



Bridging Traditional Knowledge And Modern Waste Management: A Gendered Analysis Of Waste Picker Women In India

Prakash Kumar Hajam
Research Scholar
Department of Economics
Ranchi University Morabadi , Ranchi.
Pin code:-834001.

Dr. Jyoti Prakash
Assistant Professor
Department of Economics
Ranchi University Morabadi , Ranchi
Pin code:-834001

Abstract

The increasing urbanization and industrial growth in India have led to an unprecedented rise in waste generation, posing significant environmental and social challenges. Amid this scenario, women waste pickers play an indispensable role in waste segregation, recycling, and resource recovery. However, they remain one of the most marginalized groups, facing systemic neglect, gender discrimination, and hazardous working conditions.

This paper explores the intersection of the Indian Knowledge System (IKS)—rooted in sustainable living practices—and modern waste management strategies, with a gendered lens. By examining the contributions of women waste pickers and the challenges they face, the paper highlights how IKS principles like composting, source segregation, and upcycling can be integrated into modern waste management systems. It argues that recognizing and equipping waste picker women with IKS-based skills can empower them economically, reduce gender disparities, and create a more sustainable and inclusive urban waste management ecosystem. Through case studies of initiatives like Pune's SWaCH cooperative and Bengaluru's composting programs, this study illustrates the potential of IKS in fostering sustainable livelihoods and addressing urban waste challenges. Policy recommendations focus on formalizing waste picker women's roles, providing skill development in IKS-based practices, and promoting community-driven waste management models.

Keywords:- Indian Knowledge System (IKS) , Waste Picker Women , Sustainable Waste Management , Gender and Waste Management , Urban Waste Management , Informal Economy.

Introduction

The Growing Urban Waste Challenge in India

India is at the crossroads of rapid urbanization and environmental degradation. With urban areas generating over 62 million tons of waste annually, the country faces a mounting crisis in waste management. Only 70-80% of urban waste is collected, and less than 30% is treated, with the rest ending up in open dumps or landfills. This not only harms the environment but also poses severe health risks to communities. Addressing this issue requires innovative solutions that balance economic, social, and environmental priorities.

Women Waste Pickers: The Invisible Workforce

Among those managing urban waste, women waste pickers form a significant but invisible workforce. Often from marginalized communities, these women manually segregate and collect recyclables from mixed waste, playing a critical role in reducing landfill burdens and contributing to resource recovery. Despite their contributions, they face numerous challenges:

Economic Exploitation: Low and irregular incomes due to informal employment and middlemen exploitation.

Health and Safety Risks: Daily exposure to hazardous waste, sharp objects, and toxic chemicals without adequate protection.

Social Stigma: Viewed as "unclean," they endure discrimination based on caste, gender, and occupation.

While modern waste management systems focus on technological solutions, they often overlook the contributions and needs of women waste pickers, who work at the frontlines of urban waste management.

The Role of Indian Knowledge System in Waste Management

The Indian Knowledge System (IKS) offers valuable insights into sustainable waste management. Historically, Indian societies practiced waste segregation, composting, and reuse, aligning with the principles of a circular economy. For instance, organic waste was traditionally composted or used to produce biogas, while textiles and metals were creatively upcycled. These practices not only minimized waste but also created livelihoods for communities.

Incorporating IKS principles into modern waste management can address several gaps in the current system. By equipping women waste pickers with skills in composting, upcycling, and sustainable waste processing, their economic opportunities can be enhanced, and their contributions can be formally recognized. This approach aligns with global sustainable development goals (SDGs) and India's own commitments to sustainability under programs like Swachh Bharat Abhiyan.

Research Questions and Objectives

This paper seeks to address the following questions:

1. How can traditional knowledge and practices be integrated with modern waste management systems?
2. What are the unique challenges faced by women waste pickers, and how can IKS principles help mitigate them?
3. How can the contributions of women waste pickers be formalized and recognized within urban waste management policies?

The primary objectives are:

To analyze the historical and cultural relevance of IKS in waste management.

To investigate the socio-economic challenges faced by women waste pickers.

To propose actionable strategies based on IKS for empowering women waste pickers and creating sustainable waste management systems.

Structure of the Paper

The paper is organized as follows:

Section 1 provides a detailed review of the Indian Knowledge System and its relevance to waste management.

Section 2 examines the role and challenges of women waste pickers in urban India.

Section 3 presents case studies of successful initiatives that integrate IKS with modern waste management practices.

Section 4 outlines policy recommendations for formalizing and empowering women waste pickers.

The conclusion discusses the broader implications of integrating IKS into urban sustainability efforts.

