A Study on the Effectiveness of Haritha Karma Sena in Wadakkanchery Municipality

Discipline: Economics

Dr. Liji Maliakkel

Assistant Professor, Post Graduate & Research Department of Economics, Vimala College, (Autonomous), Thrissur, Kerala, India, Affiliated to the University of Calicut, Kerala, India
Email: lijimaliakkel@vimalacollege.edu.in

Anju K.A.

Independent Researcher
Email: anjuka0722@gmail.com

Abstract

Analysing how effectively Haritha Karma Sena handles garbage disposal, segregation, and recycling is one of the main goals of this study. Waste management in Kerala has advanced remarkably, and Wadakkanchery's Haritha Karma Sena is essential to maintaining the municipality's sustainability and cleanliness. The study's findings may be used to pinpoint best practices and suggest enhancements to improve environmental preservation and solid waste management. Many Kadambashree members have access to economic options through the Haritha Karma Sena. This study will clarify how Haritha Karma Sena empowers women by providing jobs and encouraging social inclusion. The study highlights the relationship between environmental activities and social empowerment by examining how Haritha Karma Sena has contributed to raising the living conditions of its members.   The results of this study may influence state and municipal government regulations meant to improve the effectiveness and sustainability of waste management procedures. This will assist legislators in improving their approaches and allocating funds to better support programs such as Haritha Karma Sena. Recognizing Haritha Karma Sena's efficacy also emphasizes its function in teaching the public about recycling, waste reduction, and segregation. The study may increase knowledge and cooperation in waste management at the local level by encouraging community involvement.

Keywords

Haritha Karma Sena, garbage disposal, segregation, recycling, local self-government, Kudumbashree

1. Introduction

The Haritha Keralam Mission is one of four missions established by the state government to create a new Kerala. The Mission was established on December 8, 2016, with the goals of encouraging cleanliness, water abundance, water security, and safe food production. The Haritha Keralam Mission has already achieved outstanding results in a variety of fields relating to the state's environmental characteristics. Water, Hygiene, and Harvest is the mission's distinctive motto, and it clearly states its objectives. The Haritha Keralam Mission consists of three sub-missions: water conservation, sanitation and waste management, and agriculture. Haritha Karma sena is an initiative that works with Kerala local self-government authorities to manage garbage and provide sanitation. 2017 saw the establishment of Harita Karma sena in local self-government organizations as a part of the Kerala government's Harithakeralam Mission Project. Haritha Karma Sena is a professional team made up of green technicians and green supervisors, primarily Kudumbashree women, who will be in charge of waste collection, transportation, processing, recycling/disposal, and management in collaboration with respective LSGs and the Suchitwa Mission. The mission seeks to achieve the following goals: Make Kerala a garbage-free state. To encourage sustainable waste management practices. To generate employment possibilities in the waste management industry. To educate the public about the importance of trash management. The Haritha Karma Sena waste management system stands as a pioneering model for sustainable waste management. Its emphasis on community involvement, waste segregation, and recycling has led to significant improvements in sanitation and environmental sustainability. By addressing challenges and continuing to innovate, the system has the potential to serve as a model for other regions seeking to implement effective waste management solutions.

2. Objectives

- To analyse the effectiveness of Haritha karma sena in wadakkanchery municipality

- To examine the satisfaction and challenges of Haritha karma sena in the sample area

3. Literature Review

- Parvathy Ravikumar (2024) To examine the purpose of the study is to ascertain how Keralans view the Haritha karma Sena's contribution to sustainable development and trash management. The primary goals are to evaluate how the general public views Sena's efficacy and implementation in tackling the state's most pressing issue, which is the accumulation of waste and the absence of waste management procedures.

- Nishad, A. (2024) Study the Haritha Karma Sena, based in Kerala, India, promotes trash management and environmental conservation. The study examines its techniques, impact, and factors influencing trash management. Challenges include habit change, restricted participation, and financial constraints. The report recommends initiatives to raise awareness, community participation, coordination with local governments, and financial assistance to increase efficiency. Implementing incentives and sustainable garbage disposal strategies can contribute to a cleaner, greener world. Continuous monitoring and assessment are critical for future improvement.

