

Breaking The Waste Crisis In Rural India: How Community Volunteerism Bridges Environmental Sustainability And Livelihood Security: Evidence From Haritha Karma Sena Implementation In Kerala

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Abstract

Rural local governments across India are under growing pressure to manage rising volumes of household solid waste without the technical capacity or budgets of large municipal corporations. Kerala's response a decentralised, women-and-men-led volunteer cadre known as the Haritha Karma Sena (HKS), or "Green Action Force" offers a working model of how a state can convert an environmental liability into a source of local employment. This article examines whether the scheme functions credibly as a waste-collection agency and what it means for the livelihoods of the people who run it. The evidence suggests that HKS has achieved high household participation and improved perceived environmental quality, while also lifting the incomes of a workforce drawn overwhelmingly from economically disadvantaged, middle-aged, moderately educated backgrounds even as it exposes workers to genuine occupational strain around pay, safety, and physical health.

Key Words

Solid waste management, Community Volunteerism, Environmental sustainability, Rural development, Haritha Karma Sena, Employment generation, Household cooperation, Decentralized Governance.

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I. Introduction

Solid waste generation has emerged as one of the most visible symptoms of economic growth, rising consumption and rapid urbanization across the developing world. Unlike air or water pollution, whose sources are often diffuse, solid waste accumulates conspicuously in streets, water bodies and open plots, making its mismanagement a direct threat to both environmental quality and public health. Left unmanaged, solid waste contaminates soil and groundwater, breeds disease vectors responsible for illnesses such as dengue and dysentery, and imposes long-term ecological costs that are disproportionately borne by low-income communities living close to dumping sites.

Global waste generation is projected to rise sharply in the coming decades as population growth and changing consumption patterns outpace the capacity of municipal systems, particularly across South Asia and Sub-Saharan Africa. Wealthier nations tend to have far higher waste-collection coverage than low-income regions, a disparity that mirrors the uneven distribution of municipal infrastructure and public investment worldwide. India, with an average per capita waste generation of roughly two-thirds of a kilogram per day, faces a growing gap between the waste generated and the waste that is actually collected, treated or scientifically disposed of. National policy instruments such as the Solid Waste Management Rules of 2016 and the Swachh Bharat Mission have attempted to close this gap by formalizing the role of waste pickers, promoting segregation at source, and encouraging decentralized processing.

Within this national landscape, Kerala has followed a distinctive trajectory. Rather than relying primarily on centralized landfills or large-scale incineration, the state has emphasized decentralized, community-anchored waste management built around its well-established Kudumbashree network of women's neighbourhood groups. The Haritha Karma Sena literally, the "Green Action Force" was constituted under the Haritha Kerala Mission and the Suchitwa Mission, drawing legal backing from provisions of the Kerala Municipalities Act relating to solid waste management. HKS units typically comprise local residents, often women from economically disadvantaged households, who are trained to collect segregated non-biodegradable waste directly from households and small establishments for a modest monthly user fee, which is then channelled partly to the workers as wages and partly to a panchayat-level consortium fund.

Haritha Karmasena is a venture working in the field of sanitation and waste management in local self-government bodies in Kerala. In 2017, as part of the Harithakeralam Mission Project implemented by the Government of Kerala, the formation of Haritha Karmasena was held in local self-government bodies. Door-step

collection of cleaned non-organic waste and in some cases organic waste, by haritha karma sena members, is carried out from households and institutions by collecting the user fee fixed by the Local Self-Government bodies based on the Government Order. The inorganic waste collected at regular intervals is delivered to the material collection facility. From here, the waste is sorted and sent to the resource recovery facility. They are then handed over for reuse or recycling.

As part of these activities the haritha karmasena is providing clean up means and solutions for organic waste management at homes. Haritha Keralam Mission, Kudumbashree, Shuchithwa Mission, Clean Kerala Company and Local Self-Government are all partners in this mega project. Tons of waste is being disposed of in the state through the Haritakarmasena system. Haritha karmasena is trying to become self-sufficient by creating new products from waste materials, promoting recycling and starting innovative green initiatives. More than 3,6000 haritha karma sena workers are currently working in all the local bodies of the state. The basic facilities, vehicles, uniforms, identity cards etc. required by them are provided under the leadership of the local self-government bodies.

