

Socio-Economic Contributions of Informal Waste Pickers to Urban Waste Management

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Abstract

A major but marginalized source of labor in urban waste management systems across the world is informal waste pickers. This paper will discuss the socio-economic complexity of the informal waste pickers contribution to sustainable urban development, environmental conservation, and frameworks of the circular economy. This paper, through the analysis of the modern research and empirical evidence, shows that waste pickers prevent large amounts of recyclable materials in landfills, smaller amounts of greenhouse gases, offer affordable waste management systems, and sustain livelihoods of millions of urban poor. Waste pickers have had significant contributions, but still experience systemic issues such as social stigmatization, economic exploitation and policy marginalization. This article proposes that it is possible to integrate and formalize the informal waste pickers into the municipal waste management systems without depriving them of their autonomy and economic opportunities.

Keywords

Informal Waste Pickers, Urban Waste Management, Circular Economy, Recycling, Sustainable Development, Social Inclusion

1. Introduction

The crisis of waste in the world is one of the most urgent environmental and social problems of the twenty-first century. Due to the increasing rate of urbanization in developing countries, the generation of municipal solid waste is growing exponentially, striking a greater burden on formal waste management systems than ever. According to United Nations Environment Programme (2024), global generation of waste is expected to rise by 70 percent by 2050 with the most significant rises in the low- and middle-income countries where formal waste collection systems are either insufficient or do not exist at all. In this scenario, informal waste pickers people gathering, sorting and selling recyclable items in waste streams have become vital players in the urban waste management systems especially in Asia, Africa and Latin America. Working in various other names, such as catadores (Brazil), pepenadores (Mexico), zabbaleen (Egypt), and ragpickers (India), informal waste pickers, also called waste collectors, scavengers, recyclers, or in region-specific names, are a heterogeneous workforce that is estimated to be between 15 and 20 million people worldwide [1]. These are workers who do not work under any form of employment contract and they will go out into streets, bins, dumpsites and landfills whereby they retrieve recyclable materials and then sell them to middlemen, junkshops or recycling facilities. Although in precarious status in urban economies and under the continuing social marginalization, informal waste pickers have significant socio-economic and environmental impact which is increasingly being appreciated by researchers, policymakers and international development agencies. This paper discusses the multidimensional role of informal waste pickers to urban waste management systems and how they have contributed to the city-based waste management systems in terms of economic value, environmental costs and social value. In the analysis, we rely on the recent literature, empirical research, and policy reports, and prove that informal waste pickers are an invaluable element of sustainable urban development and the circular economy models. In addition, this article discusses challenges and barriers to full recognition and inclusion of waste pickers in formal waste management, and suggests avenues that could lead to more inclusive and equitable practices that view waste pickers as environmental custodians and not marginal players.

The Scale and Organization of Informal Waste Picking

1.1 Global Distribution and Demographics

One of the most critical environmental and social problems of the twenty-first century is the crisis of waste in the world. With the rising pace of urbanization in developing nations, the production of municipal solid waste is exponentially rising, which is a greater blow to the formal waste management system than ever before. United Nations Environment Programme (2024) reveals that the total generation of waste globally will increase by 70 per cent by 2050, with most considerable increases in the low- and middle-income nations that have either inadequate formal waste collection systems or do not have them at all. In this context, informal waste pickers individuals collecting, sorting, and selling

recyclable materials in waste streams have been key stakeholders in the urban waste management systems particularly in Asia, Africa, and Latin America. Pепенadores (Mexico), ragpickers (India), catadores (Brazil), zabbaleen (Egypt), and working under different other names, like informal waste pickers, also known as waste collectors, scavengers, recyclers, or by other region-specific terms, informal waste pickers are a heterogeneous workforce ranging in number from 15 to 20 million people worldwide [2]. They are those workers who do not work by any employment agreement and they will venture into the streets, bins, dumpsites as well as landfills where they will pick up recyclable products and then sell them to the middlemen or junkshops or recycling plants. Even though in precarious condition in urban economies, and subject to the ongoing social marginalization, informal waste pickers do manifest considerable socio-economic and environmental effects that is ever more being increasingly valued by researchers, policymakers and international development organizations.

