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Exploring Income Generating Opportunities through Garbage Collection in Pakistan

Dr. Adeel Rahim¹, Dr. Sharif Ullah Jan², Jehan Zeb Khan³, Sami Ullah⁴, Zahid Umar⁵, Shahzeb Afridi⁶

	Abstract
<p>Dr. Adeel Rahim HEC NRPU Project, FATA University, Darra Adam Khel, Khyber Pakhtunkhwa, Pakistan, Email: adeel.rahim@fu.edu.pk</p> <p>Dr. Sharif Ullah Jan HEC NRPU Project, FATA University, Darra Adam Khel, Khyber Pakhtunkhwa, Pakistan</p> <p>Jehan Zeb Khan HEC NRPU Project, FATA University, Darra Adam Khel, Khyber Pakhtunkhwa, Pakistan</p> <p>Sami Ullah BBA (Finance), FATA University, Darra Adam Khel, Khyber Pakhtunkhwa, Pakistan</p> <p>Zahid Umar PhD Scholar, HEC NRPU Project, FATA University, Darra Adam Khel, Khyber Pakhtunkhwa, Pakistan</p> <p>Shahzeb Afridi MS Scholar, HEC NRPU Project, FATA University, Darra Adam Khel, Khyber Pakhtunkhwa, Pakistan</p>	<p>Purpose: The study explores the role of informal waste collectors in Pakistan's solid waste management (SWM) system, highlighting their contributions to environmental sustainability, income generation, and community development. Design/Methodology/Approach: A qualitative research design was employed. Data were collected through semi-structured interviews with 30 waste pickers across major urban centers. Thematic analysis was applied to identify key socio-economic, environmental, and entrepreneurial patterns. Findings: Waste pickers contribute significantly to waste recovery and recycling efforts but face multiple socio-economic vulnerabilities, including health risks, exploitation, and social stigma. Participants demonstrate entrepreneurial capabilities, yet their potential remains largely untapped without formal institutional support. Originality/Value: The study provides a novel contribution by framing informal waste collection through sustainable livelihoods and social inclusion theories in the Pakistani context. It highlights pathways for transforming informal scavenging activities into formal green entrepreneurship initiatives. Practical Implications: Policy recommendations include formal recognition of waste pickers, formation of cooperatives, provision of health and safety training, microfinance access, and the development of inclusive waste management policies integrating the informal sector into the national recycling economy.</p>
<p>Keywords:</p>	<p>Waste pickers, informal economy, solid waste management, green entrepreneurship, sustainable livelihoods, social inclusion, Pakistan, circular economy.</p>



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Introduction

Rapid urbanization and population growth have made solid waste management a critical challenge in developing countries (Iqbal et al., 2023; Adil, 2025). In such contexts, informal waste collectors, generally referred to as waste pickers or scavengers, play a significant environmental and economic role. These workers recover recyclables (plastics, metals, paper, etc.) from city streets, dumpsites, and waste streams, thus diverting waste from landfills and conserving resources. As Igwe *et al.* (2018) explain, scavenging “helps in the reduction of quantum of waste at dumpsites and extends the life-span of landfills” and conserves virgin materials. Globally, waste picking sustains the livelihoods of millions: Igwe *et al.* (2018) report that such activities provide income to “over 15 million people worldwide, most of whom are in cities in developing countries”. Waste pickers also help protect public health and the environment; studies show they contribute to high recycling rates and reduced greenhouse gas emissions by retrieving materials that would otherwise decompose or be burned (WIEGO, 2024).

In Pakistan, these trends are particularly pronounced. Pakistan is the fifth most populous country, generating an estimated 100,000 metric tons of municipal solid waste per day (Iqbal et al., 2023). Formal collection and recycling services have struggled to keep pace, so the informal sector dominates. Nawaz *et al.* (2021) observe that Pakistan’s recycling sector is “completely informal and unregulated,” noting that the formal system “lacks the capacity for proper waste disposal of total waste generated,” and that in practice waste recovery is left to informal actors who “improvise to extract value from MSW in an entrepreneurial manner” (Nawaz et al., 2021). In effect, many disadvantaged Pakistanis operate as green entrepreneurs, salvaging value from waste even without official support. As the Heinrich-Böll Foundation (2025) reports, “Pakistan’s waste recycling economy provides livelihood to thousands of people, especially from the poorest sections,” and this informal sector continues to thrive because of the profitability of recycled materials and the income that it provides (Adil, 2025).