- Kannankai, M. P., Sherin, F., & Devipriya, S. P. (2024) Examine Kerala's decentralized solid waste management strategies take a people-centered approach to handling plastic trash. An online poll indicated a 62% plastic waste literacy rate, with women and the elderly becoming more ecologically conscientious. However, poor disposal practices persist, particularly in metropolitan areas. The Haritha Karma Sena's plastic waste collection program garnered excellent comments, although the public is opposed to user fees. This research seeks to enhance garbage disposal effectiveness and increase its adoption in underdeveloped countries.

- Kumar, G., Vyas, S., Sharma, S. N., & Dehalwar, K. (2024) The study focuses on the environmental health concerns associated with inappropriate garbage collection in Indian cities, particularly in peri-urban areas. The study stresses the importance of public education on proper garbage disposal behaviors, effective waste disposal in municipal areas, and consistent street maintenance and cleaning. The issues include insufficient garbage disposal infrastructure, inadequate waste segregation, low public awareness, and inadequate waste disposal in the informal sector. Inefficient collection and delivery methods, out-of-date government laws, and a lack of access to innovative waste management technologies exacerbate the situation. A comprehensive strategy encompassing infrastructural upgrades, awareness raising, enhanced policies, and informal sector participation is required.

- Sharma, S. N., Dehalwar, K., & Singh, J. (2024) This study emphasizes the relevance of innovative solid waste management strategies, such as recycling, composting, and waste-to-energy technology, in lowering worldwide waste volume. These approaches can help to reduce greenhouse gas emissions, boost resource efficiency, and improve public health outcomes. They help to achieve sustainable development objectives like sustainable urbanization, environmental sustainability, and public health. The study's goal is to help policymakers and

waste managers choose the most appropriate waste management approach for their communities

4. Research Methods

This study adopts both qualitative and quantitative approaches to assess the effectiveness of Haritha Karma Sena in managing garbage disposal, segregation, and recycling. The study is based on both primary and secondary data. The primary data are collected from 30 Haritha karma sena workers and 30 beneficiaries in wadakkanchery municipality. The primary data has been collected by using well-structured pre designed schedules through personal interview method. Index has been created to analyse the primary data. The secondary information was collected research articles, research projects, government websites, and online data sources like google scholar. Descriptive statistics, frequency tables, graphs, Likert scale, cross tabs, linear regression were used to analyse the data.

5. Analysis of Data

5.1. Effectiveness of Haritha Karma Sena Workers in the Selected Sample

This section of the study presents an objective examination of data collected to evaluate the effectiveness of Haritha Karma Sena in Wadakkanchery Municipality. This part assesses the effectiveness of waste collection services, staff responsiveness, punctuality, cleanliness improvements, and overall performance.

Table 1
Effectiveness of the Haritha Karma Sena

	Highly satisfied	Satisfied	Neutral	Dissatisfied	Highly dissatisfied	Total score	Mean score	Consolidated score
Efficiently gather garbage	80	44	9	0	0	133	4.4	
Satisfaction in frequency of waste collection	45	76	3	2		126	4.2	
Responsiveness of workers	5	56	42	2	0	105	3.5	
Improvement in cleanliness of your area	80	40	12	0	0	132	4.4	
Effectiveness in communication	25	60	27	2	0	114	3.8	
Punctuality of workers	30	68	21	0	0	119	3.9	
Contribution to environment awareness by the workers to locality	40	48	27	2	0	117	3.9	
Handling different types of waste	55	60	9	2	0	126	4.2	
Reduction in waste after the presence of Haritha Karma sena worker	60	56	9	2	0	127	4.2	
Rate over all the performance of workers	60	60	9	0	0	129	4.3	
Cleanliness of your neighbourhood	20	64	30	0	0	114	3.8	
Responsiveness of workers to reported issues	20	64	30	0	0	114	3.8	
Behaviour of workers	40	56	21	2	0	119	3.9	
Total							52.3	4.02

Source: Primary data

Table 1, results of the study reflect a generally high level of satisfaction with waste collection services, with many categories scoring better than 4.0. Key highlights include efficient garbage collection and significant increases in area cleanliness both with a mean score of 4.4, as well as excellent waste management and overall worker performance. However, there is a place for improvement, particularly in staff' responses to concerns and reported complaints, which received the lowest score of 3.5. Communication efficacy and neighbourhood cleanliness both received lower ratings 3.8, indicating potential gaps in clarity and thoroughness. While workers' behaviour and timeliness received reasonably high ratings 3.9, minor improvements in these areas could boost satisfaction even further. Overall, focusing on greater communication and responsiveness may assist elevate.

