	1
Paper Carton	18	2
E-waste	13	3
food waste	9	4
Household sanitary waste	9	5
Battery	7	6
Tin/can	6	7
Fibre bag	5	8
Glass	4	9
Total	100	

FIGURE 4.7

RANKING OF HOUSEHOLD SOLID WASTE



Interpretation: The table presents data on the frequency and rank of various types of solid waste. Plastic bags were the most frequently encountered type of waste, with a frequency of 29, securing the top rank. Following closely behind were paper cartons with a frequency of 18, ranking second. E-waste occupied the third position with a frequency of 13. Notably, food waste and household sanitary waste shared the fourth rank, both occurring 9 times. Batteries were the sixth most common type of waste, with a frequency of 7. Tin/cans, fibre bags, and glass followed in succession, with frequencies of 6, 5, and 4, respectively. The total frequency sums up to 100, indicating the collective instances of solid waste considered in the dataset. This data provides insight into the relative prevalence of different types of solid waste, which can inform waste management strategies and environmental conservation efforts.

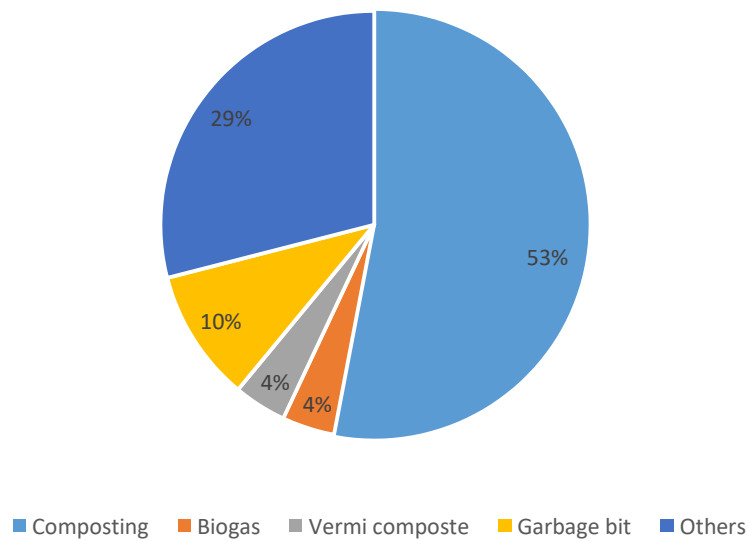
TABLE 4.8

HANDLING OF FOOD AND OTHER DEGRADABLE WASTE

Remedies	No. of Responses	Total
Composting	53	53
Biogas	4	4
Vermi compost	4	4
Garbage bin	10	10
Others	29	29
Total	100	100

Source: Primary data

FIGURE 4.8
HANDLING OF FOOD AND OTHER DEGRADABLE WASTE



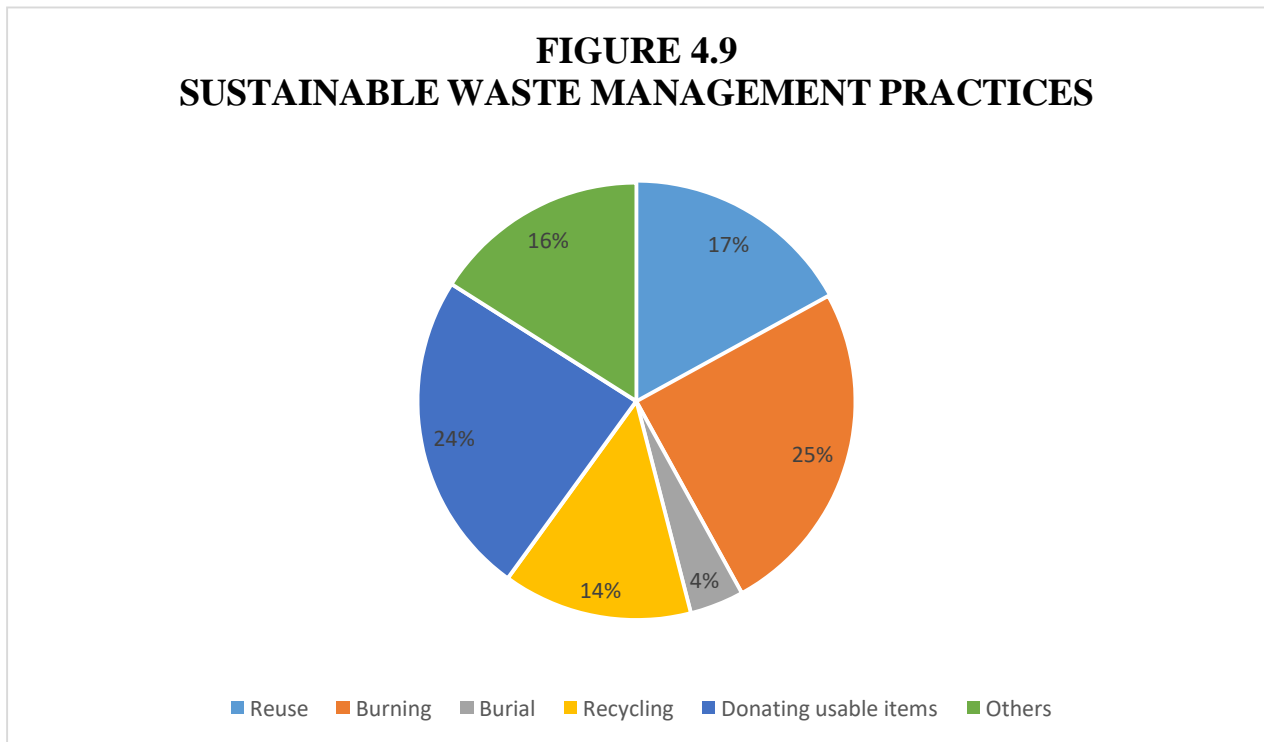
Interpretation: The table outlines respondents' methods for handling food and degradable waste. Composting emerges as the most popular approach, with 53 responses, followed by "Others" with 29. Biogas and vermi compost each garnered 4 responses, while 10 respondents utilize garbage bins.

TABLE 4.9
SUSTAINABLE WASTE MANAGEMENT PRACTICES

Practices	No. of Responses	Percentage (%)
Reuse	17	17
Burning	25	25
Burial	4	4
Recycling	14	14
Donating usable items	24	24
Others	16	16
Total	100	100

Source: Primary data

FIGURE 4.9
SUSTAINABLE WASTE MANAGEMENT PRACTICES



Interpretation: Burning emerges as the predominant method, comprising 25% of responses, closely trailed by donating usable items at 24%. Reuse and recycling each account for 17% and 14%, respectively. Burial and other methods make up smaller proportions.

TABLE 4.10
FACTORS INFLUENCING SUSTAINABLE WASTE MANAGEMENT

Factors	N	Mean	Std. Deviation
Government policy	100	4.39	1.063
Influence of family	100	3.91	.621
Infrastructure	100	4.17	1.045
Public support	100	4.20	1.110
Awareness	100	4.33	.985
Valid N (listwise)	100		

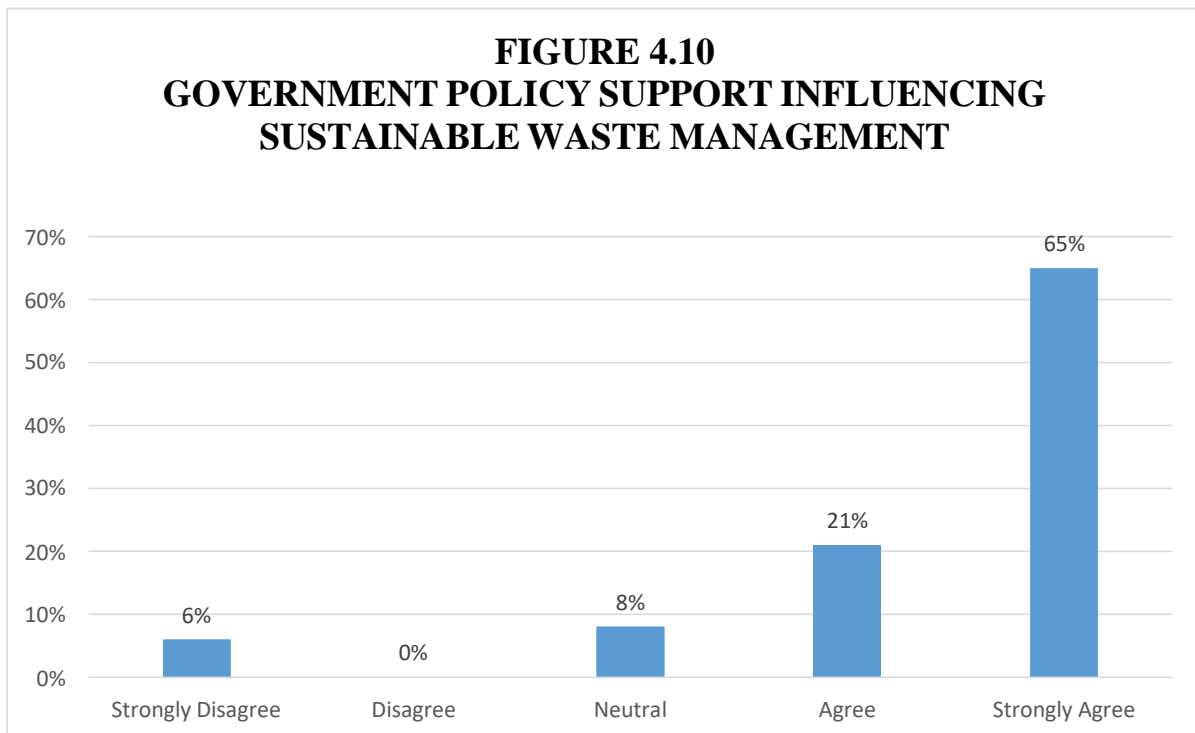
Source: Primary data

The table displays the means and standard deviations for different factors influencing a particular phenomenon. Among the factors considered, "Government policy" has the highest mean score of 4.39, indicating that respondents perceive it as the most influential factor, with a relatively low standard deviation of 1.063, suggesting a moderate level of agreement among respondents. "Awareness" follows closely behind with a mean of 4.33 and a standard deviation of 0.985, indicating a comparable degree of perceived influence but with slightly less variability in responses. "Infrastructure" and "Public support" both have means of 4.17 and 4.20, respectively, suggesting they are also considered significant factors, albeit slightly less so compared to government policy and awareness. "Influence of family" has the lowest mean of 3.91, indicating it is perceived as somewhat less influential compared to the other factors. However, it also has the lowest standard deviation of 0.621, suggesting a higher level of agreement among respondents regarding its influence. Overall, these findings provide insights into the perceived importance and variability in opinions regarding the influence of different factors on the phenomenon under study.