Theoretical Framework

Indian Knowledge System and Sustainable Waste Management

IKS encompasses indigenous knowledge, philosophies, and practices that emphasize the harmonious coexistence of humans and nature. Key principles of IKS relevant to waste management include:

1. **Circular Economy Practices:** Traditional methods of composting, biogas production, and material reuse reduce waste.
2. **Source Segregation:** Historically, households practiced waste segregation, separating organic, recyclable, and non-recyclable materials.
3. **Craft and Upcycling:** Waste materials like textiles and metals were reused to create artisanal products.

4. Community-Based Systems: Waste management was often a collective responsibility, involving local communities.

Gender and Waste Picking in India

Women comprise a significant proportion of India's 1.5 million waste pickers. Their work involves sorting recyclable materials from mixed waste, often in hazardous conditions. Key challenges include:

Social Marginalization: Women waste pickers are often from marginalized castes and face discrimination on multiple fronts.

Health Risks: Exposure to pathogens, sharp objects, and toxic substances without protective gear.

Economic Vulnerability: Low and unstable incomes due to exploitation by middlemen.

Despite these challenges, women waste pickers contribute to sustainable urban waste management through:

1. Resource Recovery: Diverting recyclable materials from landfills.
2. Reduction of Environmental Pollution: Facilitating material reuse and recycling.
3. Informal Economy Participation: Contributing to the circular economy, albeit without formal recognition.

Methodology

1. Literature Review: Analyzing academic studies, government reports, and NGO publications on IKS, waste picker women, and urban waste management.
2. Case Studies: Investigating successful models where IKS principles have been integrated into waste management, such as the Pune SWaCH cooperative.
3. Field Research: Conducting interviews and surveys with women waste pickers, community leaders, and policymakers to understand their perspectives and challenges.

Findings and Discussion

Table 1: Socio-Economic and Work Conditions of Waste Picker Women in India

Category	Details	Source
Total Waste Pickers in India	Approximately 1.5 to 4 million	Swachh Bharat Mission (2022)
Percentage of Women Waste Pickers	60-70% of total waste pickers	Chikarmane (2016)
Daily Income	₹150 - ₹300 per day	Medappa & Prakash (2019)
Major Waste Materials Collected	Plastic (50%), Paper (20%), Metal (15%), Glass (10%), Others (5%)	Goel (2008)

Working Hours	8-12 hours per day	Sharma & Mishra (2019)
Access to Social Security	Less than 10% have access to government welfare schemes	Wilson et al. (2006)
Health Issues Faced	Respiratory problems, skin infections, musculoskeletal pain	Narayana & Rao (2018)
Education Level	80% have no formal education	Gupta & Chakraborty (2021)
Child Labour in Waste Picking	20-25% of waste pickers are children	Scheinberg et al. (2010)
Impact of Waste Pickers on Recycling	Contribute to 20-30% of India's total recycling output	Swachh Bharat Mission (2022)
Technology Use	Less than 5% of waste pickers use mobile apps or digital platforms	Ministry of Housing and Urban Affairs (2021)
Formal Recognition by Government	Less than 15% of waste pickers are formally registered	Chikarmane (2016)
Role in Composting & IKS Practices	40% of women waste pickers engage in composting activities	Gupta & Chakraborty (2021)

This data highlights the significant contributions of women waste pickers to India's waste management system while also shedding light on their socio-economic vulnerabilities. The integration of Indian Knowledge Systems (IKS) and modern technologies can improve their working conditions, enhance earnings, and contribute to sustainable waste management.

Table 2: Waste Picker Women in India – Economic and Environmental Contributions

Category	Data/Statistics	Source
Estimated Annual Contribution to Recycling Economy	₹3,000 - ₹5,000 crore (₹30-50 billion)	Chikarmane (2016)
Waste Collected Daily Per Waste Picker	20-50 kg of waste per person	Swachh Bharat Mission (2022)
Estimated Contribution to Urban Waste Recycling	30-40% of all recyclables recovered	Wilson et al. (2006)
Percentage of Household Waste Recycled Informally	60% of recyclable waste is processed by informal waste pickers	Goel (2008)
Proportion of Organic Waste Handled by Waste Pickers	25-30% of organic waste managed through composting	Gupta & Chakraborty (2021)
Access to Basic Protective Gear (Gloves, Masks, Shoes)	Only 12-15% have access	Narayana & Rao (2018)