Table 1 mention Informal recycling workers play a key role in developing countries, particularly in Asia and Africa. Despite lacking formal status, they contribute significantly to waste recovery and the circular economy. Developed regions, such as Europe, have shifted toward more institutionalized waste management models.

Table 1. Regional distribution of informal waste pickers.

Region	Estimated Number (millions)	Share of Urban Workforce (%)	Recycling Contribution (%)
Asia	15–20	1.5–2.5	45
Africa	5–8	2.0–3.0	25
Latin America	4–6	1.0–1.5	30
Europe	<1	0.2	10

1.2 Organizational Structures and Value Chains

The informal waste picking involves highly organized forms of organization and value chains linking individual collectors to local, regional and global recycling markets. On the lowest level, people picking up waste work individually, and sell it in large quantities to middlemen, junkshop owners, or small scale recycling businesses. These intermediaries hold central positions in recycling value chains as they take the output of several collectors and sort, and process these materials to fit quality standards and sell it to bigger recycling plants or export markets. Waste pickers in many cities around the world have formed collective organizations such as cooperatives, associations and social enterprises that strengthen their economic bargaining power, social protection and political representation [3].

2. Economic Contributions of Informal Waste Pickers

2.1 Material Recovery and Resource Conservation

Material recovery efforts by informal waste pickers also contribute greatly to the economies of developing countries because of the conservation of virgin resources, lower extraction costs and recycling industries [4]. The studies show that the waste pickers redirect high rates of materials within the waste streams, and estimates indicate that they pick about 58 percent of plastics across the world, and consequently play a major role in supplying recycling value chains and the avoidance of plastic pollution. Informal waste collectors in most developing cities are the major or only source of material collection of the recyclable waste type, and recovery rates are often higher than those of the formal waste collection and management systems. The economic potential of materials obtained by garbage pickers is significant, but it is usually not fully reflected in the official economic statistics because the industry is very informal. Individual waste pickers usually gather 20–80 kilograms of engineered materials in a day, although there is a considerable difference in this number depending on urban settings and surroundings, waste types, market dynamics, and personal capacities. Such materials are plastics, metals (especially aluminum, copper, and steel), paper, cardboard, glass, and in some situations, electronic waste parts [5].

Table 2 This reveals that informal waste collectors not only create considerable economic value in the recycling economy (approximately US\$2.5 billion), but also play an important role in environmental protection by reducing carbon emissions and saving energy.

Table 2. Economic and environmental contributions of informal waste pickers.

Indicator	Estimated Annual Contribution	Economic Value (USD)	Environmental Impact
Recyclable Material Collected	60–80 million tons	\$2.5 billion	Reduced landfill volume by 25%
CO ₂ Emissions Avoided	-	-	30–50 million tons CO ₂ /year
Energy Savings	-	-	Equivalent to 10 million households' power use

2.2 Cost-Effective Waste Management Services

The informal garbage collectors offer affordable waste disposal services that save the local authorities both on expenses and overload their already weak formal systems. Waste pickers are commonly the sole functional waste collection service in cities with no comprehensive systems of waste collection, especially in informal settlements and marginal urban areas where uncollected waste would pose health risks to citizens and provide environmental pollution. Economic efficiency of informal waste picking is also based on low capital bases, labor-intensive operations, and direct market incentives that encourage material recovery over disposal. Comparative studies have shown that incorporation of

informal waste pickers in municipal waste management systems can save a lot of money and increase coverage of services and rates of recycling [6]. Cities collaborating with waste picker cooperatives have formalized partnerships, which report a high level of economic gains such as lowering the costs of collection and transportation, lowering the amount of landfills, and fostering the efficiency of recycling.