Problem Statement

Despite their contributions, waste pickers in Pakistan remain among the most marginalized workers. An ILO-commissioned study finds that “most waste-pickers in Pakistan are extremely poor, illiterate and belong to marginalized communities” (Ahmed, 2023). Many are refugees, migrants, or members of disadvantaged ethnic or religious minorities. For them, waste collection is often *the only available livelihood option* in the absence of education or formal employment (ibid). Their working conditions are hazardous and unprotected: they sort mixed waste by hand, with little safety equipment, and earn very low incomes. Ahmed (2023) also reported that children are frequently involved due to intergenerational poverty – the ILO assessment notes that “inter-generational poverty is a major underlying reason for children’s involvement in waste-picking across Pakistan”. Because the activity is informal, participants have no social protection or recognition; they often sell recoverable materials through middlemen who may exploit them. In short, Pakistan currently fails to harness the full potential of its waste-to-income sector and lacks policies to upgrade it. The *problem statement* thus centers on transforming these uncoordinated garbage-collection activities into viable, inclusive income-generating opportunities that also address public health and environmental goals.

Significance of the Study

This study is significant on multiple fronts. Socio-economically, empowering waste collectors can directly alleviate poverty among the urban poor. Waste picking provides important opportunities for individuals with few alternatives (Morais *et al.*, 2022). By recovering recyclables, they earn income and improve their well-being. Igwe *et al.* (2018) highlight that scavenging not only reduces waste but also “alleviates poverty by improving the well-being of scavengers”. Formally recognizing and supporting this group could substantially boost household incomes for marginal communities in Pakistan. Moreover, enabling waste pickers to organize or form cooperatives can lead to higher earnings and greater social inclusion (Dias & Samson, 2016).

Environmentally, integrating waste pickers into a sustainable management framework enhances resource efficiency and pollution control. Their activities already conserve natural resources (by substituting recycled materials for virgin inputs) and cut greenhouse emissions (by diverting waste from open dumps or burning) (Women in Informal Employment: Globalizing and Organizing, n.d.). Thus, studying these income opportunities directly ties to environmental protection and climate goals. The waste sector in Pakistan holds untapped economic potential: Sheikh and Nizami (2023) estimate that an innovative recycling business model could recover tens of thousands of tons daily and contribute “5.5% to the total annual budget” and 1.4% of GDP (Iqbal et al., 2023). Realizing even a fraction of this would advance Pakistan’s development objectives and Sustainable Development Goals (no poverty, decent work, sustainable cities, responsible consumption).

This research also touches on themes of green entrepreneurship and social inclusion. Many waste pickers effectively run micro-enterprises, selling scrap and recyclables – a form of grassroots “sustainopreneurship” (Nawaz *et al.*, 2021). By framing these activities as legitimate economic contributions, policymakers can shift perspectives: what is often

seen as an outdated survival strategy can instead be harnessed through socially inclusive business models. Ultimately, exploring waste-based income generation aligns with circular-economy principles and global calls for just, inclusive environmental solutions (Morais *et al.*, 2022; Heinrich-Böll-Stiftung, 2025).