Table 2

Index of the effectiveness of the Haritha Karma Sena

	Frequency	Percent
Low	17	56.7%
Medium	13	43.3%
Highly	0	0
	30	100

Source: Primary data

The Haritha Karma Sena's effectiveness assessment shows that the majority of participants 56.7% assessed its performance as low, while 43.3% judged it to be medium effective. Notably, none of the participants evaluated the training as highly effective. This distribution indicates that there may be limitations in the program's influence or implementation, resulting in low overall satisfaction or effectiveness. The lack of high ratings suggests that considerable modifications are required to improve the program's outcomes, such as refining techniques, enhancing involvement, or optimizing resource allocation to better fulfil the program's objectives.

5.2. Satisfaction level of the Haritha Karma Sena Workers

Haritha Karma Sena (HKS) workers are the backbone of Kerala's waste management system, playing a crucial role in maintaining cleanliness and promoting environmental sustainability. However, despite their significant contributions, they encounter numerous challenges that affect their efficiency and overall well-being. Identifying these challenges is essential for improving their working conditions, ensuring fair wages, and strengthening waste management policies to create a more effective

and sustainable system. Therefore, it is indeed to examine the satisfaction level of the HKS workers.

Table 3

Satisfaction level of Haritha karma sena

	Highly satisfied	Satisfied	Neutral	Dissatisfied	Highly dissatisfied	Total score	Mean score	Consolidated score
Job	70	56	6	0	0	132	4.4	
Your current wage	0	36	51	8	0	95	3.16	
Your working hours	35	56	27	0	0	118	3.93	3.638
Provision of leisure time	60	40	3	14	0	117	3.9	
Provision of leave	10	4	54	18	0	86	2.8	
Total							18.19	

Source: Primary data

Table 3 summarizes the survey findings on job-related satisfaction across multiple dimensions. Overall job satisfaction had the highest score, with a total of 132 and a mean score of 4.4, showing that employees are very satisfied with their jobs. Satisfaction with working hours (mean score of 3.93) and availability of leisure time (mean score of 3.9) also received positive feedback. However, present wage satisfaction is significantly lower, with a mean score of 3.16, indicating a need for compensation changes. The provision of leave obtained the lowest score, with a mean of 2.8, indicating a major room for improvement. The total score for all categories is 18.19, with an average mean suggesting moderate overall satisfaction. To improve overall happiness, addressing pay concerns and enhancing leave rules could be critical areas for change.

Table 4
Satisfaction Index

Low	5	16.7%
Medium	25	83.3%
Highly	0	0
	30	100%

Source: Primary data

A vast majority of participants i.e., 83.3% gave their level of satisfaction a medium rating, according to the satisfaction index, while a lesser percentage 16.7% gave it a

bad rating. No one who took part expressed a high degree of satisfaction. There is no indication of great pleasure, according to this distribution, even though the majority of participants regard the program to be moderately good. The lack of high satisfaction points to areas that could want improvement, such as particular participant issues being addressed or the program as a whole being improved to better fulfil expectations.

Table 5
Regression on Satisfaction Index

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.133	.899		2.374	.026
	age of the Haritha karma sena	.048	.122	.077	.396	.696
	income of the Haritha karma sena	9.191E-006	.000	.265	1.477	.153
	education of the Haritha karma sena	-.239	.138	-.334	-1.736	.095
	economic status of the Haritha karma sena	.107	.259	.095	.414	.683
	religion of the Haritha karma sena	.041	.181	.055	.227	.823
a. Dependent Variable: index of the satisfaction Haritha karma sena						

Source: Primary data

Considering all p-values are greater than 0.05, the regression analysis shows that none of the independent variables—the Haritha Karma Sena (HKS) members' age, income, education, economic standing, or religion—significantly affect the satisfaction index. Economic status, age, and income all have weak but positive correlations with contentment, although these relationships are not statistically significant. Higher education may somewhat lower satisfaction; however, this is not conclusive. Education and satisfaction have a negative connection that approaches significance (p = 0.095). The influence of religion on satisfaction is minimal. All things considered, the model shows that these variables fall short of explaining variances in satisfaction, underscoring the necessity of investigating other variables that might more accurately represent the causes influencing satisfaction among HKS members.