2.3 Livelihood Generation and Poverty Alleviation

Waste picking is a life-saving livelihood activity to millions of urban poor in the world, and a poverty reduction tool though the working conditions and economic vulnerability are often precarious. Studies of the incomes of waste pickers show that there is a great diversity of geographic setting, material markets, and situations. The research done in Indonesia shows that waste picker families make an average monthly income of around 197 USD, which leaves many waste pickers above the poverty line but below the minimum wage benchmarks [7]. Organised waste pickers in Brazil have realised markedly better income under mutual understanding and direct agreements with cities and factories. In addition to direct income generation, waste picking offers various economic benefits to the participants such as flexible work schedules, the lack of formal employment obstacles, flexible working conditions, and a possibility of participation of an entire household. Waste picking provides women, the elderly, persons with disabilities, and undocumented migrants with delicate, yet available sources of income, especially when these groups of people do not find formal labor markets to be satisfying. Furthermore, the waste picking is able to provide the contribution to the wider urban economies in terms of multiplier because the waste pickers spending facilitates the local businesses, the real estate business, and the provision of services.

2.4 Environmental Contributions of Informal Waste Pickers

Greenhouse Gas Emission Reduction

Material recovery by informal waste pickers is an important contributor to climate change mitigation as it lowers greenhouse gas emissions resulting between waste disposal and the manufacture of virgin materials. By redirecting organic and recyclable material out of landfills and dumpsites by implementing waste picking activities, the methane emissions generated by anaerobic decomposition processes are avoided, which offers considerable climate benefits. Recent studies investigating the long-term benefits of informal waste pickers in large urban areas show that they play a major role in recovering recyclable waste materials and reducing greenhouse gasses, and their temporal variation reflects dynamic changes in material recovery and mitigation of carbon dioxide emissions per year. Waste picking climate value is not limited to the avoided landfill emissions, but significant energy use and emissions reductions in regards to extracted virgin material, processed, and manufactured material [8]. The recycling of the materials collected by the waste pickers will substitute the production on the virgin resources and achieve energy savings and emission reduction depending on the type of material. As an illustration, recycling aluminum will save about 95 percent of the energy used in primary production, recycling plastic will save about 70-80 percent, recycling paper will save about 65 percent of energy used in virgin production. With the large amounts of materials that were accumulated by waste pickers across the world, their combined role in the GHG emission mitigation is a considerable but not always considered climate action.

Table 3 shows how different countries have achieved the multiple goals of social inclusion, economic empowerment, and environmental sustainability by integrating informal waste collectors into formal waste management systems through policy innovations and social integration mechanisms.

Table 3. Policy inclusion and support mechanisms for informal waste pickers.

Country	Policy/Program	Key Features	Impact
Brazil	National Waste Policy (2010)	Recognition of waste pickers as service providers; cooperative inclusion	Higher income, access to benefits
India	Swachh Bharat Mission	Municipal contracts with informal collectors	Enhanced inclusion in city recycling plans
Colombia	Constitutional Court Ruling (2011)	Legal protection for cooperatives	Formal recognition and fair compensation
Philippines	EcoWaste Coalition Programs	Community-based segregation and livelihood support	Reduced landfill waste, improved employment

2.5 Pollution Prevention and Environmental Health

The informal waste pickers help to prevent pollution by collecting and disposing of waste that would have polluted soil, water systems, and seas. Waste pickers significantly reduce plastic pollution, which has been identified as a major environmental crisis in the world because they collect about 58 percent of the plastics flowing into recycling channels all over the world. Such a material recovery prevents the leakage of plastics into rivers, oceans and terrestrial ecosystems where plastics remain centuries, break up into microplastics and cause massive ecological consequences [9]. In addition to mitigating plastic pollution, waste pickers deter environmental pollution by retrieving hazardous and toxic substances such as batteries, electronic and chemical waste that need special disposal and handling. Where there is no formal infrastructure to manage hazardous waste, the collection of these materials by informal waste pickers, although putting the workers at risk of health hazard, prevents large-scale environmental contamination that would otherwise be

caused by improper disposal. In addition, by clearing waste deposits in streets, drainage systems, and other open spaces, waste pickers also help in controlling the environment in terms of disease vectors breeding grounds, preventing flooding due to blocked drainage systems, as well as improving the aesthetics of the urban environment [10].