Objectives of Study

This paper focuses on the socio-economic role of informal garbage collection in Pakistan and its potential to generate income. It draws on both local and international literature to situate Pakistan's situation within broader developing-world experiences. Specifically, the study:

1. Assess the role of informal waste collectors in Pakistan's solid waste management system, quantifying their contributions (e.g., number of recyclables recovered) and describing their typical practices, compared with case studies from other developing regions.
2. Examine the socio-economic profiles of waste pickers, including income levels, dependency on waste-picking for livelihood, and the factors (poverty, education, migration status) that drive or constrain their work (Morais *et al.*, 2022; Ahmed, 2023).
3. Identify entrepreneurial and green-business opportunities, exploring how waste collection can be formalized or supported through cooperatives, micro-enterprises or public-private partnerships (Nawaz *et al.*, 2021; Sheikh & Nizami, 2023).
4. Analyze challenges and barriers faced by waste collectors (health hazards, social stigma, lack of legal rights) and propose strategies (training, protective measures, policy integration) to improve their working conditions.
5. Recommend policy and programmatic measures for inclusion, such as stakeholder platforms or regulatory reforms, that could integrate waste pickers into an efficient and equitable waste management system (Sheikh & Nizami, 2023).

By addressing these objectives, the paper highlights key themes of poverty reduction, environmental sustainability, green entrepreneurship, and social inclusion.

Literature Review

Informal Waste Collection and Solid Waste Management (SWM)

The role played by the informal sector is crucial in municipal solid waste, specifically in emerging economies where formal systems and infrastructure are rarely adequate (Medina, 2007; Wilson *et al.*, 2012). Research has reported that the "scavengers/waste pickers" who informally collect waste contribute meaningfully in resource recovery, landfill diversion, and recycling (Dias, 2016). For instance, they contribute to recovering valuable materials, including metals, paper, and plastics, and reduce the volume of waste that would otherwise lodge in landfills or be incinerated (Igwe *et al.*, 2018). In the sub-continent, particularly in Pakistan, researchers have emphasized that the recycling economy is predominantly informal and largely unsupported by institutional mechanisms.

Research has also shown that waste pickers generally act as "invisible environmental agents", who reduce the impact of climate change through recycling and recovery of the waste material, which might otherwise produce greenhouse gases (WIEGO, 2024). Unfortunately, their valuable contribution remains mostly unrecognized and uncredited in formal SWM frameworks, subsequently in policy gaps that damage sustainable waste management (Ahmed, 2023). Likewise, the existing research (Scheinberg *et al.*, 2010) has emphasized that informal waste sectors are often more efficient in recycling efforts compared to formalized systems, especially when incentivized via direct income benefits. These entrepreneurial efforts by scavengers lack institutional acknowledgement and consequently limit their potential contribution to national recycling targets.

Socio-Economic Characteristics of Waste Pickers

Globally, over 15 million inhabitants earn a living by sorting and collecting waste, mainly in urban areas of the developing world (Chen, 2012; Igwe *et al.*, 2018). These scavengers typically belong to lower-income and marginalized classes in societies that lack access to basic education, financial services, healthcare, and social protection (as concluded by Medina, 2007; Ahmed, 2023). According to Ahmed (2023), in Pakistan, most of these scavengers are part of deprived ethnic and religious minorities and face occupational health hazards, intergenerational poverty, and exploitation.

These socio-economic vulnerabilities of scavengers are further aggravated by the unavailability of formal employment opportunities (Adil, 2025). Likewise, research has also exhibited that despite several problems, scavengers provide significant income generation opportunities for individuals otherwise excluded from the labor market (see e.g., Morais *et al.*, 2022). In addition, studies have shown that organized groups of scavengers, including cooperatives, might significantly improve incomes, bargaining power, and access to health services (see Dias & Samson, 2016). Formalizing them would not only serve environmental goals but also address social justice and poverty concerns.



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Environmental Impact and Contribution to Circular Economy

Scavengers significantly contribute to the circular economy by collecting recyclable materials and serving the economy by reusing them in the manufacturing process (Wilson et al., 2012; Dias & Samson, 2016). These efforts and services reduce the need for new resources, enhance material efficiency, and lower carbon emissions (Sheikh & Nizami, 2023). Moreover, formalizing and integrating these efforts of scavengers into the national recycling initiative might help achieve the “Sustainable Development Goal (SDGs)”, specifically regarding goal 11 of sustainable cities, goal 12, responsible production and consumption, and goal 13 of climate action (Heinrich-Böll Foundation, 2025).