This article investigates how the HKS scheme has functioned from two complementary vantage points: first, as an economic and social intervention in the lives of the workers themselves, and second, as a service delivered to and evaluated by the households it serves. In doing so, it engages with a broader policy question of considerable relevance to rural India: can community volunteerism, when formalized into a structured livelihood programme, simultaneously deliver environmental outcomes and income security, and what conditions determine its success?

II. Review Of Literature

Ministry of Housing and Urban Affairs- Government of India, (2019), assessed the plastic waste management and its issues, solution and case studies under Swachh Bharat Mission (Urban) by Ministry of Housing and Urban Affairs (mohua) of Govt. of India. The study goes through the types of Plastic, plastic waste management rule 2016; Reduce, reuse, recycle and recovery concepts; adoption of circular economy, etc. It explains the harmful effect of plastic wastes, a kind of solid waste to the entire environment. It pointed out 10 solutions or way forward for govts to reduce the use of plastic.

David N. Berde and David E. Bloom, "THE Economics of Municipal Solid Waste" assessed the generation and management of municipal solid waste through the perspective of economics. The authors estimated that, about two - thirds of a kilogram of waste per person per day. Industrial countries accounts, a disproportionately high share in world's waste compared to its share on world population and developing countries accounts a disproportionately high share in world's waste relative to their share of world income. When analysing across countries, it is found out that municipal solid waste is positively related to variations in PCI. Addressing the issues of handling hazardous waste, will become urgent matter especially in the developing countries, where the author's projects which emphasize increased annual municipal solid waste of annual growth rate of 2.7% through the year of 2010.

Chorgwoo Choe and Lain Fraser, "household waste management. Issue and guidelines", revealed the waste management policies, policy instruments, pricing for garbage collection and govt. reactors to the household waste. Household waste is generated and therefore it is needed to reduce it partly by produces and by Household. Household have no incentive to reduce the amount of waste. They conclude their study with their view that if a society wishes greatly to reduce household waste, it must either change its present consumption Patterns or hope that technological advances nullify the problem.

Myra J Hird, Scott Loughheed, R Kerry Rowe and Cassandra Kuyvenhoven "Making waste management public (or falling back to sleep)", is concerned with how and why public assemble around waste management issues. Through the study of a small city in Ontario in Canada, who landfill is closed and waste diversion options are saturated and that faces unsustainable cost in shipping it is waste to the United States, China and other region. It is understood that, the city 's official are under taking a cost benefit assessment to determine the efficiency of sitting a new landfill or any other waste management facility.

Mohammad Izzat Rasnam, Ahmad Fariz Mohammad & choo Ta Goh and Kohei Wantanabe (2016), sustainable E - waste management in Asia: analysis of practices in Japan, Taiwan and Malaysia aims to evaluate e - waste management practices in three Asian countries like Japan, Taiwan and Malaysia, and consequently, purpose, recommendations and insights for Malaysia on how to manage e- waste in a sustainable manner. There realities of e- waste problem are exponential increase in total amount, environmental degradation and health complications. All items of Electrical and Electronic Equipment (EEE) and its parts is the E waste. Management background, governance & legislation of E- waste, infrastructure, etc...

Sandhya Venkateswaran, "Managing Waste: Ecological, Economic & Social Dimensions", assessed the solid waste management practices and issues, environmental aspects, investment in waste management and emerging issues. Waste generated in any urban centre would be household or commercial refuse, street sweeping, construction and demolition debris, hospital waste and industrial waste. It explained that the storage of waste in

community bins creates unhygienic conditions. It is noted that most landfill sites in India are uncontrolled dumps and domestic, commercial, hospital and industrial waste are dumped together. Indiscriminate dumping of waste leads to air and waste pollution. Dry waste and organic content of waste offers tremendous opportunities for recycling over all the study explains the ecological, economic & social dimension of waste management.