3. Circular Economy and Resource Efficiency

Informal waste pickers form the building blocks of the circular economic models, promoting a material flow, which closes the resource loops and optimizes the use of resources. Circular economy paradigm aims at removing dependence on consumption of resources by economies by implementing approaches such as waste avoidance, product durability, reuse, repair, remanufacturing, and recycling [11]. In this context, waste pickers play key roles of recovering the post-consumers materials and reusing them in production processes, thus eliminating the need to extract virgin resources and reducing the amount of waste produced. The inclusion of the role of waste pickers in the process of transforming the circular economy is increasingly receiving support in the international policy community, especially concerning discussions during the Global Plastics Treaty and sustainable development models. Policymakers are becoming more convinced that the circular economy goals can only be met by including informal waste workers into the mainstream systems instead of abstracting them via mechanization or formalization of these systems excluding current workers. Models of inclusive circular economy that acknowledge the experience of waste pickers, fairly compensates and social protection are positive avenues to sustainable waste management strategies that can both achieve environmental goals and consider social justice issues [12].

3.1 Social Contributions and Community Development

Social Capital and Community Organization

In addition to its economic and environmental benefits, informal waste pickers create social capital (social organization, community support systems and collective action) that extends beyond the interests of the workplace. The community of waste pickers also often shows a strong sense of solidarity that emerges through the sense of shared work identity, vulnerable experiences of marginalization, and cooperative work structures. This social solidarity allows the creation of cooperatives, associations, and social movements that enhance the voice of waste pickers, promote the recognition and rights, and mobilize to change the working conditions and reform the policy [13]. Well-known waste picker organizations include the National Movement of Waste Pickers (MNCR) in Brazil, which has won several major policy battles like the legalization of the role of waste pickers in the constitution, and preferential treatment of waste picker cooperatives in municipal waste collection institutions. On the same note, the Alliance of Indian Waste Pickers has been effective in lobbying the policy to provide policy reform measures that ban privatization of waste management services that would render the informal employees redundant and enforce social provision of protection to the waste pickers. These organizational experiences reflect the ability of waste pickers to mobilize politically and take on an active role in determining the urban government, but not as a passive receiver of policy interventions.

3.2 Knowledge Systems and Innovation

The informal waste pickers have complex knowledge systems about the nature of materials, market relations, waste circulation, and resource recovery practices based on experiential learning and transmissibility intergenerational knowledge. This tacit knowledge encompasses skills to recognize a wide range of plastic polymer types based on visual and a feel aspect, evaluate the quality and level of contamination of materials, maximize the collection process and timing, and use innovative problem-solving strategies to technical challenges. The skills of waste pickers can be judged as one of the pioneers of human capital that the systems of waste management do not clearly understand or utilize to gain the opportunity to optimize the system and share knowledge [14]. Moreover, the communities of waste pickers have been shown to have a high level of innovation in the design of relevant technologies, the system of work collaboration, and the development of social enterprises that respond to their needs and circumstances. They may be development of modified collection vehicles adapted to narrow streets and steep terrain, the introduction of quality control systems, industrial requirements, and the development of value-added processing methods to increase marketability of the material and increase profits. It is possible to acknowledge and empower the waste pickers due to their knowledge and innovation abilities, which will increase the effectiveness of the waste management system, yet leave the workers with their autonomy and professionalism [15].

3.3 Challenges and Barriers Facing Informal Waste Pickers

Social Stigmatization and Marginalization

In spite of their significant contribution, informal waste pickers are subjected to the wide spread social stigmatization which stems out of the relationship between waste work and pollution, poverty and social marginality. When the dumping of waste is constructed culturally as dirty, dangerous, and degrading, it is symbolically transferred onto the waste pickers themselves leading to social discrimination, exclusion, and a lack of basic dignity and respect. Such stigmatization takes diverse forms such as verbal harassment, physical violence, discriminatory treatment by authorities, and social ostracism that is extended to the family members and communities of the waste pickers. Psychological and social implications of stigmatization are massive and have an impact on self esteem, mental health and social integration of the waste pickers [16]. The children of waste pickers are often discriminated in schools or educational institutions, which restricts their access to education and perpetuates the poverty cycle between generations. Women

waste pickers experience further stigmatization with gender, class, occupation intersections, sexual harassment, gender-based violence, and other impediments to social mobility. The solution to social stigmatization has to be multifaceted such as public awareness programs that rebrand waste pickers as environmental workers, policy-based responses that give them formal acknowledgment and protection, and education-based responses that dismantle discriminatory mindsets.