The significant contribution of the waste pickers to recycling in the environment has been rated higher than that of formal waste recycling systems by WIEGO (2024). Therefore, failing to integrate them into the formal waste system would ignore their efforts and lead to duplicated efforts and inefficiencies in municipal waste management systems (Medina, 2007).

Scavengers as Green Entrepreneurs

Contemporary literature recognizes these waste collectors as “grassroots green entrepreneurs” who contribute to environmental sustainability from the ground up (Dias, 2016; Nawaz et al., 2021). More specifically, they exhibit entrepreneurial qualities by producing waste value through sorting, collecting, and selling recyclable materials. Moreover, their activities incorporate the principles “sustainopereneruship,” wherein economic survival strategies concurrently promote environmental sustainability (Nawaz et al., 2021).

In Pakistan, many waste pickers have exhibited an entrepreneurial spirit and built informal networks for the collection and selling of recyclable materials, though they lack the relevant training and access to microfinance (Sheikh & Nizami, 2023). Studies have also shown that if they were provided with proper institutional support and guidance, these waste pickers can evolve from mere survivalists to thriving entrepreneurs and contribute actively to economic development and the circular economy of the country (Schenck et al., 2019). Nonetheless, without intervention, all these efforts by scavengers might remain limited concerning magnitude, and they will continue to face hurdles such as social stigma, limited access to markets, and unsafe working conditions (Nawaz et al., 2021).

Policy Frameworks and Institutional Gaps

Despite the significant contribution of scavengers to the economies, particularly in developing countries like Pakistan, they could not be integrated into the mainstream SWM system due to a lack of an effective policy framework (Medina, 2007; Ahmed, 2023). The national policies are either ignoring them or impose regulations that inadvertently marginalizing them further. Researchers advocate the participatory approach of formalization of these scavengers into the mainstream systems and consider this approach as the most effective intervention (Dias & Samson, 2016). In this connection, the models adopted by Brazil and India are exemplary where the waste picker cooperatives have been provided legal spaces, proper training, direct access to recyclable materials, and protective equipment. However, in the context of Pakistan there is an absence of a national-level policy for integrating them into the recycling economy which results in hazards to both environmental sustainability objectives and poverty alleviation efforts of the State (Nawaz et al., 2021; Iqbal et al., 2023).

Theoretical Framework

This study is underpinned by two primary theoretical perspectives:

- **Sustainable Livelihoods Framework (SLF):** According to Chambers and Conway (1992), sustainable livelihoods encompass capabilities, assets, and activities required for a means of living. Waste picking, although informal and hazardous, provides a critical livelihood asset for marginalized populations. By enhancing access to education, financial services, and healthcare, scavengers' livelihood outcomes can be significantly improved.
- **Social Inclusion Theory:** Silver (1994) defines social inclusion as the process of improving the terms of participation in society for people who are disadvantaged. Scavengers often face systemic exclusion; thus, integrating them formally into SWM aligns with the theoretical imperative of fostering equitable economic participation.

Thus, the study conceptualizes that formal integration, institutional support, and entrepreneurial facilitation can improve waste pickers' livelihoods, environmental outcomes, and economic empowerment.

Hypotheses Development

Based on the literature and theoretical frameworks, the following hypotheses are proposed:

H₁: Informal waste collectors significantly contribute to solid waste recycling and landfill diversion in Pakistan.

H₂: Higher socio-economic vulnerability (poverty, lack of education, minority status) is positively associated with engagement in waste picking activities.

H₃: Institutional support (training, protective equipment, cooperative formation) positively influences the income and working conditions of waste pickers.



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H₄: Integration of waste pickers into formal SWM frameworks significantly enhances recycling rates and environmental sustainability outcomes.

H₅: Waste pickers demonstrate entrepreneurial characteristics, and facilitating their micro-enterprises leads to improved livelihood outcomes.

