

ECO-DRIVEN COMMUNITY EDUCATION FOR SUSTAINABLE PLASTIC USE: COLOMBO CASE STUDY

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Abstract - Plastic pollution represents a severe and escalating environmental and social challenge in urban areas such as Colombo, Sri Lanka, where rapid urbanization, population density, and inadequate waste management infrastructure contribute to high volumes of mismanaged plastic waste. This results in marine ecosystem degradation, soil contamination, microplastic infiltration into food chains, and disproportionate health and economic burdens on marginalized communities. This study assesses the effectiveness of community-based educational campaigns in fostering sustainable plastic consumption behaviors among urban households, employing a sociological framework to analyze behavior change through mechanisms like social learning, community cohesion, and cultural integration. Utilizing a mixed-methods approach, the research encompassed pre- and post-intervention surveys of 150 households across two socioeconomically diverse neighborhoods Wellawatte (middle-income) and Mattakkuliya (low-income) supplemented by semi-structured interviews with 20 community leaders and residents. The intervention involved a four-week program featuring interactive workshops, localized social media campaigns in Sinhala and Tamil, and participatory clean-up drives, tailored to incorporate Sri Lankan cultural elements such as Buddhist principles of non-harm (ahimsa) and communal harmony to boost engagement and receptivity. Quantitative outcomes demonstrated a 25% overall reduction in single-use plastic consumption (from an average of 10 bags per week per household to 7.5), a 71% increase in reusable item adoption (from 35% to 60% of households), and an 83% rise in regular recycling participation (from 30% to 55%), alongside a 50% improvement in environmental awareness scores (from a mean of 2.8 to 4.2 on a 5-point Likert scale). Qualitative findings illuminated the pivotal role of peer modeling and collective efficacy in driving change, while underscoring persistent barriers including economic constraints, infrastructural deficiencies, and gender-based disparities in waste management responsibilities. Socioeconomic differences were pronounced, with middle-income areas achieving a 28% reduction compared to 22% in low-income zones, highlighting the moderating influence of resource access. The results affirm the potential of sociologically grounded interventions to advance circular economy principles such as reduce, reuse, and recycle and align with United Nations Sustainable Development Goals (SDGs) 12 (Responsible Consumption and Production) and 13 (Climate Action). By providing

empirical insights into scalable, community-led strategies, this Colombo case study contributes to global and regional discourses on mitigating plastic pollution, emphasizing the integration of social sciences in environmental policy and practice for long-term behavioral and systemic transformations.

Key words—*behavior change, community education, plastic pollution, sustainable consumption*

I. INTRODUCTION

Plastic pollution has become one of the most pressing environmental crises of the 21st century, with global production surpassing 460 million tons annually and contributing to climate change through greenhouse gas emissions, biodiversity loss via habitat destruction, and pervasive microplastic contamination in ecosystems and human health chains. In South Asia, this challenge is intensified by rapid urbanization, high population densities, and limited infrastructure, leading to substantial plastic leakage into rivers, oceans, and landfills. Sri Lanka exemplifies these regional dynamics, generating approximately 250,000 tonnes of plastic waste each year, with around 70% attributed to single-use items and 69% (or 171,561 tonnes) remaining unmanaged due to weak enforcement of bans, inadequate alternatives, and low public awareness. In Colombo, the urban epicenter, daily solid waste generation reaches 5,000 tons, of which 10-15% comprises plastics, with recycling rates languishing below 10%, exacerbating marine ecosystem harm, soil contamination, and health risks such as respiratory issues from open burning and disruptions to livelihoods in fishing and tourism sectors. Recent studies indicate an annual increase in plastic consumption by 16%, reaching 265,000 tonnes, underscoring the urgency for targeted interventions.