5.3. Challenges faced by the Haritha Karma Sena Workers

However, despite of their significant contributions, they encounter numerous challenges that affect their efficiency and overall well-being. These challenges include financial instability, lack of adequate safety equipment, limited public cooperation, and logistical issues such as inefficient transportation and waste disposal facilities. Additionally, social stigma and irregular income further add to their struggles. This part focuses on analysing the various difficulties faced by HKS workers in Wadakkanchery Municipality through data-driven insights. Identifying these challenges is essential for improving their working conditions, ensuring fair wages, and strengthening waste management policies to create a more effective and sustainable system.

Table 6
Challenges faced by HKS

	Always	Most of the time	Some times	Rarely	Never	Total score	Mean score	Consolidated score
Any resistance from residents when encouraging them to segregated waste	0	0	45	28	1	74	2.4	2.922
supportive are local authority or municipalities in helping you resolve waste management issues	10	32	33	16	1	92	3.06	
People agree to pay for garbage collection services	25	48	30	4	1	108	3.6	
Transportation	5	8	15	16	14	58	1.9	
Storage of waste or recycling	60	64	6	0	0	130	4.3	
Insufficient income	5	36	33	12	3	89	2.9	
Behaviour of beneficiaries	10	28	24	16	5	83	2.7	
Disposal of waste is difficult task	5	24	15	20	8	72	2.4	
Facing health risks while handling waste	0	4	21	20	12	57	1.9	
Seasonal changes, like heavy rains, affect your waste collection	65	36	15	6	0	122	4.06	
Total							29.22	

Source: Primary data

Table 6 describes the problems and support available for trash management. The highest level of satisfaction is seen in waste storage or recycling, which received 130 points with a mean score of 4.3, showing strong effectiveness in managing this area. Seasonal variations, such as severe rains that impacted waste collection, also fared well, with a total score of 122 and a mean of 4.06, demonstrating resilience to weather-related issues. People who agreed to pay for waste collection services scored 108 with a mean score of 3.6, indicating a moderate willingness to pay. However, transportation and dealing with health concerns when handling trash were the most difficult, with both receiving the lowest mean score of 1.9. Waste disposal as a tough task, as well as resident reluctance to encouraging segregation, received a mean score of 2.4, indicating persistent challenges with waste management systems. Support from local governments or municipalities received a moderate mean score of 3.06, indicating space for improvement in collaboration. The overall consolidated score is 29.22, with an average mean indicating mixed levels of satisfaction. Improving transportation, health safety, and waste Disposal operations could boost overall satisfaction.

Table 7 - Challenges Index

	Frequency	Percent
Never	0	0
Sometimes	14	46.7
Almost	16	53.3
	30	100

Source: Primary data

Based on the challenges index, 53.3% of participants reported having difficulties "almost always," despite 46.7% reporting having difficulties "sometimes." None of the participants said they had any difficulties. According to this distribution, difficulties are a frequent and recurrent problem for the majority of participants, pointing to possible barriers in the planning or execution of the program. The frequency of common problems emphasizes the necessity of focused interventions to find and fix these problems, enhancing program effectiveness and participant satisfaction overall.

Table 8
Regression on the Challenges Index

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	3.085	.612		5.044	.000
age of the Haritha karma sena	.037	.083	.085	.443	.662
income of the Haritha karma sena	2.420E-006	.000	.101	.571	.573
education of the Haritha karma sena	-.172	.094	-.349	-1.841	.078
economic status of the Haritha karma sena	-.070	.176	-.090	-.398	.694
religion of the Haritha karma sena	.132	.123	.254	1.071	.295
a. Dependent Variable: challenges of the Haritha karma sena index					

Source: Primary data

Considering all p-values are higher than 0.05, the regression analysis shows that none of the factors—age, income, education, economic standing, or religion of Haritha Karma Sena (HKS) members—significantly predict the difficulties they encounter. Although there are slight positive correlations between challenges and age and wealth, these interactions are insignificant. The association between economic status and economic status is somewhat negative, suggesting no discernible influence. Challenges are positively, but not significantly, impacted by religion. However, education shows a negative association and approaches significance (p = 0.078), indicating that, while not conclusive, higher education may somewhat lessen problems. All things considered, these results imply that the model falls short in explaining the differences in difficulties, underscoring the necessity of investigating other elements to gain a deeper comprehension of the factors that influence the difficulties encountered by HKS members.