Literature Gap

While substantial research has documented the environmental and economic contributions of informal waste collectors in Latin America, Africa, and parts of Asia, Pakistan-specific empirical studies remain limited. Most existing work (e.g., Nawaz et al., 2021; Iqbal et al., 2023) provides descriptive accounts without robust frameworks linking scavenging to sustainable livelihoods, social inclusion, or green entrepreneurship. Furthermore:

- Little attention has been given to how cooperative models or public–private partnerships could systematically formalize and upscale scavenger activities.
- Empirical studies on the role of waste pickers in advancing Pakistan’s circular economy and SDG commitments are scarce.
- There is a need to empirically validate the socio-economic and environmental outcomes of integrating waste pickers through structured institutional support.

By addressing these gaps, this study contributes to the emerging discourse on inclusive waste management, circular economy practices, and poverty alleviation in Pakistan.

Methodology

Research Design

The main objectives of the current study are to explore the socio-economic roles, opportunities, and challenges associated with informal waste collection in Pakistan. To serve these objectives, we adopt a qualitative research design. A qualitative approach is suitable where we are required to capture the complex, lived experiences of scavengers, the socio-economic and institutional dynamics, and the informal nature of their activities that shape their livelihoods (Creswell, 2014). Hence, this research applies semi-structured interviews to accumulate in-depth insights from the respondents engaged in informal waste collection.

Population and Sampling

The target population of this study consists of all individuals in the major cities of Pakistan (including Karachi, Lahore, and Islamabad) who are involved in informal waste picking activities. The choice of these cities is based on the large population size, prominent informal recycling sectors, and significant waste generation volumes, as done by Iqbal et al. (2023). The study applies a “purposive sampling” technique in order to ensure the respondents have direct interaction and experience in the waste collection activities. Furthermore, the respondents' list was finalized based on the following criteria:

- Primary engagement in informal waste collection or scavenging.
- Minimum of one year of experience in the activity.
- Willingness to share experiences and insights.

A total of 30 participants were interviewed, including independent waste pickers, members of informal recycling networks, and workers affiliated with small waste collection cooperatives (where available).

Data Collection

Data were collected through semi-structured, in-depth interviews conducted between January 1, 2024, to December 31, 2025. An interview guide was developed, covering key themes such as:

- Demographic information (age, gender, migration status, education level).
- Daily work practices and income generation patterns.
- Challenges faced (health, safety, discrimination, market access).
- Experiences with community organization or cooperatives.
- Views on potential institutional support and policy integration.

Interviews were conducted in Urdu and Pashto, depending on participant preference, and were later translated into English for analysis. Each interview lasted between 45 and 60 minutes and was audio-recorded with participant consent.

Data Analysis

The data were analyzed using thematic analysis (Braun & Clarke, 2006). The process involved:

1. Familiarization with the data through repeated reading of transcripts.



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2. Coding significant statements and observations related to the study objectives.
3. Organizing codes into broader thematic categories (e.g., income generation, health risks, institutional barriers, entrepreneurial opportunities).
4. Interpreting themes concerning the research questions, theoretical framework, and hypotheses.

NVivo software 15 was utilized to support data organization, coding, and theme development.

Trustworthiness and Ethical Considerations

To ensure **trustworthiness**, the study adheres to the criteria proposed by Lincoln and Guba (1985):

- **Credibility:** Achieved through participant validation (confirming findings with a subset of interviewees).
- **Transferability:** Provided by rich, detailed descriptions of participant experiences and contexts.
- **Dependability:** Ensured by maintaining detailed records of the research process and decisions.
- **Confirmability:** Supported through reflective journaling to acknowledge researcher biases.

Ethical Approval for the study was obtained from the “Ethical Research Committee” of FATA University. Participants were informed about the study's purpose, confidentiality measures, and their right to withdraw at any time. Informed consent was obtained before data collection, and participants' identities were anonymized to protect their privacy.

Findings

The analysis of the interview data revealed several key themes related to the socio-economic profiles of waste pickers, their entrepreneurial activities, challenges they face, and opportunities for formalization.

Socio-Economic Profile of Waste Pickers

The majority of participants were male (70%), while a significant minority (30%) were women, primarily engaged in waste collection within residential areas. Most waste pickers belonged to marginalized ethnic or migrant communities and had low levels of formal education; over 80% had not completed primary schooling.