Beyond environmental impacts, plastic pollution intersects with social inequalities, disproportionately

affecting low-income and marginalized communities who bear the brunt of waste mismanagement while contributing minimally to consumption patterns. From a sociological viewpoint, plastic use is not an isolated individual choice but a socially embedded practice influenced by cultural norms (e.g., convenience-driven consumption), economic constraints (e.g., affordability of single-use items), and community dynamics (e.g., lack of collective action). This study draws upon Albert Bandura's Social Learning Theory (1977), which emphasizes that behaviors are learned through observation, modeling, and reinforcement in social contexts, fostering collective efficacy the group's shared confidence in achieving outcomes. Complementarily, Robert Putnam's Social Capital Theory (2000) highlights how networks of trust, reciprocity, and cooperation within communities enable collective responses to environmental challenges. Furthermore, circular economy principles, as outlined by the Ellen MacArthur Foundation (2013), advocate for systemic shifts toward reducing waste through reuse, recycling, and minimized consumption, aligning with UN SDGs 12 and 13. In Sri Lanka, cultural elements like Buddhist principles of non-harm (ahimsa) and communal harmony offer untapped potential to enhance intervention receptivity.

Despite global and national efforts, such as Sri Lanka's National Action Plan on Plastic Waste Management (2021–2030), which promotes 3R principles (Reduce, Reuse, Recycle) and circular economy transitions, implementation gaps persist due to limited community engagement and behavioral focus. This research addresses a key gap in sociologically informed, community-driven interventions in urban South Asian contexts, posing the question: How do educational campaigns leveraging social learning and cultural elements influence sustainable plastic behaviors in Colombo households? The hypothesis suggests that such interventions will yield significant reductions in plastic use, moderated by socioeconomic factors, contributing to scalable models for urban sustainability. By examining this through a mixed-methods lens, the study not only evaluates immediate impacts but also informs broader policy frameworks for integrating social sciences into environmental strategies.

The paper is organized as follows: Section 2 reviews the literature; Section 3 details the methodology; Section 4 presents results; Section 5 discusses implications; and Section 6 concludes with recommendations and future directions.

II. LITERATURE REVIEW

The literature on plastic pollution and sustainable consumption spans environmental science, economics, and sociology, with increasing emphasis on behavioral

interventions in developing regions. This section expands on global and regional contexts, theoretical foundations, and case studies of community-based approaches.

A. Global and Regional Context of Plastic Pollution

Globally, plastic waste inputs into oceans are estimated at 19–23 million tons annually, with microplastics posing risks to marine life and human health via food chain contamination. In South and Southeast Asia, projections indicate a 40% rise in plastic waste by 2060 without interventions, driven by urbanization and consumption growth. Sri Lanka's national inventory reveals 1.59 million metric tons generated yearly, with 5% mismanaged, ranking the country among top ocean polluters and leading to cross-shore microplastic accumulation on western coasts. In Colombo, infrastructural deficits result in low recycling rates (5–10%), exacerbating health risks and economic burdens on waste pickers and coastal communities. Recent events, like the 2021 X-Press Pearl disaster, highlight vulnerabilities, while studies in areas like Weras Ganga and Bolgoda North Lake show high microplastic concentrations influenced by plastic color and degradation rates.

Socioeconomic dimensions reveal inequalities: marginalized groups face greater exposure, with plastic bans failing due to enforcement issues and lack of alternatives. In South Asia, similar patterns in Pakistan underscore the need for educational awareness on health and environmental risks.

B. Sociological Theories on Behavior Change for Sustainable Consumption

Behavioral change theories provide critical insights for designing effective interventions. Bandura's Social Learning Theory stresses the influence of peer observation, modeling, and reinforcement, highlighting how behaviors diffuse within social networks fostering collective efficacy. Ajzen's Theory of Planned Behavior complements this insight by linking attitudes, societal norms, and perceived control over behaviors to intentions, providing pathways for educational messaging to increase behavioral intention for plastic reduction. Robert Putnam's Social Capital Theory emphasizes the enabling role of social networks characterized by trust and reciprocity, facilitating cooperation essential for collective waste management efforts. Cultural factors, including Buddhist ethical principles prevalent in Sri Lanka, offer untapped motivational leverage for environmental behaviors, though their integration in intervention designs remains limited in the literature.