1. Results & Discussion

The Haritha Karma Sena (HKS) initiative plays a crucial role in of Kerala's decentralized waste management system, seeking to promote sustainability, cleanliness, and environmental conservation. Haritha karma sena, founded by the Haritha Keralam Mission, is mostly made up of women workers who collect, segregate, and recycle waste together with local self-governing authorities. This initiative not only promotes

efficient garbage disposal but also creates job possibilities, particularly for women from economically poor families. Hence, the present study "A Study on Effectiveness of Haritha Karma Sena in Wadakkanchery Municipality" is under taken, with the following specific objectives

•   To analyse the effectiveness of Haritha karma sena in wadakkanchery municipality

•   To Identify the challenges faced by the Haritha karma sena workers.

The primary data collected from randomly selected 30 beneficiaries and 30 Haritha karma sena workers in Wadakkanchery municipality. The primary information has been included by using well-structured pre designed schedules. Various tables, charts, percentages, Likert scale, constructed for mean, index were used to analyze data.

•   Workers expressed strong job satisfaction, with a mean score of 4.4, showing that they enjoy their work despite the hurdles.

•   Satisfaction with working hours (mean score of 3.93) and availability of leisure time (mean score of 3.9) received favourable responses, indicating that workers found their workload manageable.

•   The average wage satisfaction score is 3.16, suggesting unhappiness with existing salaries. This shows that increasing pay could greatly boost employee morale and satisfaction.

•   The supply of leave obtained the lowest mean score of 2.8, indicating that employees are very unsatisfied with their leave alternatives. This identifies a significant area where policies must be modified in order to achieve better work-life balance.

•   The Satisfaction Index 83.3% of employees reported being moderately satisfied with their jobs, 16.7% of respondents expressed low levels of satisfaction, and no respondents expressed high satisfaction.

•   The absence of high satisfaction levels suggests large gaps in achieving worker expectations. To improve job happiness, wages should be addressed first, followed by improved leave provisions.

•   All of the independent variables (age, income, education, economic status, or religion) had a significant impact on the satisfaction measure (all p-values > 0.05).

•   The crosstabulation indicates that increased income correlates with higher satisfaction, with all members earning ₹ 11,000-14,000 reporting medium satisfaction. Lower-income groups (₹ 5,000-8,000) have the highest levels of

dissatisfaction, indicating financial strain may affect enjoyment. Wage increases could help lower-income members feel more satisfied.

- The survey results show strong family support (mean score 4.4) and moderate happiness with family time (3.7). However, income adequacy had a lower score (2.9), indicating financial concerns among members. Addressing money difficulties may increase overall family satisfaction while retaining strong family support.

- The data show that garbage storage and recycling are highly effective (mean score: 4.3), as is resistance to seasonal problems (4.06). However, substantial challenges include transportation and health concerns (both 1.9), as well as trash disposal issues (2.4). Improving transportation, health safety, and disposal methods may increase overall satisfaction with garbage management.

- Haritha Karma Sena members find Construction and Demolition (C&D) Waste the most challenging to manage, followed by E-Waste, Non-recyclable Plastics, and Medical and Hazardous Waste. These waste types require specialized disposal methods, highlighting the need for better infrastructure and training in waste management.

- Haritha Karma Sena members identified transportation issues and lack of public cooperation as major challenges in waste management. Improving transportation infrastructure and raising public awareness about proper waste disposal could significantly ease their workload and enhance efficiency in waste handling.

- Haritha Karma Sena follows a structured recycling process where waste is segregated and sent to the Kumblangad MCF. Plastic waste is shredded and sold for reuse, while food waste is converted into organic compost. This system promotes sustainable waste management and reduces environmental impact.