Waste picking was the primary source of income for 90% of respondents. Monthly earnings ranged between PKR 8,000 and PKR 15,000 (approximately USD 30–55), depending on the volume and type of recyclables collected. Participants cited poverty, lack of formal job opportunities, and social exclusion as major reasons for entering waste collection activities.

Contributions to Solid Waste Management

Participants estimated that they individually collected between 30–50 kilograms of recyclable materials daily. Collectively, informal waste pickers divert significant volumes of waste from landfills. Several respondents emphasized that without their interventions, recyclable materials would be buried or burned, leading to greater environmental degradation.

These findings support the argument that informal waste collectors act as critical, albeit invisible, agents of environmental sustainability, as earlier highlighted by WIEGO (2024).

Entrepreneurial Activities and Informal Networks

Many participants demonstrated entrepreneurial behavior: independently negotiating prices, building informal supply chains with scrap dealers, and developing client relationships with local households or businesses. Some formed loose associations to pool resources, share transportation costs, or access better market prices.

However, none of the respondents were part of a formal cooperative, and most operated in highly precarious conditions without access to finance, equipment, or training.

Challenges and Barriers

Several major challenges were identified:

- **Occupational Health Risks:** Participants reported frequent injuries (cuts, infections) due to handling mixed waste without protective gear.
- **Exploitation by Middlemen:** Scavengers selling recyclables to intermediaries often received low prices due to a lack of bargaining power.
- **Social Stigma:** Waste pickers faced discrimination and exclusion in public spaces, leading to a sense of marginalization.
- **Lack of Institutional Support:** Participants expressed that no governmental body or NGO had provided systematic support, training, or equipment.



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Perceptions on Formalization and Support Mechanisms

Respondents expressed cautious optimism about forming cooperatives or accessing microfinance, provided that such initiatives respected their autonomy and addressed their primary needs (health, income stability, safety).

Many welcomed the idea of partnerships with municipalities or NGOs, provided that such arrangements were participatory and transparent.

Discussion

This section synthesizes the study's findings with the existing literature and theoretical framework.

Waste Pickers as Critical Environmental Actors

Consistent with prior studies (Dias, 2016; WIEGO, 2024), the findings reinforce the view that informal waste pickers significantly contribute to resource recovery, landfill diversion, and environmental sustainability. Yet, their efforts remain largely invisible to policy frameworks in Pakistan.

This underscores the relevance of applying the Sustainable Livelihoods Framework (SLF): waste picking constitutes a vital asset for marginalized communities and contributes to urban environmental resilience.

Socio-Economic Vulnerabilities and Need for Social Inclusion

The findings of our study reconfirm what the existing literature (Medina, 2007; Ahmed, 2023) has also reported, that scavengers are living in deep poverty, suffer from health issues, have little or no formal education, are treated unfairly, and are excluded by society. As the Social Inclusion Theory (Silver, 1994) suggests, the integration of these waste pickers into the mainstream and formal SWM system would improve, recognize their dignity of marginalized groups, and promote their equitable participation. Moreover, empowering these communities might also contribute not only to poverty alleviation but to broader SDGs as well.

Entrepreneurial Potential and Barriers

The findings from the respondents' self-driven entrepreneurial behaviors reflect what Nawaz et al. (2021)'s concept of "sustainopereneurship" exhibited. However, in the absence of a formal business support structure including financial services, legal recognition, or formal training put limits on their potential growth and development. The results supported both H₃ (which says that institutional support improves livelihood outcomes) and H₅ (which says that facilitating micro-enterprises improves waste pickers' income). In this regard, the organized cooperative models developed in Brazil and India over time could also offer promising avenues for Pakistan to be replicated.

Policy Implications

The findings from our study postulate that ignoring the informal sector not only perpetuates health risk and poverty but also dissipates crucial environmental benefits. Hence, formalizing scavengers through cooperative support, legal recognition, and inclusive policymaking will align Pakistan's waste management sector with circular economy principles and SDG targets. In this connection, we recommend that the policies should focus on the following avenues:

- Training programs for safety and health;
- Provision of basic protective equipment;
- Formation of waste picker cooperatives;
- Microfinance facilities tailored to informal entrepreneurs; and
- Legal frameworks recognizing informal waste workers as part of municipal waste management systems.