C. Community-Based Interventions and Case Studies

Globally, community-driven education programs demonstrate promise in promoting sustainable plastic use by integrating local culture and participatory methods. Southeast Asian case studies from Indonesia and India report 20-30% reductions in plastic consumption through workshop-based skill development, social media campaigns, and community clean-up drives adopting circular economy principles. South Asia's regional initiatives like the South Asia Co-operative Environment Programme's Plastic-Free Rivers and Seas focus on awareness and upstream engagement with industries and policymakers. Sri Lankan models such as the Plasticcycle initiative reflect emerging social entrepreneurship, yet gaps remain in addressing socioeconomic disparities, gender roles, and long-term behavioral maintenance.

III. METHODOLOGY

This study employed a convergent mixed-methods design to comprehensively evaluate the impact of a community-based educational campaign on sustainable plastic consumption behaviors in Colombo, integrating both quantitative and qualitative data to provide nuanced insights.

A. Study Design and Implementation

The research was conducted between January and April 2025, subsequent to preliminary presentations at the ICPIES 2025 conference. The design aimed to triangulate behavioral changes measured through pre- and post-intervention surveys with qualitative narratives derived from semi-structured interviews, thus capturing both outcomes and social processes shaping them. The mixed-methods approach aligns with Creswell's (2018) best practices for integrating quantitative metrics and qualitative contextualization to strengthen validity and interpretive power.

B. Study Area and Participants

Two socioeconomically contrasting neighborhoods in Colombo were selected: Wellawatte, representing a middle-income area with relatively better infrastructure; and Mattakkuliya, characterized by low-income informal settlements with greater plastic waste exposure. This dichotomy allowed for examination of socioeconomic moderating effects on behavior change. A total of 150 households equally divided between the two neighborhoods were recruited via door-to-door stratified sampling based on age (18-65 years; mean age 42), gender (52% female), income range (30,000 to over 100,000 LKR monthly), and educational

background (primary to tertiary levels). Inclusion required at least one year residency and regular plastic use. For qualitative depth, 20 purposively selected interviewees, comprising 10 community leaders (such as NGO representatives and religious figures) and 10 residents, participated in semi-structured interviews exploring contextual factors influencing plastic use and perceptions of the campaign.

C. Intervention Details: Workshop Plan and Activities

The intervention was a culturally tailored, four-week eco-driven campaign co-developed with the Colombo Municipal Council. It consisted of:

Week 1: Awareness workshops in Sinhala and Tamil, each neighborhood hosting two 1.5-hour sessions with 20-30 participants, featuring videos and interactive discussions linking plastic pollution impacts to Buddhist principles of non-harm (ahimsa).

Week 2: Skill-building workshops focused on practical reuse and recycling techniques, including demonstration of alternatives to single-use plastics.

Week 3: Social media outreach through Facebook and WhatsApp, targeting over 500 residents with bi-lingual infographics and behavioral challenges to reinforce messaging.

Week 4: Community clean-up drives—two events per neighborhood, each engaging 100 participants to foster collective efficacy and peer reinforcement.

Supporting materials such as reusable bags (150 distributed) and informational guides were provided to facilitate behavior adoption.

D. Data Collection Instruments

Data collection integrated standardized quantitative and qualitative methods:

Quantitative: A structured household survey (summarized in Appendix A) employing Likert scales assessed frequency of plastic use behaviors (e.g., single-use bag consumption), recycling habits, campaign exposure, perceived barriers, and demographic information. The survey was pilot tested (N=20) and yielded high reliability (Cronbach's alpha = 0.82). Surveys were administered pre-intervention

and two weeks post-intervention to capture immediate behavioral shifts.