TABLE 4.11
GOVERNMENT POLICY SUPPORT INFLUENCING SUSTAINABLE WASTE MANAGEMENT

Particulars	No. of Responses	Percentage (%)
Strongly Disagree	6	6
Disagree	0	0
Neutral	8	8
Agree	21	21
Strongly Agree	65	65
Total	100	100

Source: Primary data



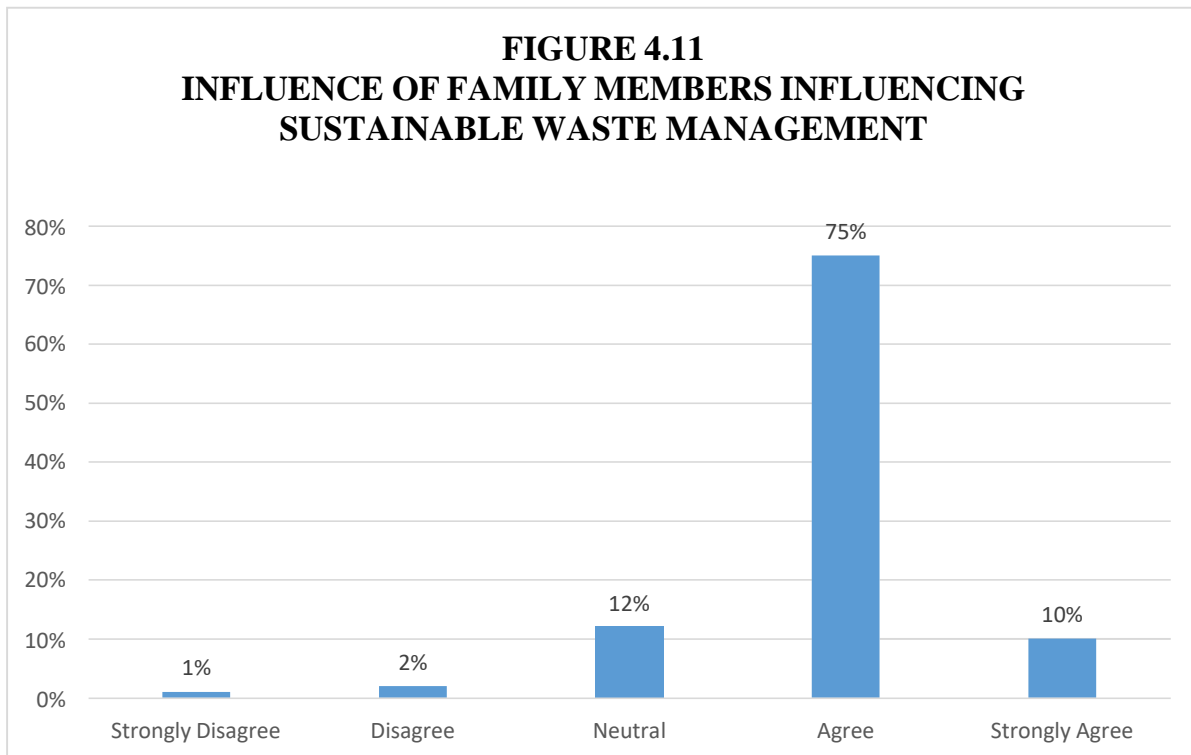
Interpretation: The data reflects responses to a survey statement. Most respondents (65%) strongly agreed, while 21% agreed, suggesting strong endorsement. A minority expressed neutrality (8%) or disagreement (6%). Overall, the statement garnered substantial support, with a notable absence of outright disagreement among participants.

TABLE 4.12

INFLUENCE OF FAMILY MEMBERS INFLUENCING SUSTAINABLE WASTE MANAGEMENT

Particulars	No. of Responses	Percentage (%)
Strongly Disagree	1	1
Disagree	2	2
Neutral	12	12
Agree	75	75
Strongly Agree	10	10
Total	100	100

Source: Primary data

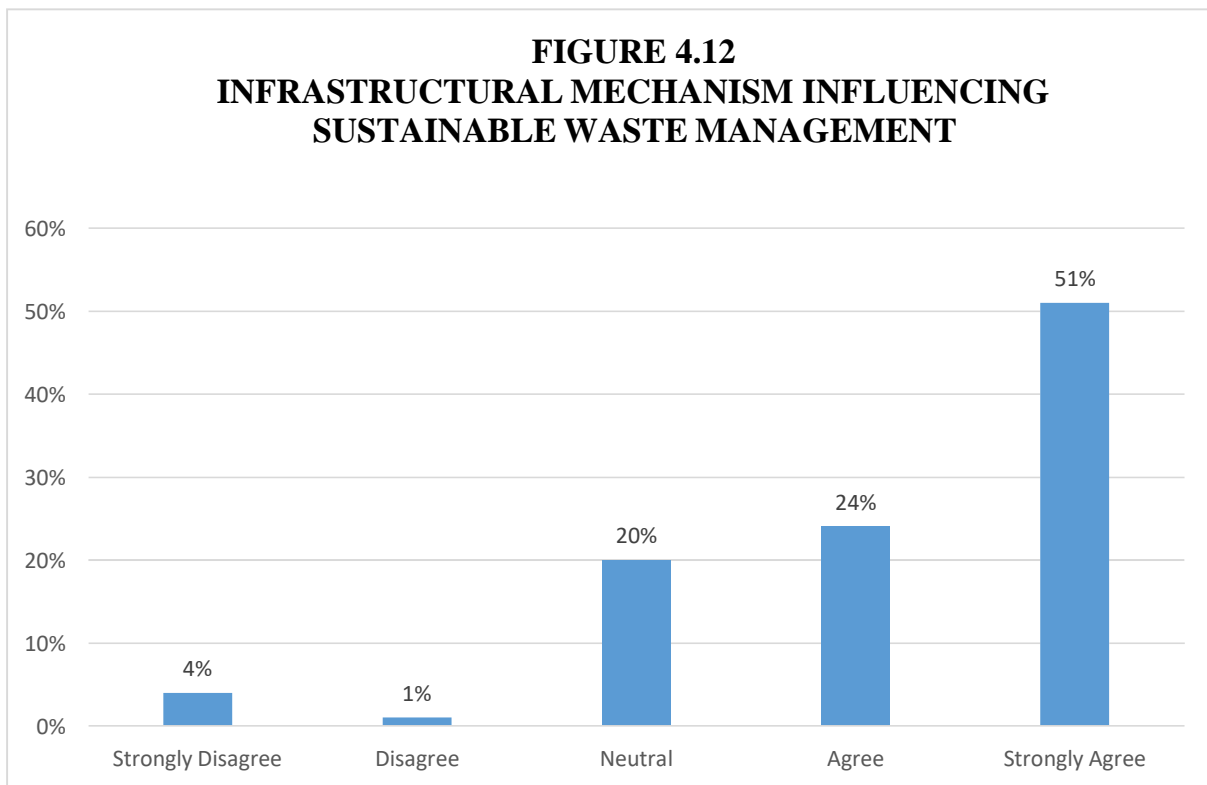


Interpretation: In response to the survey statement, 85% of participants either agreed (75%) or strongly agreed (10%), indicating substantial support. A small percentage disagreed (2%) or strongly disagreed (1%), while 12% remained neutral. Overall, the majority expressed agreement, with minimal disagreement.