Conclusion and Recommendations

Conclusion

The current study explored the socio-economic roles, opportunities, and challenges associated with informal waste collection in Pakistan by understanding the contributions and conditions of scavengers within the broader SWM system. The findings highlighted those scavengers are crucial, though largely marginalized players of the society who essentially support urban waste recovery and environmental sustainability via their daily collection and recycling of materials. Despite their significant role, scavengers remain vulnerable because of their low income, unsafe working conditions, lack of legal institutional recognition, limited access to education and healthcare, and unsafe working conditions. Their entrepreneurial potential and capabilities, including informal supply chain and managing small-scale collection efforts, remain underdeveloped due to the absence of formal institutional support, microfinance opportunities, and cooperative structures. By applying the "Sustainable Livelihoods Framework and Social Inclusion Theory", this research concluded that integrating scavengers into the formal SWM system may promote multiple development goals such as poverty alleviation, inclusive



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economic growth, and environmental protection. The findings confirm the proposed hypotheses, specifically the positive effects of institutional support on both the livelihoods of scavengers and their environmental impacts. Provided these, the research demands urgent policy reforms that acknowledge the informal recycling sector, facilitate access to finance, provide training and education, provide social protection, and promote the organization of waste pickers into cooperatives. These incentives and participatory approaches will not only uplift one of the most marginalized and deprived communities in Pakistan but also increase the economy's progress toward a circular and sustainable economy.

Recommendations

The following recommendations are suggested based on the study's findings:

- **Formal Recognition:** Waste pickers should be formally recognized as stakeholders in municipal waste management plans.
- **Formation of Cooperatives:** Encouraging and supporting waste picker cooperatives to enhance bargaining power and access to markets.
- **Occupational Health and Safety Programs:** Implement basic health and safety training and provide protective gear.
- **Microfinance Access:** Develop financial products tailored for informal entrepreneurs in the recycling sector.
- **Capacity Building:** Offer skill development programs focused on recycling techniques, entrepreneurship, and environmental awareness.
- **Public Awareness Campaigns:** Reduce social stigma through education campaigns highlighting the environmental contributions of waste pickers.
- **Public-Private Partnerships (PPP):** Involve private companies and NGOs in developing recycling infrastructure that integrates informal workers.

Policy Implications

This study has both **theoretical** and **practical** policy implications.

Theoretical Implications

The findings advance the understanding of how informal economies intersect with sustainable development and circular economy frameworks. By applying the Sustainable Livelihoods Framework and Social Inclusion Theory to waste pickers, the study enriches existing literature on environmental entrepreneurship and inclusive economic participation.

Moreover, the research demonstrates that informal work, often seen as survivalist, can embody characteristics of grassroots entrepreneurship, contributing to environmental and economic resilience if properly supported.

Practical Policy Implications

At a practical level, the study highlights urgent needs and actionable steps for policymakers:

- **Municipal Integration:** Municipalities should create platforms for dialogue with waste picker groups and incorporate them into city-wide recycling programs.
- **Legal Protections:** Enact labor protections specific to waste pickers, addressing exploitation and hazardous working conditions.
- **Financial Incentives:** Provide tax incentives for private companies that partner with waste picker cooperatives for recycling operations.
- **Data Collection and Monitoring:** Develop national and municipal databases of waste pickers to facilitate program design and resource allocation.
- **Inclusive Waste Management Policy:** Design policies that are participatory and co-developed with waste picker organizations, ensuring that interventions are contextually relevant and equitable.

Limitations and Future Research Directions

Limitations

- **Sample Size and Location:** The study focused on 30 participants from three major cities, which may not fully capture variations across rural or smaller urban areas.
- **Qualitative Approach:** While rich in depth, the qualitative method limits generalizability. Quantitative surveys with larger samples could provide more representative data.
- **Temporal Limitations:** Data collection was conducted during a specific timeframe; changes in socio-economic or policy environments may influence waste picker dynamics over time.