2. Suggestions

- **Suggestions from the respondents to enhance the effectiveness of Haritha karma sena workers**

A major concern is the reduction of service fees, suggesting that some beneficiaries feel the cost of waste collection could be more affordable. Additionally, there is a demand for more awareness programs on waste management, indicating the need for better public education on proper disposal practices. Some respondents also emphasized the importance of better cooperation from workers towards households, which could improve service quality and community relations. Hygiene concerns were raised, as workers often lack essential protective gear such as gloves and masks, which could impact both their health and work efficiency. The issue of waste dumping was also

highlighted, where collected household waste is temporarily dumped before being transported later, raising concerns about cleanliness and environmental impact. Moreover, the lack of proper vehicles and timely waste collection was mentioned, pointing to the need for better infrastructure and punctuality in waste management operations. Addressing these concerns through improved policies, better equipment, and enhanced community engagement could significantly boost the overall effectiveness of Haritha Karma Sena workers.

- **Suggestion in the waste management system to make job easier**

The responses from Haritha Karma Sena members regarding improvements in the current waste management system indicate that better transportation facilities and increased public cooperation are the key areas that need attention. A significant portion of respondents, 43.3%, emphasized the need for greater cooperation from the public, suggesting that improper waste disposal and lack of awareness among residents create additional challenges for workers. However, the majority of workers identified transportation as the most pressing issue, highlighting difficulties in waste collection, transfer, and disposal due to inadequate or inefficient transport systems. These findings suggest that enhancing transportation infrastructure and implementing awareness campaigns to encourage public participation could significantly ease the workload of waste management workers and improve overall efficiency in waste handling.

Conclusion

The study on the effectiveness of Haritha Karma Sena (HKS) in Wadakkanchery Municipality highlights the program's crucial role in decentralized waste management, environmental sustainability, and women's empowerment. While beneficiaries generally appreciate HKS services, concerns about responsiveness, communication, and affordability persist. The study reveals that HKS workers, predominantly women from marginalized and low-income backgrounds, face significant challenges, including low wages, inadequate leave provisions, lack of safety equipment, and transportation issues. Older and less-educated workers report higher work-related difficulties, and managing certain waste types like construction debris and hazardous materials remains a challenge. Despite these hurdles, HKS has a well-structured waste recycling process that promotes sustainability. Enhancing transportation, increasing public cooperation, improving worker safety, and addressing wage concerns are essential steps to improving efficiency and job satisfaction, ensuring a more sustainable and effective waste management system.

References

1. Nishad, A. (2024). Haritha Karma Sena: Transforming Waste Management.

2. Kannankai, M. P., Sherin, F., & Devipriya, S. P. (2024). Investigating the sociodemographic and individual attributes influencing the plastic waste management practices in Kerala, India. *Journal of Material Cycles and Waste Management*, *26*(4), 2567-2578.

3. Kumar, G., Vyas, S., Sharma, S. N., & Dehalwar, K. (2024). Challenges of Environmental Health in Waste Management for Peri-urban Areas. In *Solid Waste Management: Advances and Trends to Tackle the SDGs* (pp. 149-168). Cham: Springer Nature Switzerland.

4. Sharma, S. N., Dehalwar, K., & Singh, J. (2024). Emerging techniques of solid waste management for sustainable and safe living environment. In *Solid Waste Management: Advances and Trends to Tackle the SDGs* (pp. 29-51). Cham: Springer Nature Switzerland.

5. Castro-Amoedo, R., Granacher, J., Kantor, I., Dahmen, A., Barbosa-Povoa, A., & Maréchal, F. (2024). On the role of system integration in plastic waste management. Resources, Conservation and Recycling, 201, 107295.

6. Nwokediegwu, Z. Q. S., Ugwuanyi, E. D., Dada, M. A., Majemite, M. T., & Obaigbena, A. (2024). AI-driven waste management systems: a comparative review of innovations in the USA and Africa. Engineering Science & Technology Journal, 5(2), 507-516.

7. Hernandez, D., Pasha, L., Yusuf, D. A., Nurfaizi, R., & Julianingsih, D. (2024). The role of artificial intelligence in sustainable agriculture and waste management: Towards a green future. International Transactions on Artificial Intelligence, 2(2), 150-157.

8. Syam, D., Anish, K. K., Eldho, N., Shanima, V. S., & PS, S. K. (2024). AIoT Based Smart Waste Management System. Journal of Network & Information Security, 12(2).

9. Kala, K., & Bolia, N. B. (2024). Empowering the informal sector in urban waste management: Towards a comprehensive waste management policy for India. Environmental Development, 49, 100968.