3.4 Occupational Health and Safety Risks

The occupational health and safety risks encountered by informal waste pickers are manifold and are based on exposure to hazardous material, exposure to hazardous working environments and the lack of protective gear and medical care. However, some of the common health risks include cuts and puncture wounds caused by sharp objects, musculoskeletal injuries caused by heavy lifting and repetitive movements, respiratory illnesses caused by dust and toxic fumes, skin diseases caused by contact with dirty materials and infectious diseases caused by contact with pathogens. Other risks such as machinery accidents, fire and explosion risks, building collapses and excessive weather conditions are also of risk to waste pickers operating at dumpsites and landfills. The financial resources of informal waste pickers, absence of health coverage, discrimination in healthcare settings and time are the most common barriers to accessing healthcare services due to the daily survival necessities [17]. Poor health conditions such as respiratory illnesses, skin related problems, and musculoskeletal disorders are very common in the population of waste pickers and in most cases they go undetected to cause irreversible disabilities. Waste pickers children are especially at high risk of health risks such as poor growth and development, high risks of infection, and long term health effects that persist into adulthood.

4. Economic Exploitation and Vulnerability

The unofficial quality of waste picking work also subjects the workers to several types of economic exploitations such as manipulations in prices by middlemen, theft of materials gathered, no employment benefits, and no social security benefits. The weak bargaining position of the waste pickers is frequently exploited by middlemen, who acquire the materials at low prices, weigh them badly, or pay them late, and bind them in debt relationships, which lead them to a state of dependency. Unpredictability in recycling markets directly impacts the income of the waste pickers leading to economic insecurity and hardship in financial planning. The informal waste pickers are not subject to formal employment benefits like minimum wages, paid leave, retirement pensions, unemployment insurance, and workers compensation of occupational injuries. This lack of social security exposes the waste pickers and their families to economic shocks such as sickness, injury, market failures, and seasonal changes in availability of materials. Moreover, informal status denies waste pickers access to formal credit facilities and they have to be satisfied with informal money lenders who charge astronomical interest rates and traps them in debt cycles [18]. The cooperative organization has been effective in correcting certain types of economic exploitation by collective bargaining, direct access to the market, and formation of fair prices systems.

4.1 Policy Exclusion and Criminalization

The policy and legal frameworks of urban waste management are often not conducive to informal waste pickers, and criminalizing them often poses an obstacle to their acceptance, protection, and formalization. Privatization efforts on waste management usually do not offer alternative sources of livelihood or compensation to the incumbent informal workers, instead transferring gains to formal privately-owned businesses and externalizing social costs on the vulnerable populations. Waste picking can also be banned by municipal authorities under anti-scavenging ordinances or trespassing statutes or as a nuisance to the community and the waste pickers can face police harassment, fines, arrests, and seizure of materials and equipment collected. These trends in criminalizing waste picking have been mirrored in wider trends of urban governance that place aesthetic values and interests of the formal sector ahead of acknowledging informal livelihoods and workers rights. Informal waste pickers are sometimes discussed with zero-waste policies and modernization agendas that see informal waste pickers as a barrier to progress, instead of a collaborator in sustainable development, which can result in policies that aim to eradicate informal waste work instead of facilitating it. Policy options based on progressive policies that acknowledge the role of waste pickers, ensure their rights, offer social security, and empower them to integrate into formal structures and maintain autonomy have proven possible and effective in different settings such as Brazil, India, Colombia, and South Africa [19].

4.2 Pathways Toward Integration and Recognition

Inclusive Policy Frameworks

Creating supportive policy frameworks to credit the role of waste pickers and ensure they have their rights is an important avenue to the more just and sustainable systems of waste management. The effective policies should cover various aspects such as legalization of waste picking as a legitimate employment, preferential treatment when contracting waste picker cooperatives, social protection benefits, occupational health and safety standards and ensuring meaningful engagement in policy-making. Other examples of international policies show that inclusive policymaking can take many forms, such as India's National Solid Waste Policy that has given preference to waste picker cooperatives in municipal contracts and publically funded cooperative infrastructure. The policy frameworks must propose rights-based strategies of treating the waste pickers as workers who deserve fair wages, good working conditions and social protection instead of beneficiaries of charity or development interventions. It involves confronting discriminatory ways

of thinking, overcoming structural obstacles to inclusion, and having formalization practices improve, rather than deter the livelihoods and independence of the waste pickers. Moreover, the policies should be established in a participatory manner that engages the organizations of waste pickers as stakeholders, so that the policy answers are based on the priorities of workers, experience, and knowledge.