Taken together, this literature converges on three recurring themes: (i) waste generation and management outcomes are deeply intertwined with income and consumption patterns; (ii) price-based and information-based interventions can shift household behaviour, but their success depends on design and local context; and (iii) community- or informal-sector-based collection systems can deliver both environmental and livelihood benefits, but only when workers are adequately supported, formalized and protected. The Haritha Karma Sena scheme in Kerala sits precisely at this intersection, combining a community-anchored labour model with a decentralized fee-based collection system, yet very little empirical work has examined its functioning at the level of an individual panchayat.

III. Research Gap

While international literature has extensively examined economic incentives, pricing instruments and informal-sector recycling, and while national-level Indian studies have documented policy frameworks such as the Solid Waste Management Rules and the Swachh Bharat Mission, there remains a distinct scarcity of grounded, panchayat-level empirical research on Kerala's Haritha Karma Sena model specifically. Existing accounts of HKS tend to be descriptive or programmatic, appearing in government reports and mission documents rather than in independent field-based socio-economic assessments. In particular, no prior study appears to have jointly examined (a) the demographic and socio-economic profile of HKS workers including their caste, religious composition, poverty status, health outcomes, job security and job satisfaction and (b) the corresponding perceptions, waste-segregation practices and cooperation levels of the households they serve, within a single, hilly and relatively remote panchayats. This dual-sided gap linking worker welfare with service-recipient satisfaction forms the empirical space that the present study seeks to fill.

IV. Research Objectives

The study is guided by three specific objectives:

1. Does HKS function credibly as an agency for solid waste collection, that is, does it actually reach households, gain their cooperation, and visibly improve the local environment?
2. What is the socio-economic profile of the people who staff it, and does the work improve or strain their economic and personal wellbeing?

V. Research Methodology

The study adopts a descriptive research design combining both primary and secondary sources of data, centred on Kerala.

Data Collection Tools: Data were gathered through a combination of personal interviews, telephone interviews, and a self-administered questionnaire circulated in the form of a Google Form.

Supplementary information was drawn from panchayat planning documents (Padhathi Regha), Suchitwa Mission and Haritha Keralam Mission publications, Local Self-Government Department records, newspaper reports, and relevant peer-reviewed and institutional literature accessed through academic databases and web sources.

Analytical Approach: Data were tabulated and analysed using simple descriptive statistics frequencies and percentages supplemented with bar charts, pie charts and line graphs to visualize distributions. Given the exploratory, panchayat-specific nature of the enquiry and the relatively small sample sizes dictated by the size of the local HKS workforce, inferential statistical testing was not undertaken; the analysis instead emphasizes descriptive patterns and their substantive interpretation.

VI. Analysis & Discussion

Socio-Economic Profile of Haritha Karma Sena Workers

Household size among workers clusters around four members in nearly half of the cases, with smaller shares reporting two, three or five-member households—broadly typical of contemporary rural Kerala family structures. Assessed against the poverty line, the workforce is overwhelmingly drawn from Below Poverty Line households, with fewer than a quarter classified as Above Poverty Line. This confirms that HKS functions, in practice, as a targeted livelihood intervention for economically vulnerable households rather than a general-purpose employment scheme.

Educationally, the workforce is moderately schooled: roughly three in five workers have completed high school, about a third have only primary-level education, and a small minority have progressed to higher secondary level; no worker reported education beyond higher secondary or a complete absence of schooling. This profile

suggests that HKS work does not require, nor primarily attract, highly educated individuals, but nor is it confined to the entirely unschooled.

Almost all workers—all but one—had held some form of paid work prior to joining HKS, indicating that the scheme did not represent most respondents' first exposure to employment but rather an alternative or supplementary livelihood. Comparing earnings before and after joining HKS reveals a marked improvement: whereas a majority of workers previously earned between one and five thousand rupees a month, the bulk of the workforce now earns between five and ten thousand rupees monthly through HKS work, with a smaller group earning even more. This upward shift in income constitutes one of the clearest indicators that the scheme has delivered tangible livelihood benefits to a workforce drawn predominantly from economically disadvantaged backgrounds.