10. Thomas, E., Susan Nelson, N., Saju, N., & Menon, A. (2023). A Study on the Socio-Economic Profile of Harith Karma Sena Workers with Special Reference to Cheranallooor Panchayat (Doctoral dissertation, St Teresa's College (Autonomous), Ernakulam

11.   Sengupta, D., Ilankoon, I. M. S. K., Kang, K. D., & Chong, M. N. (2022). Circular economy and household e-waste management in India: Integration of formal and informal sectors. Minerals Engineering, 184, 107661.

12.   Sharma, H. B., Vanapalli, K. R., Samal, B., Cheela, V. S., Dubey, B. K., & Bhattacharya, J. (2021). Circular economy approach in solid waste management system to achieve UN-SDGs: Solutions for post-COVID recovery. Science of the Total Environment, 800, 149605.

13.   Nanda, S., & Berruti, F. (2021). Municipal solid waste management and landfilling technologies: a review. Environmental chemistry letters, 19(2), 1433-1456.

14.   Chisholm, J. M., Zamani, R., Negm, A. M., Said, N., Abdel daiem, M. M., Dibaj, M., & Akrami, M. (2021). Sustainable waste management of medical waste in African developing countries: A narrative review. Waste Management & Research, 39(9), 1149-1163.

15.   Amaral, R. E., Brito, J., Buckman, M., Drake, E., Ilatova, E., Rice, P., ... & Abraham, Y. S. (2020). Waste management and operational energy for sustainable buildings: a review. Sustainability, 12(13), 5337.

16).   Kabirifar, K., Mojtahedi, M., Wang, C., & Tam, V. W. (2020). Construction and demolition waste management contributing factors coupled with reduce, reuse, and recycle strategies for effective waste management: A review. Journal of cleaner production, 263, 121265.

17.   Malav, L. C., Yadav, K. K., Gupta, N., Kumar, S., Sharma, G. K., Krishnan, S., ... & Bach, Q. V. (2020). A review on municipal solid waste as a renewable source for waste-to-energy project in India: Current practices, challenges, and future opportunities. Journal of Cleaner Production, 277, 123227.

18.   Kinantan, B., Matondang, A. R., & Hidayati, J. (2018, February). Waste management as an effort to improve urban area cleanliness and community income (journal review). In *IOP Conference Series: Materials Science and Engineering* (Vol. 309, No. 1, p. 012017). IOP Publishing.

19.   Elsaid, S., & Aghezzaf, E. H. (2015). A framework for sustainable waste management: challenges and opportunities. Management Research Review, 38(10), 1086-1097.

20.   Udawatta, N., Zuo, J., Chiveralls, K., & Zillante, G. (2015). Improving waste management in construction projects: An Australian study. Resources, Conservation and Recycling, 101, 73-83.

21. Gangolells, M., Casals, M., Forcada, N., & Macarulla, M. (2014). Analysis of the implementation of effective waste management practices in construction projects and sites. Resources, conservation and recycling, 93, 99-111.

22. Zaman, A. U., & Lehmann, S. (2013). The zero waste index: a performance measurement tool for waste management systems in a 'zero waste city'. Journal of cleaner production, 50, 123-132.

23. Zurbrügg, C., Gfrerer, M., Ashadi, H., Brenner, W., & Küper, D. (2012). Determinants of sustainability in solid waste management–The Gianyar Waste Recovery Project in Indonesia. Waste management, 32(11), 2126-2133.

24. Pasupathi, P., Sindhu, S., Ponnusha, B. S., & Ambika, A. (2011). Biomedical waste management for health care industry. Int J Biol Med Res, 2(1), 472-486.

25. Seadon, J. K. (2010). Sustainable waste management systems. Journal of cleaner production, 18(16-17), 1639-1651.

26. Wath, S. B., Vaidya, A. N., Dutt, P. S., & Chakrabarti, T. (2010). A roadmap for development of sustainable E-waste management system in India. Science of the Total Environment, 409(1), 19-32.

27. Kahhat, R., Kim, J., Xu, M., Allenby, B., Williams, E., & Zhang, P. (2008). Exploring e-waste management systems in the United States. Resources, conservation and recycling, 52(7), 955-964.