TABLE 4.13
INFRASTRUCTURAL MECHANISM INFLUENCING SUSTAINABLE WASTE MANAGEMENT

Particulars	No. of Responses	Percentage (%)
Strongly Disagree	4	4
Disagree	1	1
Neutral	20	20
Agree	24	24
Strongly Agree	51	51
Total	100	100

Source: Primary data

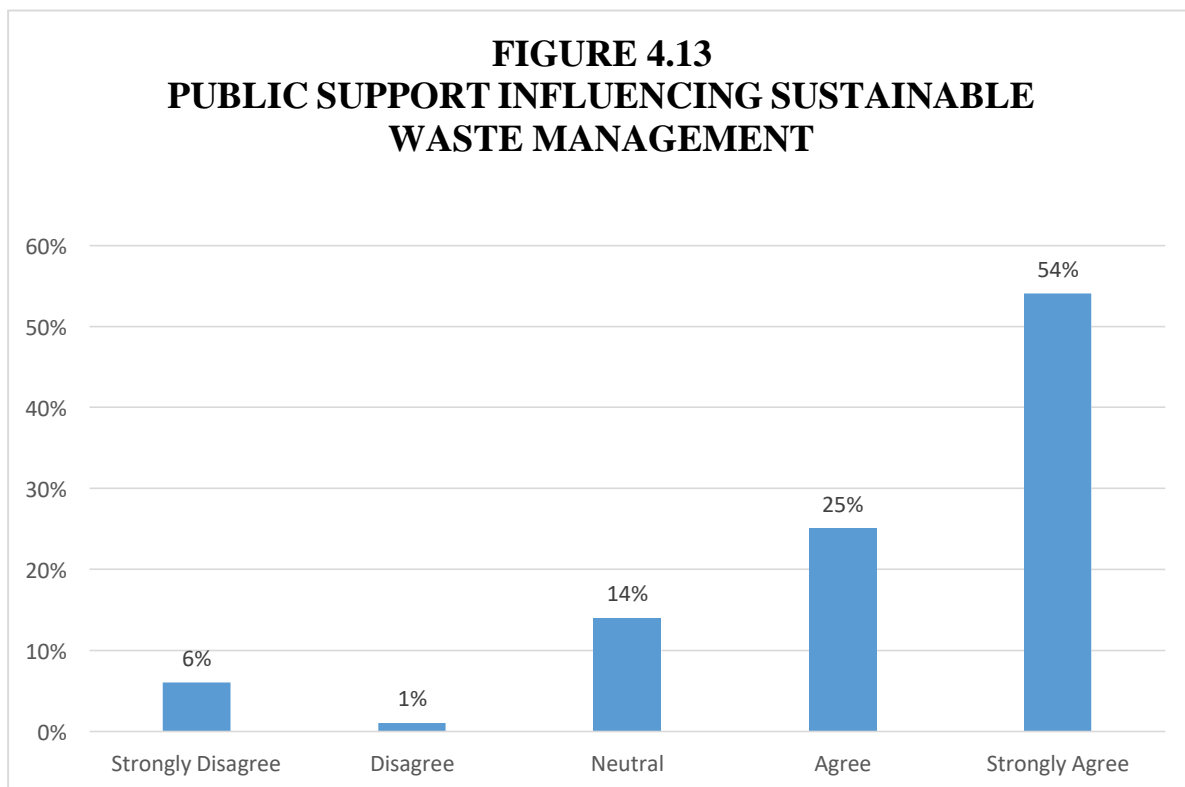


Interpretation: Among respondents, 75% either agreed (24%) or strongly agreed (51%) with the statement, indicating significant endorsement. A minority expressed disagreement, with 1% disagreeing and 4% strongly disagreeing. A notable proportion (20%) remained neutral. Overall, strong agreement prevailed, with limited dissenting views.

TABLE 4.14
PUBLIC SUPPORT INFLUENCING SUSTAINABLE WASTE
MANAGEMENT

Particulars	No. of Responses	Percentage (%)
Strongly Disagree	6	6
Disagree	1	1
Neutral	14	14
Agree	25	25
Strongly Agree	54	54
Total	100	100

Source: Primary data

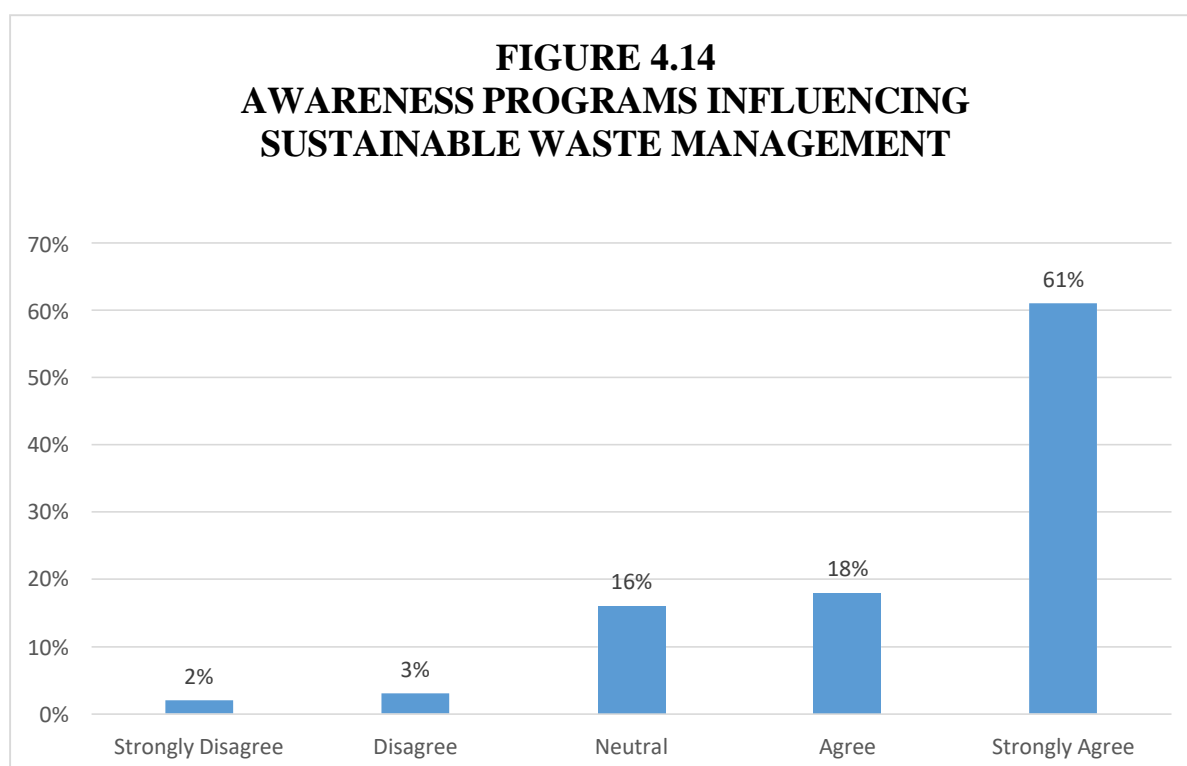


Interpretation: In response to the survey statement, 79% of participants either agreed (25%) or strongly agreed (54%), reflecting substantial support. A small percentage expressed disagreement, with 1% disagreeing and 6% strongly disagreeing, while 14% remained neutral. Overall, strong agreement prevailed, with minimal dissent.

TABLE 4.15
AWARENESS PROGRAMS INFLUENCING SUSTAINABLE WASTE MANAGEMENT

Particulars	No. of Responses	Percentage (%)
Strongly Disagree	2	2
Disagree	3	3
Neutral	16	16
Agree	18	18
Strongly Agree	61	61
Total	100	100

Source: Primary data

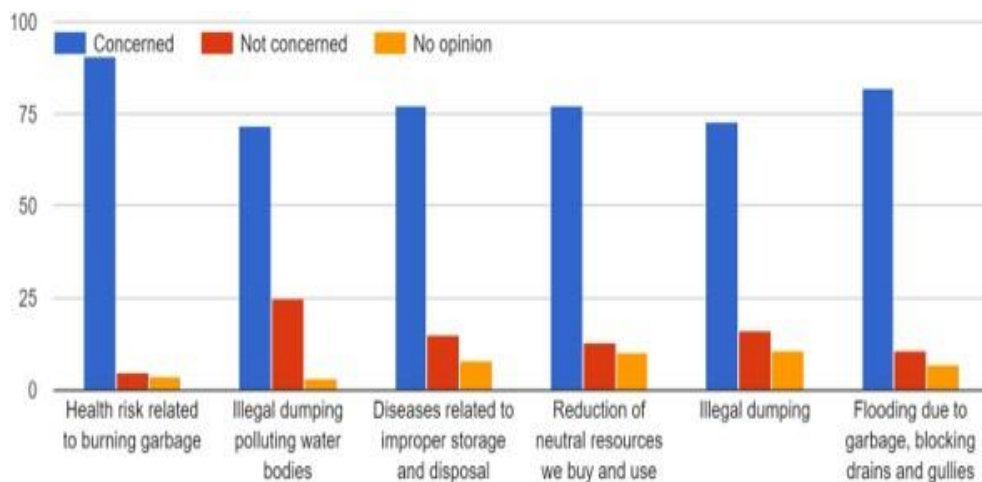


Interpretation: Among respondents, 79% either agreed (18%) or strongly agreed (61%) with the statement, indicating significant endorsement. A minority expressed disagreement, with 3% disagreeing and 2% strongly disagreeing. A notable proportion (16%) remained neutral. Overall, strong agreement prevailed, with minimal dissenting view.