Qualitative: Semi-structured interviews lasting 30-45 minutes were audio-recorded, exploring cultural influences, economic and infrastructural challenges, gender roles, and community dynamics affecting plastic behaviors. Flexible probing allowed for the emergence of in-depth themes relevant to sociological theories underpinning the intervention.

E. Data Analysis

Quantitative data were analyzed using SPSS software, generating descriptive statistics, paired t-tests to assess pre-post intervention differences, and chi-square tests to evaluate socioeconomic variations. Correlation analyses examined relationships between household income and degree of behavior change (e.g., $r=0.42$, $p<.01$).

Qualitative data were transcribed and analyzed in NVivo using thematic analysis following open coding to identify initial concepts (e.g., “peer motivation”), axial coding to cluster barriers and facilitators, and selective coding linking findings to theoretical frameworks. Triangulation of quantitative and qualitative results was conducted to strengthen findings validity. Member-checking procedures with interviewees helped mitigate bias and enhance credibility.

F. Limitations

While robust in design, study limitations include the short duration between intervention and post-assessment, potentially underestimating long-term sustained changes. Furthermore, reliance on self-reported data may introduce social desirability bias, although anonymity and mixed methods helped reduce these effects.

IV. RESULTS

The comprehensive analysis of survey and interview data revealed significant behavioral changes and sociocultural dynamics shaping sustainable plastic consumption in Colombo urban communities following the educational campaign.

A. Quantitative Findings

Pre-intervention baselines revealed high dependency: 62% households used single-use plastics frequently (avg. 10 bags/week), 30% recycled regularly, reusable adoption at 35%, awareness mean 2.8/5. Post-intervention: significant reductions single-use dropped 25% (7.5 bags/week, $t=8.2$, $p<0.001$), reusables increased 71% (60%, $t=7.5$, $p<0.001$), recycling 83%

(55%, $t=9.1$, $p<0.001$), awareness 4.2/5 (+50%, $t=10.3$, $p<0.001$). Campaign exposure: 78%, workshops rated 4.2/5 effective.

Neighborhood disparities: Wellawatte 28% reduction ($\chi^2=12.4$, $p<0.01$); Mattakkuliya 22%, due to economic barriers. Income positively correlated with change ($r=0.45$, $p<0.05$); gender showed women reporting higher initial burdens but similar gains.

Table I. Pre- and Post-Campaign Plastic Use Behaviors (N=150)

Behavior	Pre-Campaign (%)	Post-Campaign (%)	Change (%)
Frequent single-use bag use	62	37	-25
Regular recycling	28	52	+24
Use of reusable containers	35	60	+25

Table 2. Socioeconomic Variations in Plastic Reduction (%)

Neighborhood/Income	Reduction (%)	Sample Size
Wellawatte (Middle)	28	75
Mattakkuliya (Low)	22	75
Low Income (<LKR 60,000)	20	80
High Income (>LKR 60,000)	30	70

Differences according to socioeconomic status were observed; higher-income households showed greater adoption of reusable alternatives and participation in social media campaigns, while lower-income households emphasized practical reuse strategies such as upcycling plastic containers for household use. No significant gender differences appeared in behavior change, suggesting broad campaign relevance.

B. Qualitative Insights

The thematic analysis of interview data identified key facilitators and challenges influencing behavioral adoption:

- **Social Learning and Peer Influence:** Residents reported learning sustainable practices through observing community leaders and neighbours who modeled reusable bag use and recycling, consistent with Bandura's theory.
- **Cultural Integration:** Several participants linked campaign messages incorporating Buddhist ahimsa values as motivating factors, enhancing personal responsibility to minimize harm.
- **Community Cohesion:** The clean-up drives fostered a sense of collective efficacy, with participants expressing increased neighborhood pride and mutual accountability for environmental stewardship.
- **Economic Constraints:** Persistent poverty limited access to sustainable alternatives for some households, indicating need for policy support such as subsidized reusable products.
- **Infrastructure Limitations:** Lack of convenient recycling collection points and inconsistent municipal waste services undercut sustained behavior change despite high motivation.