Health outcomes among the workforce present a more mixed picture. A majority of workers reported suffering from some ailment, most commonly leg pain unsurprising given the physically demanding, door-to-door nature of waste collection across a hilly terrain followed by allergies and blood pressure-related conditions, with a smaller number reporting diabetes or other conditions such as thyroid disorders. Several workers attributed the worsening of these conditions directly to the physical demands of fieldwork, pointing to an occupational health dimension that the scheme has yet to adequately address.

Job satisfaction is moderate rather than uniformly high: half of the workers describe themselves as only "little" satisfied, with a large minority reporting full satisfaction and a small number expressing dissatisfaction linked to safety concerns, high travel costs in hilly terrain, and the physical difficulty of reaching scattered households, some of which are located in areas where wild animals such as boar have reportedly been sighted. Job security shows an even more uneven pattern: while a third of workers feel secure in their positions, a similar share feel only marginally secure, and the largest single group reports no job security at all. This finding is reinforced by isolated but serious reports of mistreatment, including one worker's account of being physically slapped by a household member, alongside more generalized concerns about encountering unfamiliar or aggressive domestic animals during collection rounds.

Despite these challenges, workers' assessment of household cooperation is generally positive: the overwhelming majority describe cooperation as "average," with a smaller share describing it as consistently reliable, and none reporting a complete absence of cooperation though workers' qualitative comments suggest that around six households in a typical worker's beat remain reluctant to pay promptly or to hand over properly segregated waste. When asked to evaluate the HKS scheme itself, the workers' assessment is overwhelmingly favourable: a clear majority rate it as "good," with a substantial further share rating it "excellent," and only a single worker offering a merely average assessment; no worker rated the scheme poorly.

Household Awareness, Practices and Perceptions

Turning to the forty-five households surveyed, awareness of solid waste management as a concept is reasonably widespread but far from universal: roughly two-thirds of households report having heard of solid waste management, while just over a third have not. Among those who are aware, information most commonly reaches households through newspapers, followed closely by television, public meetings and schools, with posters, radio and informal channels such as social media playing a smaller role. This pattern suggests that print and broadcast media, alongside school-based dissemination, remain the most effective channels for building public awareness in this rural context, more so than posters or door-to-door campaigns. Encouragingly, a large majority of households also report having received direct education on proper waste disposal from the panchayat itself, indicating that local governance structures have played an active informational role alongside mass media.

Household waste composition, as reported by respondents, typically comprises some combination of plastic, food waste and cloth material, with plastic-and-food-only or plastic-food-and-cloth combinations being the most frequently cited categories; more complex mixtures involving glass, electronic waste, cardboard or rubber are reported by only a small number of households, suggesting relatively simple, largely biodegradable-and-plastic-dominated waste streams typical of a rural, non-industrial panchayat. For collecting this waste prior to disposal, households rely on a variety of containers, with plastic bags being the single most common choice, followed by combinations of plastic bags with old buckets, and the use of sacks; smaller numbers use dedicated waste baskets or tins, often in combination with other containers.

With respect to actual disposal of non-biodegradable waste, the HKS scheme has become the overwhelmingly dominant channel: the vast majority of households now hand over such waste directly to HKS workers, with only a small residual minority relying on pits within their own compound or on public bins. This finding is perhaps the clearest quantitative indicator of the scheme's penetration and adoption within the panchayat. For biodegradable waste, households have adopted a range of complementary strategies: the largest share use kitchen waste directly as fertilizer for plants and trees, a substantial further share feed it to livestock such as cows, hens and pigs, and smaller shares rely on composting or burial in pits. This diversity indicates that

biodegradable waste management remains largely decentralized and household-driven, operating independently of the HKS collection system, which focuses primarily on non-biodegradable materials.