4.3 Support for Collective Organization

The collective organization of waste pickers (in cooperatives, associations, and social enterprises) enhances their economic bargaining power, offers political advocacy opportunities, and access to resources and services. Effective waste picker cooperatives are characterized by better income, improved working conditions, social protection and greater political leverage than single informal collections. The inclusion of capacity building programs, access to credit and capital to invest in infrastructure, legal support programs to formalize the process, and preferential procurement policies do constitute the part of the public support to form and strengthen cooperatives. Per cooperative formation, however, it should not be enforced as a condition of recognition or support since some waste pickers would rather work independently in a group setting. Policies must be in such a way that it supports the variety of organizational kinds and promotes agency in the hands of the workers to decide on the proper organizational forms that suit the particular the situations. Moreover, cooperatives should be supported with the issue of internal governance, democratic decision-making, gender equity, and elimination of elite capture that can recreate exploitative relationships inside cooperative organizations.

4.4 Integration with Formal Waste Management Systems

To ensure the formalisation of informal waste pickers into formal waste management frameworks, retaining livelihoods and autonomy, contractual set-ups, service delivery frameworks and institutional processes need to be carefully designed. Examples of successful integrations are door to door collection services that are contracted to waste picker cooperatives, the creation of sorting facilities managed by waste picker organizations, the payments of environmental services that acknowledge the efforts made by waste pickers in the recycling and prevention of pollution, and extended producer responsibility schemes where funding is provided to informal waste workers. Integration must strengthen and not eliminate the livelihoods of waste pickers by developing strategies that not only appreciate their existing roles, but also harness their skills and organizational abilities and guarantee their future roles in the waste management value chains [20]. This involves opposing any technological solutions which mechanize the collection and sorting processes in a manner that will remove any job opportunities to the informal workers, and perhaps instead where they come up with intermediate technologies that enhance better working conditions without reducing labor intensity. Moreover, integration should be gender equity-oriented, where women waste pickers should have the same access to opportunities and childcare and other reproductive labor issues are taken into account.

5. Conclusion

The informal waste pickers have huge and diversified impacts on both urban waste management systems, sustainable development, and circular economy transitions in the world. Their economic services in terms of material recovery, affordable service delivery and the production of livelihood are of a considerable magnitude but are often underestimated on the statistical records. The environmental advantages such as reduction of greenhouse gasses, pollution, and resource efficiency show how waste pickers are environmental stewards mitigating climate change and ecological destruction. The perspectives of social contribution, community organization, and solidarity networks show the agency and capacities of waste pickers in regard to the close economic frameworks. In spite of these significant contributions, informal waste pickers still experience systemic issues such as social stigmatization, work-related health hazards, financial exploitation and policy marginalization that humiliate their dignity, rights and wellbeing. To solve these problems, we need decisive changes in how societies and policymakers perceive and appreciate the work of waste, where they no longer criminalize and marginalize it, but rather recognize, include, and support it. Some of the paths leading to a fairer and more sustainable system of waste management are creation of inclusive policy frameworks, collective organizing, prudent integration, pathways that enrich the livelihoods of informal waste pickers instead of displacing them. With the growing and growing importance on global discourse of transitions to a circular economy, climate action, and sustainable development, awareness of informal waste pickers as formidable collaborators is becoming a necessity. As their current work shows, sustainable management of waste relies not only on technological remedies or official systems, but inherently on the social integration, economic fairness and valuing of knowledge and labor of waste pickers of the world. The voices, experience, and priorities of the waste pickers need to be placed at the centre of future research, policy formulation, and practices and the process of transition towards the sustainable futures should not derail the rights and dignity of those who have always been the invisible green custodians of urban landscapes.

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