TABLE 4.16
ISSUES RELATING TO SOLID WASTE MANAGEMENT

Factors	N	Mean	Std. Deviation
health risk	100	1.13	.442
illegal dumping in water resources	100	1.31	.526
diseases related to improper disposal	100	1.31	.615
reduction of neutral resource	100	1.33	.652
illegal dumping	100	1.38	.678
flooding due to garbage blocking	100	1.25	.575
Valid N (listwise)	100		

FIGURE 4.15
ISSUES RELATING TO SOLID WASTE MANAGEMENT

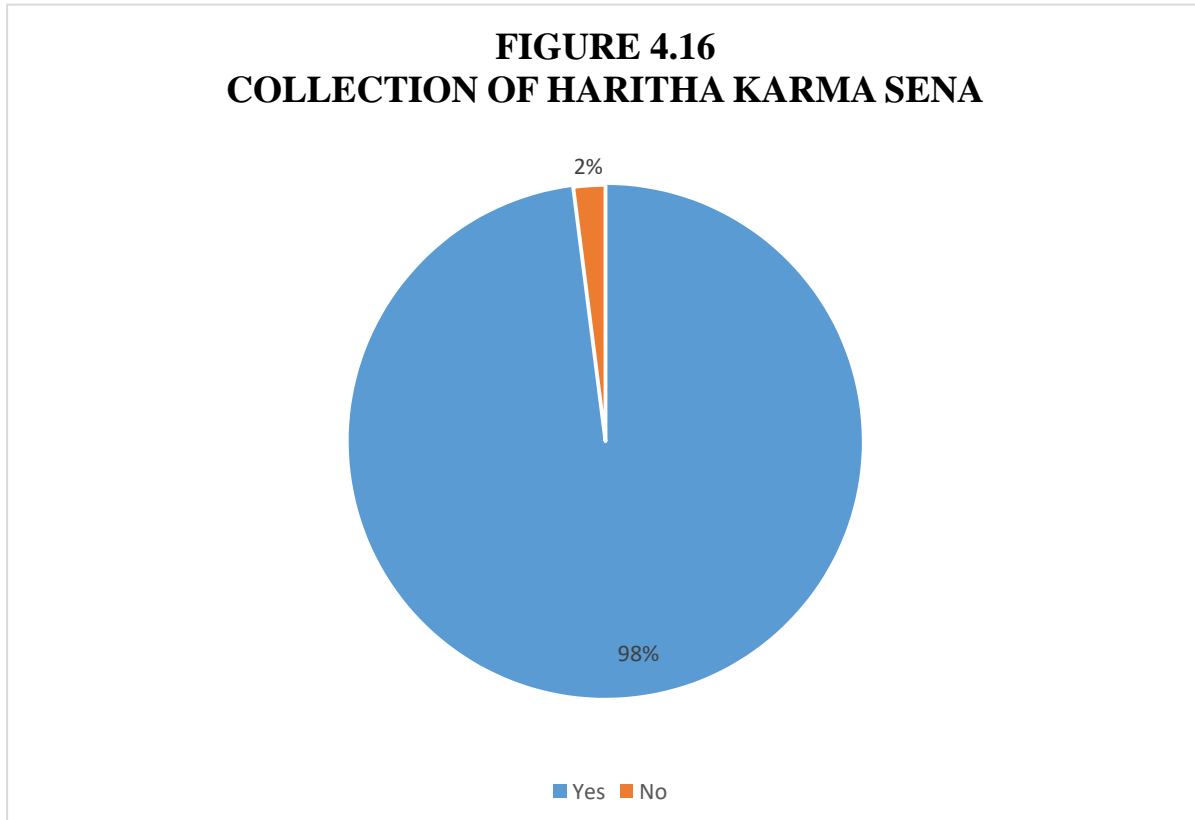


Interpretation: The table presents descriptive statistics for different variables related to environmental concerns. Each variable denotes a particular facet of waste management or environmental decline, evaluated on a scale ranging from 1 to 3. The variable "health risk" has the lowest mean score of 1.13, indicating it is perceived as the least severe concern among respondents, with a relatively low standard deviation of 0.442, suggesting a moderate level of agreement in perceptions. "Illegal dumping" has the highest mean score of 1.38, indicating it is perceived as a more significant issue, with a higher standard deviation of 0.678, suggesting more variability in responses compared to other variables. "Illegal dumping in water resources," "diseases related to improper disposal," and "flooding due to garbage blocking" all have mean scores ranging from 1.25 to 1.31, indicating they are also considered significant concerns, with moderate levels of agreement among respondents. "Reduction of natural resources" falls in the middle with a mean score of 1.33 and a standard deviation of 0.652. These descriptive statistics provide insights into the perceived severity and variability in concerns related to environmental degradation and waste management.

TABLE 4.17
COLLECTION OF HARITHA KARMA SENA

Collection	No. of Responses	Percentage (%)
Yes	98	98
No	2	2
Total	100	100

Source: Primary data



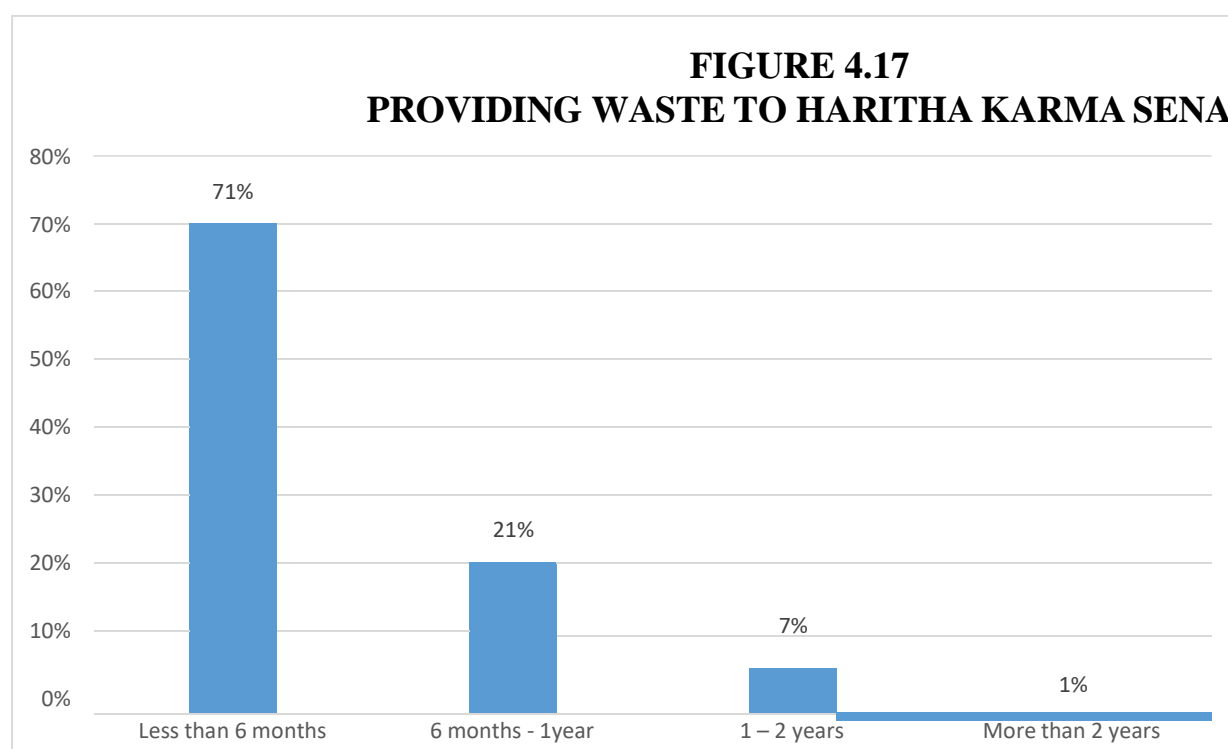
Interpretation: The table indicates responses regarding participation in a collection activity. A vast majority, 98%, confirm their involvement, while only 2% report non-participation. This high engagement rate underscores widespread participation in the collection initiative, highlighting strong community involvement in environmental efforts. The data suggests effective implementation and awareness of the program, emphasizing its significance in promoting environmental stewardship and community cohesion.

TABLE 4.18

PROVIDING WASTE TO HARITHA KARMA SENA

Time period	No. of Responses	Percentage (%)
Less than 6 months	71	71
6 months - 1 year	21	21
1 – 2 years	7	7
More than 2 years	1	1
Total	100	100