V. DISCUSSION

The results demonstrate that community-based educational campaigns grounded in sociological theories can effectively foster behavior change towards sustainable plastic consumption in urban Sri Lankan contexts. The statistically significant reductions in single-use plastic use and enhanced recycling rates affirm the campaign's impact while underscoring variations by socioeconomic conditions.

Social Learning Theory mechanisms played a pivotal role, evidenced by behavioral modeling and reciprocal influence within social networks. This highlights the importance of peer champion identification in future programming. The integration of cultural values such as Buddhist ethics significantly enhanced message resonance, suggesting that culturally tailored interventions outperform generic approaches in this context.

Community cohesion emerged as a crucial sociological factor, with collective environmental action enhancing social capital and reinforcing individual commitments. These findings align with Putnam's theory, emphasizing trust and reciprocity as foundations for collective environmental governance.

However, infrastructural deficits and economic constraints present tangible barriers that limit long-term sustainability of behavior change. These findings call for multi-level strategies that combine community education with policy reforms, financial incentives, and enhanced waste management infrastructure to create enabling environments.

This study fills a research gap by empirically linking sociological theories with measured behavioral outcomes in a developing urban setting, contributing valuable insights for policymakers, NGOs, and social entrepreneurship models striving towards Sri Lanka's SDGs and circular economy goals.

VI. CONCLUSION AND RECOMMENDATIONS

This study provides robust evidence that community-based educational interventions incorporating sociological theories and cultural contextualization can significantly reduce unsustainable plastic consumption behaviors in urban Sri Lankan settings such as Colombo. By leveraging Social Learning Theory, Social Capital Theory, and integrating Buddhist/Hindu ethical values, the campaign facilitated meaningful behavioral shifts including reductions in single-use plastic bag consumption and increased recycling engagement.

However, the persistence of infrastructural and economic barriers underscores the necessity for holistic strategies that extend beyond education alone. Policymakers should prioritize expanding accessible and affordable recycling infrastructure, subsidizing sustainable alternatives to plastic packaging, and enforcing regulatory frameworks limiting single-use plastics, especially in low-income neighborhoods.

Recommendations for future programming include scaling up community workshops with peer champion networks to enhance social modeling and diffusion, integrating digital platforms for sustained engagement, and deepening collaboration with religious and cultural institutions to amplify ethical motivations. Longitudinal studies are warranted to assess durability of behavior changes over time and optimize intervention components for different demographic segments.

This research contributes to bridging sociological theory and practical environmental solutions within the Sri Lankan context, supporting national and global sustainability agendas such as the Sustainable Development Goals. It provides actionable insights for NGOs, government agencies, and social entrepreneurs committed to environmental stewardship and community empowerment.

A. Recommendations for Policy and Practice

1. Strengthen recycling infrastructure via public-private partnerships, prioritizing low-income areas.
2. Subsidize reusable alternatives and provide

microfinance for vulnerable households to overcome economic barriers.

3. Incorporate cultural values (e.g., ahimsa) in national campaigns to enhance engagement.
4. Scale digital tools for wider reach, integrating social media with community networks.
5. Enforce extended producer responsibility under circular economy frameworks.
6. Develop gender-sensitive programs, empowering women through training and leadership roles.

B. Future Research Directions

Longitudinal studies to assess sustained impacts; comparative analyses across South Asian cities; exploration of digital interventions; life-cycle assessments of plastics; interdisciplinary models integrating sociology with environmental science.

APPENDIX

A: Household Survey Summary

The survey included sections on: (1) Plastic Use Behaviors (e.g., frequency of single-use bags, reusables, recycling); (2) Awareness and Campaign Exposure (e.g., impact knowledge, effectiveness ratings); (3) Socio demographics (e.g., education, income, age). Items used multiple-choice and Likert scales. Full instrument available upon request.

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