Health Expenditure as a Percentage of Income	15-25% spent on health issues caused by waste handling	Medappa & Prakash (2019)
Number of Waste Picker Cooperatives in India	Around 100 cooperatives and SHGs	Sharma & Mishra (2019)
Percentage of Waste Pickers Interested in Formal Training	70% would adopt modern recycling techniques if trained	Gupta & Chakraborty (2021)
Impact of Technology Adoption on Income	30-40% income increase when using digital platforms for direct sales	Ministry of Housing and Urban Affairs (2021)
Percentage of Waste Pickers Using Traditional Composting Methods	35-45%	Chikarmane (2016)
Reduction in Waste to Landfill Due to Waste Pickers' Efforts	15-20% waste diverted from landfills	Swachh Bharat Mission (2022)

Insights from the Data:

- **Waste picker women play a critical role in urban waste management, contributing significantly to recycling and composting.**
- **Despite their environmental contributions, they lack social security, protective equipment, and formal recognition.**
- **Technology integration and training in modern waste management techniques could increase their efficiency, income, and working conditions.**
- **Supporting waste picker cooperatives and self-help groups (SHGs) can help in formalizing their work and improving earnings.**

This data reinforces the importance of bridging Indian Knowledge Systems (IKS) and modern waste management techniques to create a sustainable and inclusive waste economy in India.

1. Contributions of Women Waste Pickers in Urban Waste Management

Women waste pickers perform critical functions in waste management, including:

Segregation of Recyclables: Sorting paper, plastic, metal, and glass from mixed waste for resale to recycling units.

Reduction in Landfill Burden: Diverting significant volumes of waste from landfills, reducing environmental and health hazards.

Resource Recovery and Recycling: Reintroducing materials into the production cycle, contributing to the circular economy.

However, their work is undervalued due to the informal nature of their employment and persistent social stigma.

2. Challenges Faced by Women Waste Pickers

Social Stigma and Discrimination: Women waste pickers are often seen as "unclean" and face ostracization due to caste and gender biases.

Health and Safety Risks: Lack of protective equipment exposes them to injuries, infections, and chronic illnesses.

Economic Exploitation: Middlemen often pay them minimal amounts for the recyclable materials they collect.

Limited Access to Technology: Women rarely receive training in modern waste management technologies or access to advanced tools.

3. Relevance of IKS in Addressing Challenges

IKS principles can offer solutions to these challenges:

Source Segregation at Household Level: Promoting segregation of organic, recyclable, and non-recyclable waste reduces the burden on waste pickers and enhances resource recovery.

Composting and Organic Waste Management: Training women in traditional composting methods can create economic opportunities through the sale of organic fertilizers.

Upcycling and Craftsmanship: Leveraging traditional skills to upcycle waste materials into artisanal products can provide alternative income sources.

Community-Based Waste Management Models: IKS emphasizes collective responsibility, which can foster inclusive and cooperative waste management systems.

4. Case Studies: Integrating IKS with Waste Picker Women

1. Pune's SWaCH Cooperative:

SWaCH is a cooperative of waste pickers that integrates traditional practices like source segregation with modern waste collection systems. Women members are trained in waste management, provided fair wages, and recognized as essential workers.

2. Bengaluru's Composting Initiatives:

NGOs in Bengaluru have trained women waste pickers in composting organic waste using traditional methods, enabling them to produce and sell organic fertilizers.

3. Rajasthan's Upcycling Crafts:

Women-led initiatives in Rajasthan use textile waste to create handicrafts, combining traditional skills with modern design to access urban markets.

Policy Recommendations

1. Formal Recognition of Waste Picker Women

Include waste picker women in municipal policies as formal environmental workers.

Provide identity cards, healthcare benefits, and access to social security.

2. Skill Development in IKS-Based Practices

Train women in composting, vermiculture, and upcycling, drawing on IKS principles.

Partner with NGOs and community organizations for capacity building.

3. Establishment of Cooperatives

Support the formation of women-led cooperatives for collective bargaining power and better working conditions.

Promote shared ownership of waste management initiatives.

4. Public Awareness Campaigns

Conduct campaigns to educate the public about the contributions of waste pickers to urban sustainability.

Use IKS narratives to highlight the cultural and environmental significance of their work.

5. Integration of IKS in Urban Policies

Incorporate IKS-inspired practices, such as composting and recycling, into municipal waste management frameworks.

Allocate funding for training and infrastructure development.

Integrating Technology and IKS

The integration of the Indian Knowledge System (IKS) with modern technology offers a transformative pathway to enhance waste management practices while empowering women waste pickers. Traditional waste management practices such as composting, upcycling, and natural recycling methods align with the principles of sustainability but often lack scalability due to the absence of technological support. Leveraging modern tools can bridge this gap and create innovative solutions that not only modernize waste management but also improve the socio-economic conditions of waste pickers.