Source: Primary data

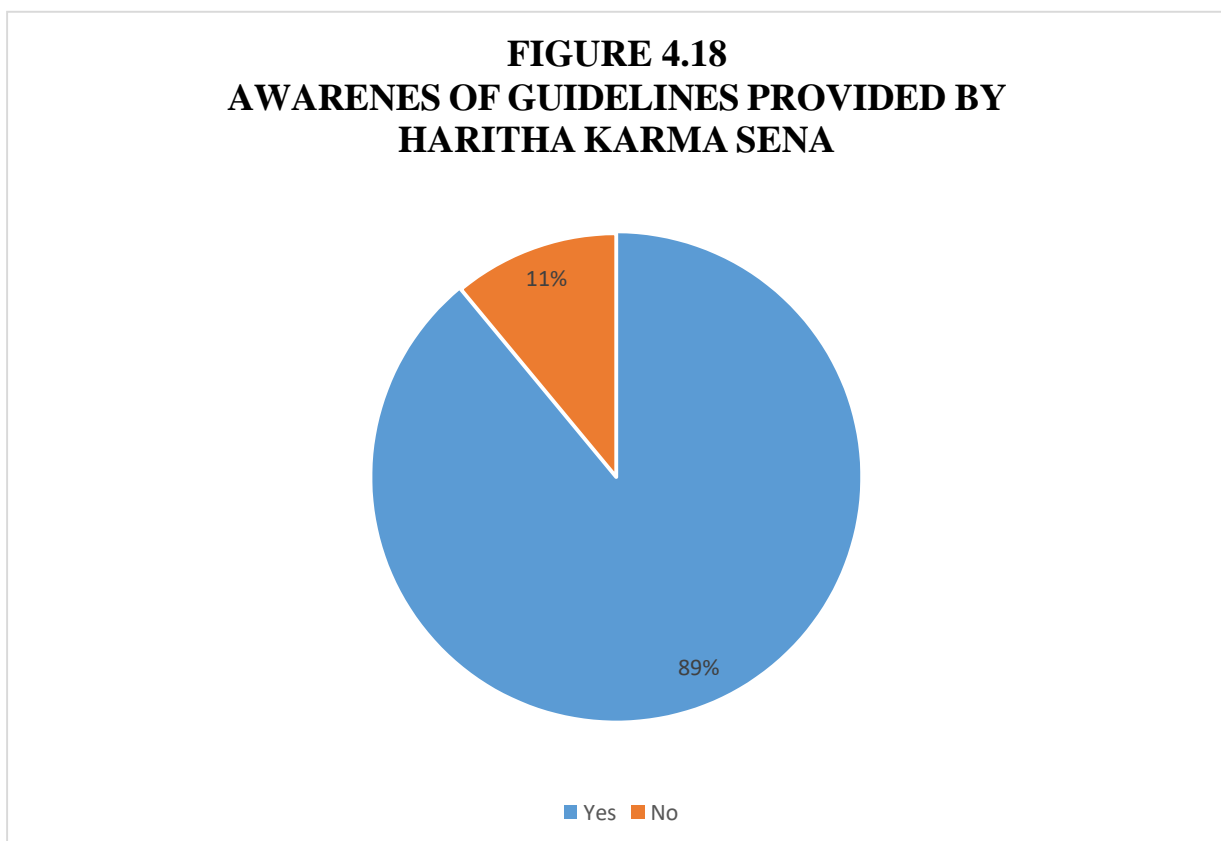


Interpretation: The table outlines the duration of providing waste to the Haritha Karma Sena. The majority, 71%, have been contributing for less than six months, indicating recent participation. Additionally, 21% have been involved for 6 months to a year, while smaller percentages have been participating for 1-2 years or over 2 years.

TABLE 4.19
AWARENESS OF GUIDELINES PROVIDED BY HARITHA KARMA SENA

Awareness	No. of Responses	Percentage (%)
Yes	89	89
No	11	11
Total	100	100

Source: Primary data



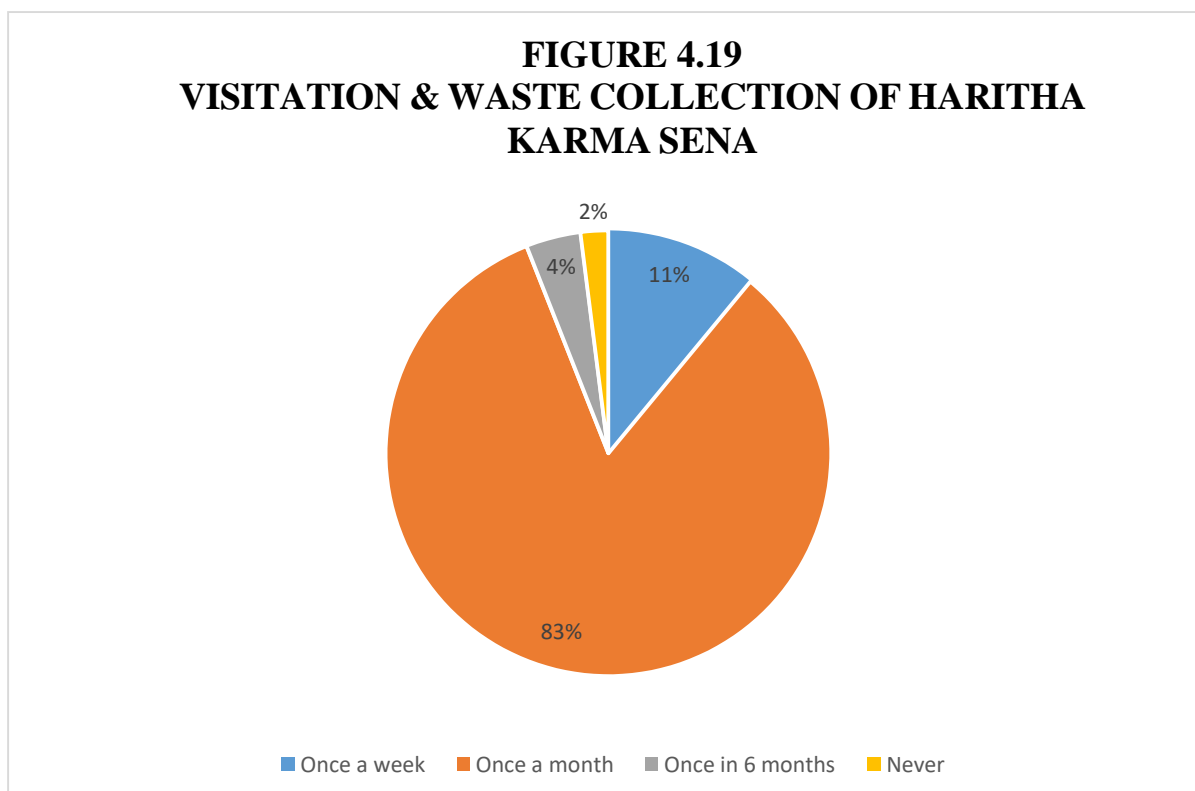
Interpretation: The table illustrates respondents' awareness of guidelines provided by Haritha Karma Sena. A significant majority, 89%, indicate awareness, while 11% report lack of awareness. This high awareness rate suggests effective dissemination of guidelines by the organization.

TABLE 4.20

VISITATION & WASTE COLLECTION OF HARITHA KARMA SENA

Time period	No. of Responses	Percentage (%)
Once a week	11	11
Once a month	83	83
Once in 6 months	4	4
Never	2	2
Total	100	100

Source: Primary data

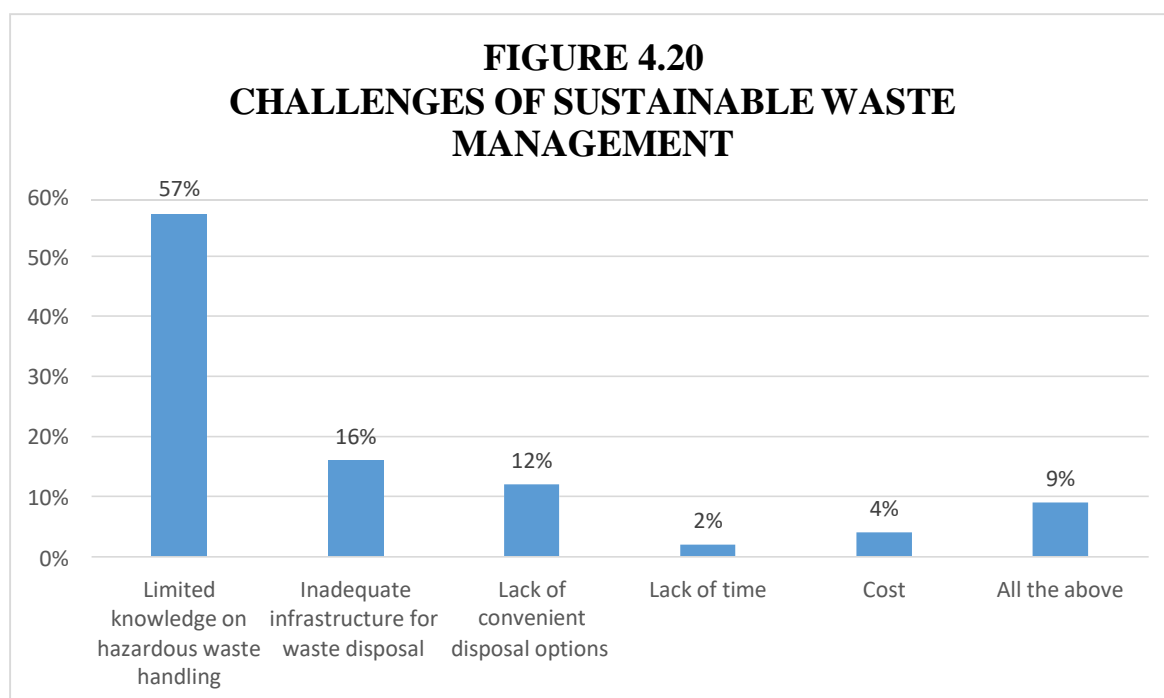


Interpretation: The majority, 83%, visit and have waste collected once a month, indicating regular participation. A smaller proportion visit either once a week (11%) or once every six months (4%). Additionally, a negligible percentage report never visiting.