Households' overall opinion of the HKS scheme in the panchayat is strongly positive: nearly three-quarters rate it as "good," a further meaningful share rate it as "average," a small minority rate it "excellent," and only a single household offers a negative assessment. This pattern closely mirrors the workers' own largely favourable self-assessment of the scheme, lending convergent validity to the finding that HKS is broadly well-received. When asked directly whether waste disposal constitutes a major problem for their household, nearly two-thirds of respondents disagree, suggesting that for most households the HKS system has effectively resolved what might otherwise be a persistent domestic difficulty. Households' opinion of the HKS workers' attitude and conduct is similarly favourable, with the large majority describing it as good, a smaller share as average, and only one household describing it as poor—indicating strong interpersonal goodwill between collectors and the community they serve, notwithstanding the isolated frictions reported from the workers' side.

At the panchayat level, opinion is more evenly divided: just over half of households consider solid waste management to be a major problem currently facing the panchayat as a whole, while a substantial minority disagree, suggesting that while individual households feel their immediate waste-disposal needs are met, broader concerns persist about panchayat-wide cleanliness, likely linked to public spaces, water bodies or areas not directly served by household-level collection. Nonetheless, assessments of overall environmental quality following the scheme's introduction are overwhelmingly positive: the large majority of households report that the environment has become "much better," a further share describes it as "best," and only a small minority perceive no change. Finally, satisfaction with the panchayat's waste-collection process as a whole is near-universal, with the vast majority of households expressing satisfaction and only a very small number dissenting.

Synthesis

Read together, the worker-side and household-side findings reinforce one another. From the workers' perspective, HKS has delivered a meaningful, if imperfect, livelihood improvement to a predominantly poor, middle-aged, moderately educated workforce, raising incomes relative to prior employment even as it exposes workers to physical strain, variable job security, and occasional mistreatment. From the households' perspective, the scheme has become the default and overwhelmingly preferred channel for disposing of non-biodegradable waste, is credited with a visible improvement in local environmental quality, and enjoys strong goodwill toward the workers who deliver the service even though a residual minority of households remain less cooperative, and panchayat-wide waste concerns persist alongside high household-level satisfaction. The convergence of positive assessments on both sides of the transaction—labour and service delivery—supports the broader thesis that community-anchored, livelihood-linked waste collection models can simultaneously advance environmental and socio-economic objectives, provided that attention is paid to the specific vulnerabilities of the workforce that sustains them.

VII. Research Findings

- Nearly all workers held prior employment before joining HKS, and the scheme has raised most workers' monthly earnings relative to their previous occupations, indicating a genuine livelihood upgrade rather than a first entry into paid work.
- Occupational health strain, particularly leg pain and related musculoskeletal complaints, affects a majority of workers and is widely attributed to the physically demanding nature of door-to-door collection across hilly terrain.
- Job satisfaction is moderate and job security is notably uneven, with a meaningful share of workers reporting no job security at all and isolated but serious incidents of mistreatment by households.
- A small minority of relatively affluent, large-landholding households, along with some financially stretched middle-class households generating little waste, resist paying the monthly fee or handing over waste, creating friction for a subset of workers.
- Workers deployed in the panchayat's more remote and hilly wards face distinct accessibility challenges not shared by their counterparts in more accessible areas.
- Renter households, such as those in quarters, appear to particularly value the scheme as a solution to a waste-disposal problem they might otherwise struggle to resolve independently.
- Complementary decentralized waste-management infrastructure ring compost units, pipe compost, and earthworm compost and biogas plants coexists with HKS, particularly for managing biodegradable waste at the household level.
- Overall, cooperation across the panchayat's wards is high: of the sample households, only one had consistently refused to pay the fee or hand over waste, underscoring broad-based community buy-in.
- Household awareness of solid waste management concepts, while reasonably widespread, still leaves over a third of households without clear exposure to the issue, pointing to residual gaps in public communication.

- Both workers and households independently rate the HKS scheme favourably, and households report a marked perceived improvement in environmental quality since the scheme's introduction, alongside near-universal satisfaction with the panchayat's waste-collection process.