1. Mobile Applications for Waste Segregation Training

Mobile applications can serve as a vital tool for disseminating knowledge about IKS-based waste management. These apps could include:

Training Modules: Interactive tutorials on traditional composting methods, organic waste treatment, and the proper segregation of biodegradable and non-biodegradable waste.

Language Accessibility: Content in local languages to ensure accessibility for women waste pickers from diverse backgrounds.

Gamification: Using quizzes and rewards to make learning engaging and motivating.

For instance, an app could teach traditional vermicomposting techniques while integrating modern tips to enhance efficiency, such as optimal moisture and temperature levels.

2. Digital Platforms for Direct Connections

One of the critical challenges faced by waste pickers is dependence on middlemen, which reduces their earnings. A digital platform or marketplace could directly connect waste pickers with recycling firms, compost buyers, or manufacturers of upcycled products. Features of such a platform could include:

Real-Time Demand Mapping: Notifications about nearby recycling firms in need of specific materials like plastics, metals, or organic waste.

Fair Pricing Mechanism: Transparent pricing for recyclable materials to ensure equitable earnings for waste pickers.

Payment Integration: Digital wallets or payment systems to facilitate secure and timely transactions

Such platforms can empower women waste pickers to negotiate better rates and eliminate exploitative intermediaries.

3. IoT-Enabled Waste Management Systems

Internet of Things (IoT) devices can be integrated with traditional practices to improve efficiency. For example:

Composting Sensors: IoT devices could monitor parameters like temperature, moisture, and decomposition rates in compost pits, ensuring better quality compost.

Smart Bins: Bins equipped with sensors to detect waste levels and type of waste, encouraging segregation at the source and reducing the manual effort required by waste pickers.

4. Blockchain for Waste Tracking

Blockchain technology can be utilized to create a transparent and traceable waste management system. By tagging waste materials with unique identifiers, their journey from collection to recycling can be tracked. This system could:

Certify waste as responsibly recycled.

Provide records of individual contributions by waste pickers, which can be used to calculate incentives or rewards.

5. Community Portals for Knowledge Sharing

Online community portals can enable the exchange of knowledge among waste pickers, NGOs, and experts in IKS-based waste management. These portals could host:

Success stories of women waste pickers utilizing traditional methods.

Tutorials on creating marketable products from waste, such as biofertilizers or upcycled crafts.

Forums for peer-to-peer learning and collaboration.

6. Artificial Intelligence for Waste Pattern Analysis

Artificial Intelligence (AI) can be employed to analyze waste collection and segregation patterns, helping waste pickers optimize their efforts. For instance:

Predictive analytics to identify high-waste-generation areas.

AI tools to classify waste visually, reducing manual sorting time.

By combining the wisdom of IKS with the efficiency of modern technologies, these solutions can empower women waste pickers to play a more significant role in sustainable urban waste management while enhancing their livelihoods and social standing.

Conclusion

The integration of the Indian Knowledge System (IKS) with modern waste management practices offers a transformative pathway to address the dual challenges of urban waste and the socio-economic marginalization of women waste pickers. This study has highlighted the immense contributions of women waste pickers to the informal economy and their critical role in resource recovery, despite operating in precarious and marginalized conditions. By leveraging traditional knowledge, such as composting, upcycling, and natural recycling, alongside modern technological innovations like mobile apps, IoT, and blockchain, a more inclusive and sustainable waste management model can be established.

Empowering women waste pickers through training in IKS-based practices and providing them access to technology not only enhances their livelihoods but also aligns with India's sustainability goals and commitments to the SDGs. Initiatives such as community-led waste management models and cooperative organizations like SWaCH in Pune serve as powerful examples of how formal recognition and support can uplift waste pickers while improving urban waste systems.

The Integration of IKS and modern technology also underscores the potential of a circular economy in urban India. By reducing dependency on landfills and fostering resource recovery, this approach can mitigate environmental degradation while promoting economic equity. Furthermore, addressing gender disparities through targeted policies, such as formalizing waste picker roles, ensuring fair wages, and providing access to healthcare and social security, is essential for creating an equitable system.

Ultimately, the success of bridging traditional knowledge and modern waste management lies in a collaborative, multi-stakeholder approach that includes policymakers, NGOs, urban local bodies, and waste picker communities themselves. By valuing and integrating the contributions of women waste pickers and leveraging IKS, India can create a waste management system that is not only sustainable but also socially inclusive, economically viable, and environmentally resilient. This endeavor is not merely an environmental necessity but a social imperative to uplift and empower one of the most vulnerable sections of society, thereby creating a more just and equitable future for all.

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