TABLE 4.21
CHALLENGES OF SUSTAINABLE WASTE MANAGEMENT

Challenges	No. of Respondents	Percentage (%0
Limited knowledge on hazardous waste handling	57	57
Inadequate infrastructure for waste disposal	16	16
Lack of convenient disposal options	12	12
Lack of time	2	2
Cost	4	4
All the above	9	9
Total	100	100

Source: Primary data



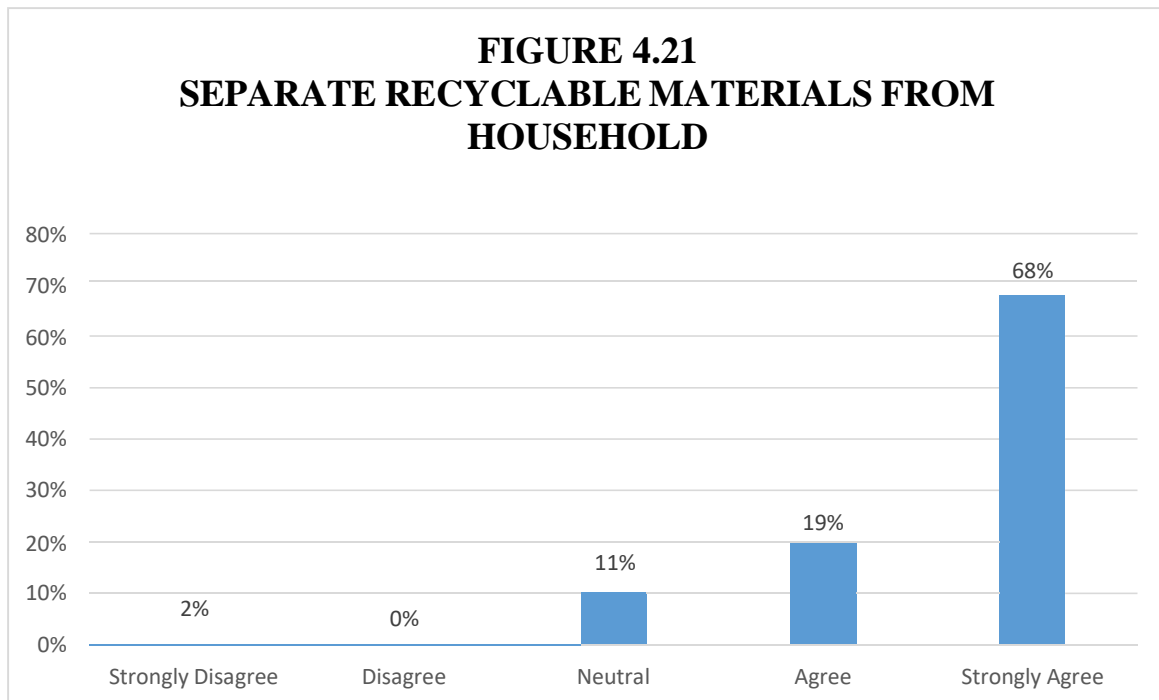
Interpretation: The table outlines challenges faced in sustainable waste management. The most prevalent challenge, reported by 57% of respondents, is limited knowledge on handling hazardous waste. Inadequate infrastructure (16%), lack of convenient disposal options (12%), time constraints (2%), and cost (4%) are also cited. Additionally, 9% identify all mentioned challenges.

TABLE 4.22

SEPARATE RECYCLABLE MATERIALS FROM OTHER WASTE

Particulars	No. of Respondents	Percentage (%)
Strongly Disagree	2	2
Disagree	0	0
Neutral	11	11
Agree	19	19
Strongly Agree	68	68
Total	100	100

Source: Primary data

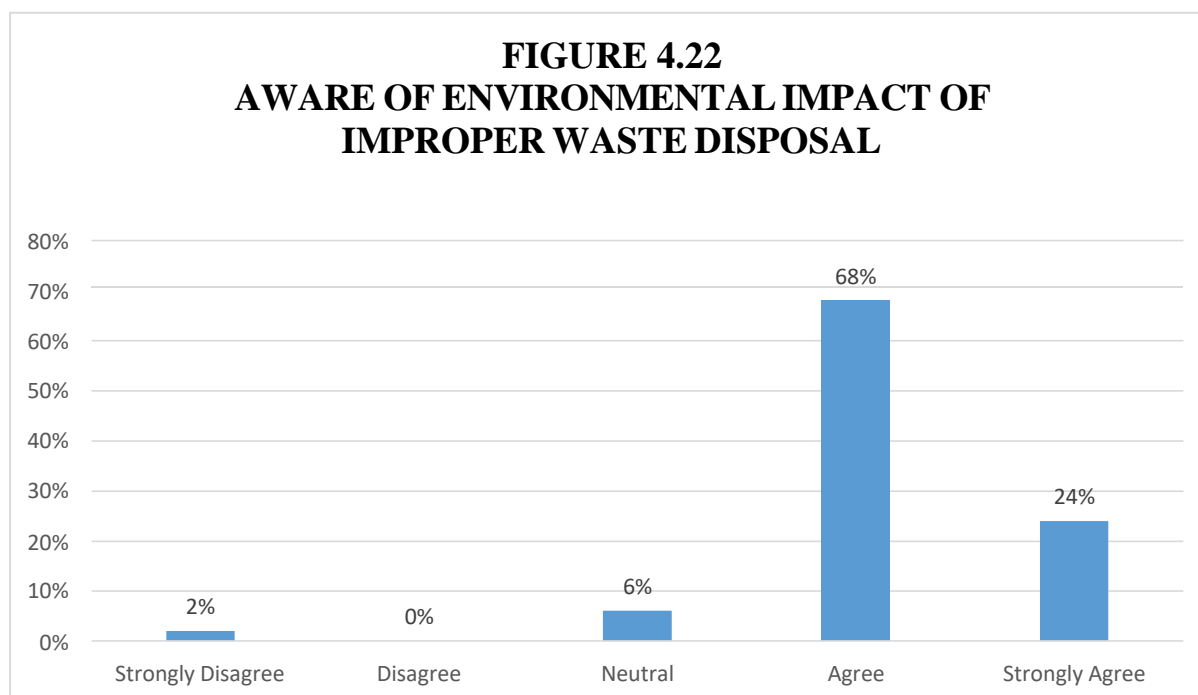


Interpretation: The data reveals responses to a survey, with 68% strongly agreeing and 19% agreeing, indicating significant support for the statement. A notable 11% remain neutral, while no respondents express disagreement. Only 2% strongly disagree, suggesting minimal dissent. Overall, the majority overwhelmingly agrees, with a small portion neutral and an even smaller portion in disagreement, illustrating strong alignment with the statement surveyed.

TABLE 4.23
AWARE OF ENVIRONMENTAL IMPACT OF IMPROPER WASTE DISPOSAL

Particulars	No. of Respondents	Percentage (%)
Strongly Disagree	2	2
Disagree	0	0
Neutral	6	6
Agree	68	68
Strongly Agree	24	24
Total	100	100

Source: Primary data



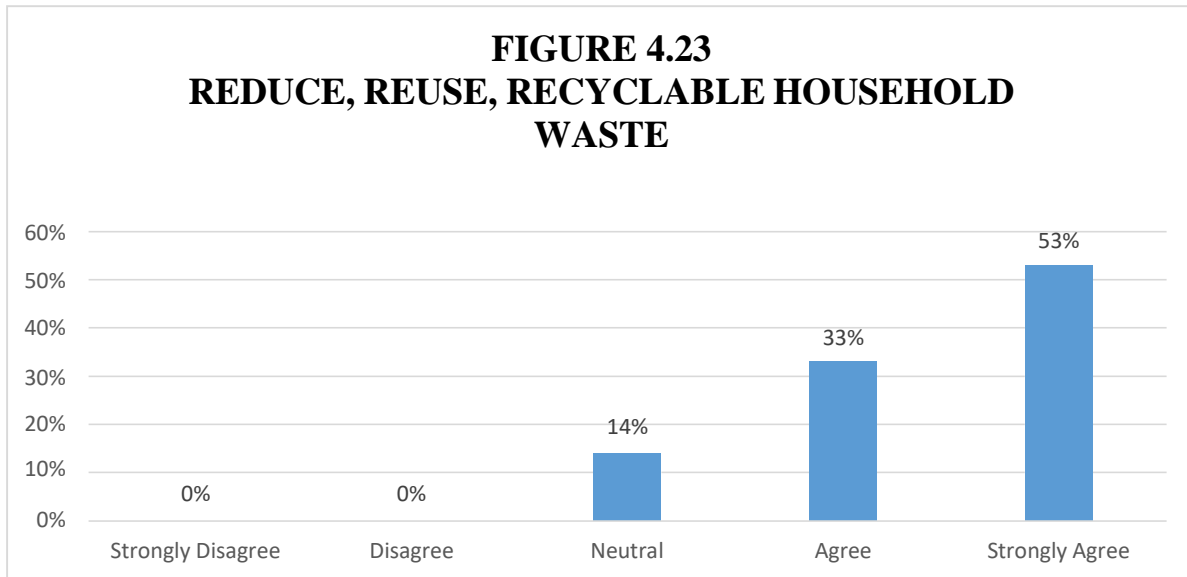
Interpretation: The data illustrates responses to a survey, indicating a substantial agreement among participants. Specifically, 24% strongly agree, while 68% merely agree with the statement presented. A small proportion of 6% remain neutral, with no respondents expressing disagreement. Only 2% strongly disagree, suggesting minimal opposition. Overall, the majority is in agreement, with a negligible portion expressing neutrality or disagreement, showcasing strong alignment with the surveyed statement.