VIII. Conclusion

The socio-economic evidence conclude that Haritha Karma Sena functions as a credible, trusted agency for household solid waste collection, commanding near-universal household reliance and strongly positive perceptions of both its workers and its environmental impact. At the same time, it functions as more than an environmental programme: for a workforce drawn overwhelmingly from below-poverty-line, middle-aged, moderately educated households, HKS membership deliver a measurable improvement in monthly income relative to prior employment. The scheme is therefore best understood not as a waste-management programme with an incidental jobs benefit, or a livelihoods programme that happens to touch waste, but as a genuine hybrid one in which environmental sustainability and livelihood security are pursued through the same mechanism. Its remaining weaknesses worker safety, job security, and occupational health are the natural next frontier for a model that has already demonstrated it can bridge Kerala's rural waste crisis and its livelihood needs at once.

IX. Recommendations

For the Haritha Karma Sena Programme:

- Strengthen household-level awareness campaigns, particularly through schools and public meetings, to close the residual gap in solid waste management knowledge among roughly a third of households.
- Introduce a graduated system of persuasion and, where necessary, formal enforcement for the small minority of households that consistently decline to pay fees or hand over segregated waste.
- Provide travel allowances or logistical support for workers assigned to remote and hilly wards, where accessibility significantly increases the physical burden of collection.
- Actively promote the use of reusable cloth bags over single-use plastic bags for waste storage at the household level.
- Enhance occupational safety measures for workers, including protective equipment and protocols for encountering domestic or wild animals during collection rounds.
- Review and periodically revise wage rates to reflect the physical demands and rising cost of living faced by workers.
- Explore pathways toward greater employment security for HKS workers, potentially including formal recognition, contractual protections, or linkage to social security and pension schemes.
- Consider diversifying HKS operations to include allied waste-related services, such as collection from hotels and small commercial establishments, to expand both revenue and employment stability.
- Encourage HKS workers to provide households with advance notice—ideally one to three days—of their collection schedule, to improve household preparedness and cooperation.

For Households and the Panchayat:

- Encourage universal, consistent participation by all households in waste segregation and fee payment, moving toward the panchayat's stated goal of a fully waste-managed local body.
- Expand the availability of decentralized biodegradable-waste infrastructure, such as ring compost units, to households that do not yet have access to them.
- Foster a stronger sense of collective civic responsibility for supporting HKS workers, recognizing their role as a shared community resource rather than a purely transactional service.

X. Limitations

The study is subject to several limitations that should be borne in mind when interpreting its findings. First, as with any survey-based enquiry, some responses provided by workers and households may not be entirely accurate, whether due to recall difficulties, social desirability bias, or reluctance to disclose sensitive information such as income or health status. Second, the reliance on primary data collection was time-intensive, and the resulting sample sizes while adequate for a descriptive, panchayat-specific study, are too small to support statistical generalization. Third, the study encountered a degree of non-cooperation from certain respondents, which may have introduced some non-response bias into the household sample in particular.

XI. Scope For Future Research

Building on the present findings, several avenues merit further investigation. Comparative studies across multiple panchayats spanning coastal, midland and highland geographies within Kerala would help determine whether the patterns hold more generally or are shaped by its specific hilly, semi-remote character. Longitudinal

research tracking the same cohort of HKS workers over several years could shed further light on the long-term occupational health consequences and career trajectories associated with this form of work. Given the workforce's demographic skew, a dedicated gender-disaggregated analysis of women's experiences within HKS including its effects on intra-household bargaining power and time-use would add considerable depth. Future work might also usefully examine the financial sustainability of the HKS fee model, including the adequacy of the wage share retained by workers relative to the share allocated to panchayat consortium funds, and explore whether digital payment or route-optimization tools could reduce the logistical burden on workers in remote wards. Finally, comparative research examining HKS alongside analogous community-based waste-worker models elsewhere in India and the Global South would help identify the institutional conditions under which such schemes most successfully combine environmental and livelihood outcomes.

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