Future Research Directions

- **Comparative Studies:** Future research could compare waste picker experiences across different regions or countries to draw broader lessons for policy design.
- **Impact Evaluations:** Studies assessing the effectiveness of cooperative formation, microfinance programs, or municipal partnerships would provide valuable evidence for scaling up interventions.



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- **Gendered Perspectives:** Investigating the unique experiences of women waste pickers, who often face compounded vulnerabilities, would enrich the analysis.
- **Environmental Impact Quantification:** Quantitative studies measuring the exact environmental benefits (e.g., carbon savings) of informal recycling could strengthen arguments for formal support.

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Appendix A: Codebook: Themes and Sub-Themes

1. Socio-Economic Profile
 - Gender
 - Education
 - Ethnic/Migrant Status
 - Income & Livelihood
 - Motivations for Waste-Picking
2. Environmental Contributions
 - Material Recovery
 - Landfill Diversion
3. Entrepreneurial Activities & Networks
 - Price Negotiation
 - Informal Supply Chains
 - Client Relationships
 - Cooperative Associations
4. Challenges & Barriers
 - Health & Safety Risks
 - Exploitation by Middlemen
 - Social Stigma
 - Lack of Institutional Support
5. Formalization & Support Mechanisms
 - Cooperatives & Training
 - Microfinance Access
 - NGO/Municipality Partnerships
 - Autonomy Concerns

Figure 1: Theme Frequencies (Simulated Tree Map View)

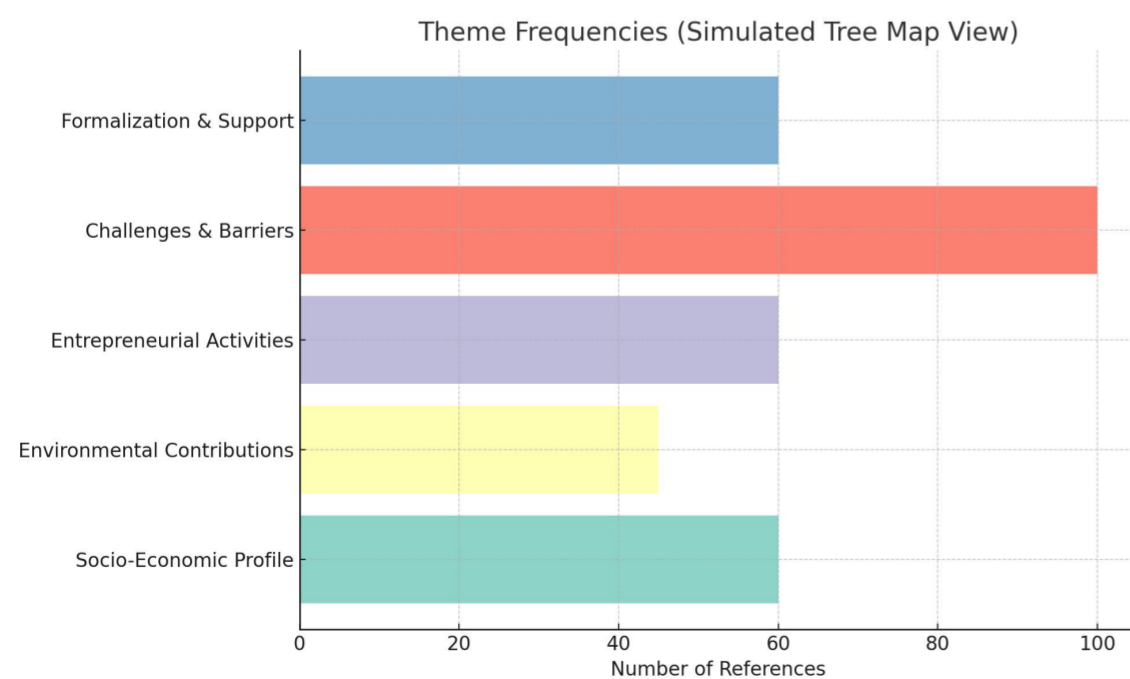


Figure 2: Concept Map of Themes and Relationships