TABLE 4.24

REDUCE, REUSE, RECYCLABLE HOUSEHOLD WASTE

Particulars	No. of Respondents	Percentage (%)
Strongly Disagree	0	0
Disagree	0	0
Neutral	14	14
Agree	33	33
Strongly Agree	53	53
Total	100	100

Source: Primary data



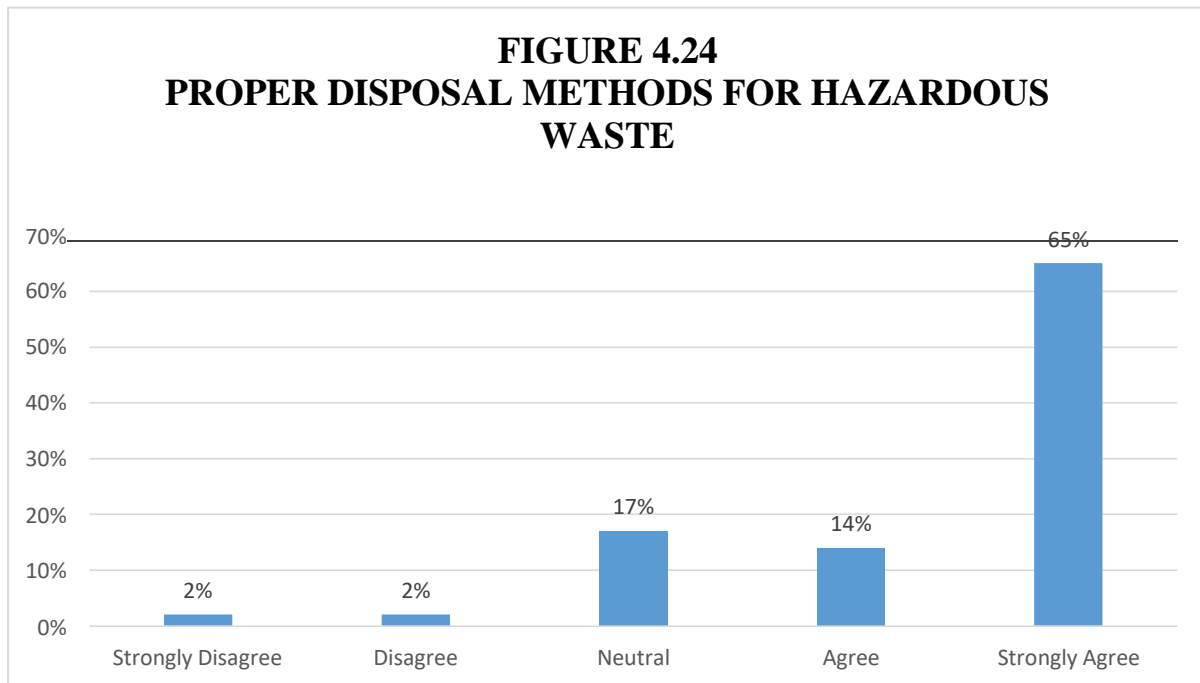
Interpretation: The data represents responses to a survey, highlighting a predominant agreement among participants. Specifically, 53% strongly agree, while 33% agree with the statement presented. A notable 14% remain neutral, with no respondents expressing disagreement or strong disagreement. This indicates a high level of consensus and alignment with the statement surveyed, with only a minority remaining neutral. Overall, the majority of respondents endorse or strongly endorse the statement.

TABLE 4.25

PROPER DISPOSAL METHODS FOR HAZARDOUS WASTE

Particulars	No. of Respondents	Percentage (%)
Strongly Disagree	2	2
Disagree	2	2
Neutral	17	17
Agree	14	14
Strongly Agree	65	65
Total	100	100

Source: Primary data



Interpretation: The data reflects responses to a survey, indicating a predominant agreement among participants. Specifically, 65% strongly agree, while 14% agree with the statement presented. A significant 17% remain neutral, with a small minority of 2% expressing disagreement or strong disagreement. This suggests a notable level of consensus and alignment with the statement surveyed, with a minority expressing dissenting views. Overall, the majority of respondents endorse or strongly endorse the statement.

ANALYSIS

Objective

- To study the major challenges faced by the household in sustainable waste management practices.

Hypothesis

- H_0 : There are no significant challenges faced by the household in sustainable waste management practices.
- H_1 : There are significant challenges faced by the household in sustainable waste management practices.

TABLE 4.26
Descriptive Statistics

	Mean	Std. Deviation	N
Challenges faced by household	2.07	1.610	100
Sustainable waste management practices	3.51	1.801	100

Source: Primary data

The descriptive statistics give information about the average level of challenges faced by households and their sustainable waste management practices, along with the variability in these measures within the sample.

Correlations

		Challenges faced by household	Sustainable waste management practices
Spearman's rho	Challenges faced by household	Correlation Coefficient	.058
		Sig. (2-tailed)	.568
		N	100
	Sustainable waste management practices	Correlation Coefficient	1.000
		Sig. (2-tailed)	.568
		N	100

Source: Primary data

The Spearman's rank correlation analysis presented in the table examines the relationship between "Challenges faced by household" and "Sustainable waste management practices." The correlation coefficient between these two variables is 0.058, indicating a very weak positive correlation. However, this correlation is not statistically significant, as evidenced by the p-value of 0.568, which is well above the common threshold of 0.05. This suggests that, based on the sample of 100 households, there is no meaningful relationship between the challenges a household faces and their engagement in sustainable waste management practices. The data indicates that the challenges encountered by households do not significantly impact their waste management behaviors.

FINDINGS

- The majority of respondent's 72% acknowledging waste disposal practices.
- The plastic bags emerged as the most prevalent waste (29 %)
- Majority of 53% of respondents used methods for handling food and degradable waste, with composting being the most popular approach.
- 25% of respondents using burning method for sustainable waste management practices at household level.
- Environmental concerns, "illegal dumping" emerges as the most significant issue, with the highest mean score of 1.38 and a relatively higher standard deviation of 0.678
- Most of the respondents 65% strongly agreeing with government policy support influencing sustainable waste management.
- A substantial majority of participants 85% either agreed with influence of members.
- 51% of respondents strongly agreeing infrastructural mechanism for sustainable waste management.
- It shows 54% respondents strongly agreeing with public support.
- Majority 61% respondents showcasing prevailing strong agreement with awareness programs.
- The environmental concerns, "illegal dumping" emerges as the most significant issue, with the highest mean score of 1.38 and a relatively higher standard deviation of 0.678
- 98% of respondents agreed to the waste collection program of Haritha Karma Sena.
- The majority, 71% respondents have been contributing their waste for less than six months.
- 89% of respondent's aware of guidelines provided by Haritha Karma Sena.
- Visitation and waste gathering by Haritha Karma Sena, the majority 83%, visit and have waste collected once a month.
- The most prevalent challenge, reported by 57% of respondents, is limited knowledge on handling hazardous waste.

- Majority 68% of respondents sort recyclables and non-recyclables separately.
- 68% of respondents aware of effect on environment of the waste disposal.
- 53% of respondents follows the system of reduce and reuse, recyclable household waste.
- Majority 65% of the respondents find it difficult for the proper disposal methods for hazardous waste.
- The correlation results indicate a very weak positive relationship between the challenges faced by households and their sustainable waste management practices, though this correlation is not statistically significant.

SUGGESTIONS

- Improving awareness and education on sustainable waste management practices within households.
- Conduct comprehensive surveys or interviews with a diverse range of households to gather data on their current waste management practices.
- Organize workshops, seminars, and awareness campaigns to inform residents about the significance of waste reduction, segregation, recycling, and composting.
- Strengthening the role and capacity of Haritha Karma Sena in facilitating community-driven waste management initiatives.
- Addressing specific challenges through targeted interventions, policy reforms, or resource allocations at the local level.
- Since plastic bags emerged as the most prevalent waste, initiatives to reduce their usage should be prioritized. This could include implementing plastic bag bans or fees, promoting reusable bag alternatives, and raising awareness about the effects of plastic pollution on the ecosystem.
- The household challenges as well as environmentally friendly waste management techniques, conduct regular monitoring and evaluation to identify gaps and areas for improvement. Use feedback from households to refine and tailor waste management programs to better meet their needs and address challenges effectively.
- Utilize the strong support for government policies and community influence on sustainable waste management to foster collaborative efforts. Encourage active participation from both government agencies and community members in implementing and enforcing policies for trash management and initiatives.

CONCLUSION

Sustainable waste management is a vital aspect of environmental conservation and community well-being. This study aimed to explore the practices adopted by households, the role of Haritha Karma Sena (Green Army) in waste management, and the difficulties encountered in implementing sustainable waste management practices. Through the analysis of data collected from surveys, interviews, and observations, several key findings emerged, shedding light on the present condition of waste management within the community and suggesting areas for improvement. The study illustrates a growing trend among households towards adopting eco-friendly waste management methods, including sorting waste at its source, composting organic matter, and minimizing single-use plastics. Source segregation emerges as a widely recognized method, indicating an understanding of its role in waste disposal. Additionally, home composting gains popularity, reflecting increased environmental consciousness. Infrastructure support, like composting bins and recycling facilities, aids during the execution of these practices. The Green Army, through its multifaceted approach including awareness drives and community engagement, stands out acting as a catalyst in fostering sustainable waste management at the grassroots level.

In conclusion, sustainable waste management is a complex and multifaceted issue that requires collaboration between households, community organizations, and government agencies. Although advancements have been achieved in adopting sustainable practices and raising awareness, challenges persist in infrastructure, compliance, and socioeconomic disparities. Addressing these challenges will require continued efforts to improve infrastructure, enhance community engagement, and promote behavior change. By working together, we can create cleaner, healthier communities and pave a path towards a more sustainable future.

REFERENCES

1. Onyinyechi Lilian Uche (2023), Plastic Waste Regime in Rwanda, Kenya and South Africa: A Comparative Case Study, *American Journal of Law*, <https://doi.org/10.47672/ajl.1652>
<https://api.semanticscholar.org/CorpusID:265224099>
2. Jayasinghe, R. R., Abeyrathna, W. P., Lythgoe, D., Hendawitharana, M. P., Liyanage, C., Williams, K., & Halwatura, R. U. (2022). Analysis of the community behavioural patterns in management of household plastic waste due to the COVID-19 pandemic in Sri Lanka. *Case Studies in Chemical and Environmental Engineering*, 6, 100246. <https://doi.org/10.1016/j.cscee.2022.100246>
3. Sugand, S., & Das, A. (Year). Food waste management: Experiences from Germany applicable in Indian scenario. Greengrahi Solutions Private Limited. <https://www.hif-hamburg.de/Images/Abschlusskonferenz%202022/pdfs%20Abstracts/Abstract%20Babu%20Ambat%20und%20T.A.%20Jayanthi.pdf>
4. Prodyanatasari, Arshy & Fernanda, Jerhi. (2023). Utilization of Plastic Wastes as Planting Media in Efforts to Handle Inorganic Waste. *Room of Civil Society Development*. 2. 232-236.. <https://doi.org/10.59110/rcsd.268>
5. Lia Muliawaty, R. Taqwaty Firdausijah, & Willya Achmad. (2022). Implementation of Waste Management Policies by the Main Waste Bank in Realizing the Effectiveness of the Waste Program in the City of Bandung. *RES MILITARIS*, 12(2), 1906–1913. Retrieved from <https://resmilitaris.net/index.php/resmilitaris/article/view/326>
6. Xiao S, Dong H, Geng Y, Fujii M, Pan H.(2020), Greenhouse gas emission mitigation potential from municipal solid waste treatment: A combined SD-LMDI model. *Waste Manag.* 2021 Feb 1;120:725-733. doi: 10.1016/j.wasman.2020.10.040. Epub 2020 Nov 20. PMID: 33223250.
7. Zhang J, Qin Q, Li G, Tseng CH. Sustainable municipal waste management strategies through life cycle assessment method: A review. *J Environ Manage.*

- (2021) Jun 1;287:112238. doi: 10.1016/j.jenvman.2021.112238. Epub 2021 Mar 10. PMID: 33714044.
8. Nanda, S., Berruti, F. (2021) Municipal solid waste management and landfilling technologies: a review. *Environ Chem Lett* **19**, 1433–1456. <https://doi.org/10.1007/s10311-020-01100-y>
 9. Zorpas AA. Strategy development in the framework of waste management. *Sci Total Environ.* 2020 May 10;716:137088. doi: 10.1016/j.scitotenv.2020.137088. Epub 2020 Feb 3. PMID: 32059326.
 10. Pu Shirui and Jiaxuan Su and Li Liuxiang and Hongsheng Wang and Chunyang Chen and Xuejiao Hu, (2019), Bioinspired sweating with temperature sensitive hydrogel to passively dissipate heat from high-end wearable electronics, *Energy Conversion and Management*, <https://api.semanticscholar.org/CorpusID:104756347>
 11. Rodić, Ljiljana, and David C. Wilson. (2017). Resolving Governance Issues to Achieve Priority Sustainable Development Goals Related to Solid Waste Management in Developing Countries, *Sustainability* 9, no. 3: 404. <https://doi.org/10.3390/su9030404>
 12. Brunner PH, Rechberger H. Waste to energy--key element for sustainable waste management. *Waste Manag.* 2015 Mar;37:3-12. doi: 10.1016/j.wasman.2014.02.003. Epub 2014 Mar 12. PMID: 24630214.
 13. Edmondson, A. C., & Bransby, D. P. (2023). Psychological Safety Comes of Age: Observed Themes in an Established Literature. *Annual Review of Organizational Psychology and Organizational Behavior*, 10, 55–78. <https://doi.org/10.1146/annurev-orgpsych-120920-055217>
 14. Kazemi Najafi S. Use of recycled plastics in wood plastic composites - a review. *Waste Manag.* 2013 Sep;33(9):1898-905. doi: 10.1016/j.wasman.2013.05.017. Epub 2013 Jun 15. PMID: 23777666.
 15. Guerrero LA, Maas G, Hogland W. Solid waste management challenges for cities in developing countries. *Waste Manag.* 2013 Jan;33(1):220-32. doi: 10.1016/j.wasman.2012.09.008. Epub 2012 Oct 23. PMID: 23098815.

16. Hoornweg, Daniel; Bhada-Tata, Perinaz. 2012. What a Waste : A Global Review of Solid Waste Management. Urban development series;knowledge papers no. 15. © World Bank, Washington, DC. <http://hdl.handle.net/10986/17388>
License: CC BY 3.0 IGO.
17. Giusti L. A review of waste management practices and their impact on human health. *Waste Manag.* 2009 Aug;29(8):2227-39. doi: 10.1016/j.wasman.2009.03.028. Epub 2009 Apr 28. PMID: 19401266.
18. Shekdar AV, (2009), Sustainable solid waste management: an integrated approach for Asian countries, *Waste Management.*, 29 (4), pp:1438-48, doi: 10.1016/j.wasman.2008.08.025. Epub: 2008 Dec 9. PMID: 19081236.
19. Simonescu, Claudia Maria. (2008). Management of waste in rural areas of Gorj county, Romania. *Environmental engineering and management journal.* 7. 717-723.
20. Goddu, Vijaya & Duvvuri, Kavita & Bakki, Vidya. (2007). A Critical Analysis of Healthcare Waste Management in Developed and Developing Countries: Case Studies from India and England.
21. Huang, Q., Wang, Q., Dong, L. *et al.* The current situation of solid waste management in China. *J Mater Cycles Waste Manag* 8, 63–69 (2006). <https://doi.org/10.1007/s10163-005-0137-2>
22. Pasang H, Moore GA, Sitorus G. Neighbourhood-based waste management: a solution for solid waste problems in Jakarta, Indonesia. *Waste Manag.* 2007;27(12):1924-38. doi: 10.1016/j.wasman.2006.09.010. Epub 2006 Dec 5. PMID: 17150349.
23. Chung, S., & Poon, C. (1998). A comparison of waste management in Guangzhou and Hong Kong. *Resources, Conservation and Recycling*, 22(3-4), 203-216. [https://doi.org/10.1016/S0921-3449\(98\)00013-5](https://doi.org/10.1016/S0921-3449(98)00013-5)
24. Darren Perrin and J. R. Barton, (2001), Issues associated with transforming household attitudes and opinions into materials recovery: a review of two kerbside recycling schemes, *Resources Conservation and Recycling*, volume 33, pp:61-74, <https://api.semanticscholar.org/CorpusID:109778925>

25. . Kironde, J. M. L., & Yhdego, M. (1997). The governance of Waste Management in urban Tanzania: Towards a community based approach. *Resources, Conservation and Recycling*, 21(4), 213–226.
[https://doi.org/10.1016/s0921-3449\(97\)00037-2](https://doi.org/10.1016/s0921-3449(97)00037-2)

Websites

- <https://www.researchgate.net>
- <https://scholar.google.com/scholar>
- <http://core.ac.uk/download/pdf/48061589pdf>
- <https://www.abrjorg>
- <http://hdl.handle.net/10603/335890>
- <https://ssrn.com/abstract=2969781>
- www.iardpub.org
- www.emeraldinsight.com/researchregister
- www.sciencepubco.com/index.php/IJET

QUESTIONNAIRE

1. Name:

2. Gender

- Male
- Female
- Others

3. Age

- 18-25
- 26-35
- 36-45
- 46-55
- 56-65
- 65 Above

4. Number of family members:

5. Occupation

- Farming
- Business
- Government servant
- Others

6. Annual income

- 10000-20000
- 20000-30000
- 30000-40000
- 40000-50000
- Above 50000

7. Have you ever been awared of proper waste disposal by council?

- Yes
- No

8. Rank the major solid waste could not be managed in your household

waste	1	2	3	4	5	6	7	8	9
Paper carton									
Plastics (bags / bottles)									
Food waste									
Tin/cans									
Fiber bags /chappals									
Glass									
Batteries									
Electronic waste									
Household sanitary waste									

9. How do you handling food and other degradable waste

- Composting
- Biogas
- Vermi composte

- Garbage bit
- Others

10. What are the major sustainable waste management practices used at household level?

- Reuse
- Burning
- Burial
- Recycling
- Donating usable items
- Others

11. Factors Influencing sustainable waste management

(Strongly Disagree-1, Disagree-2, Neutral-3, Agree -4, Strongly Agree -5)

Factors	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Government policy support					
influence of family					
infrastructural mechanism					
Public support					
Awareness programs					

12. Are you concern about the following issues relating to solid waste management

Issues	concerned	Not concerned	No opinion
Health risk related to burning garbage			
Illegal dumping polluting water bodies			
Diseases related to improper storage and disposal			
Reduction of neutral resources we buy and use			
Illegal dumping			
Flooding due to garbage, blocking drains and gullies			

13. Does the Haritha karma Sena comes to your house to collect waste

- Yes
- No

14. How long have you been providing waste to Haritha karma Sena?

- Less than 6 months
- 6 months - 1year
- 1 - 2 years
- More than 2 years

15. Are you aware of the guidelines provided by Haritha karma Sena for waste segregation?

- Yes
- No

16. How often does the Haritha karma Sena team visit your house for waste collection & disposal?

- Once a week
- Once a month
- Once in 6 months
- Never

17. What challenges do you face in practicing proper waste management at home?

- Limited knowledge on hazardous waste handling
- Inadequate infrastructure for waste disposal
- Lack of convenient disposal options
- Lack of time
- Cost
- All the above

18. Please indicate your level of agreement with the following statements regarding waste management:

(Strongly Disagree-1, Disagree -2, Neutral -3, Agree- 4, Strongly Agree -5)

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
It is easy for me to separate recyclable materials					

from other waste					
I am aware of the environmental impact of improper waste disposal					
I feel motivated to reduce, reuse, recyclable household waste					
I find it challenging to find proper disposal methods for hazardous waste					