INTEGRATION OF INFORMAL SECTOR IN SOLID WASTE MANAGEMENT

STRATEGIES AND APPROACHES

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STRATEGIES AND APPROACHES

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Abbreviations

BBMP	Bruhat Bengaluru Mahanagara Palike
C&D	Construction and demolition
CAG	Comptroller and Auditor General
DWCC	Dry waste collection centers
GST	Goods and Services Tax
ILO	International Labour Organization
KKPKP	Kagad Kach Patra Kashtakari Panchayat
MBOs	Member-based organizations
MRF	Material recovery facility
PMC	Pune Municipal Corporation
PPE	Personal protective equipment
SDGs	Sustainable Development Goals
SKs	Swachhta kendras
SWM	Solid waste management
TPD	Tonnes per day
ULB	Urban local body
UNDP	United Nations Development Programme
WTE	Waste to energy

‘Everyone has the right to work, to free choice of employment, to just and favourable conditions of work and to protection against unemployment. Everyone, without any discrimination, has the right to equal pay for equal work. Everyone who works has the right to just and favourable remuneration ensuring for himself and his family an existence worthy of human dignity, and supplemented, if necessary, by other means of social protection. Everyone has the right to form and to join trade unions for the protection of his interests.’

— Article 23 of The Universal Declaration of Human Rights

Introduction

With burgeoning population and even faster urbanization, there has been an explosion in the generation of municipal solid waste (MSW) in Indian cities. This has severely damaged the environment and public health, and strained the capacity of urban local bodies (ULBs) to collect, transport, treat and scientifically dispose of solid wastes. Urban India alone generates nearly 0.15 million tonnes per day (TPD) of MSW, with per capita generation ranging between 0.30–0.45 kg per day. The volume of waste is projected to reach 165 million tonnes by 2031 and 436 million tonnes by 2050, if existing policies, programmes and management strategies are not adequately addressed.

Environmentally sound and economically viable management of solid waste is the sole responsibility of legally prescribed urban local bodies (ULBs). Due to lack of policy and technological interventions, non-cooperation among stakeholders and inefficient collection mechanisms, solid waste management services are inefficiently managed by India's municipalities. As a result, a large segment of residents is not provided with waste collection services. Of the 62 million tonnes of waste generated annually in India only 68 per cent is collected, of which only 28 per cent is treated by municipal corporations. Thus, at present, only 19 per cent of the total waste generated in the country is treated and more than 80 per cent is disposed of in an unscientific manner at dumpsites. The *Waste to Energy Report* (2014) estimated that the unattended waste has the potential of generating 439 MW of power (from 32,890 TPD of combustible wastes including refused-derived fuel or RDF), 1.3 million cubic metre of biogas per day or 72 MW of electricity from biogas, and 5.4 million metric tonnes of compost annually to support agriculture.

Collection and recycling are not effectively executed in many parts of the country. Solid waste from industrial, municipal, agricultural, construction and demolition (C&D) and other processes typically contains base materials in the form of scrap, like ferrous and non-ferrous metals, plastics and glass, that can be potentially recycled for various gainful applications. However, the recycling rates are meagre in comparison to international standards. Lower recycling in India is attributed to a wide range of reasons such as lack of social awareness, socio-political hindrances, inefficient collection and segregation mechanisms, and lack of appropriate infrastructure and technology.

It is important to note that the engagement of formal waste management enterprises remains low, primarily due to insufficient funds, lack of legal guidance, low sectoral development and lack of tacit know-how about sustainable waste management businesses. Hence, in many developing countries including India, waste collection and material recycling activities are majorly performed by the informal waste sector. Various studies have revealed that in developing countries the informal sector's contribution in recovery of materials from municipal waste is much higher than formal waste management services.

The informal sector in SWM may refer to individuals, families, and private sector (micro-) enterprises working in SWM services, whose activities are neither organized, sponsored, financed, contracted, recognized, managed and taxed, nor reported upon by governmental authorities. Informal stakeholders are waste pickers in dumpsites and at communal waste collection points, informal waste collectors, itinerant waste buyers, small junkshop dealers, and big waste godown owners.

The International Labour Organization (ILO) defines the informal sector in waste management system as 'the individuals or small and micro-enterprises that intervene in waste management without being registered and without being formally charged with providing waste management services.' As per the Solid Waste Management Rules (2016), 'informal waste collectors' includes individuals, associations or waste traders who are involved in sorting, sale and purchase of recyclable materials. Solid Waste Rules (2016) define a 'waste picker' as a person informally engaged in the collection and recovery of reusable and recyclable solid waste from the source of waste generation to sale of waste to recyclers directly or through intermediaries. The informal sector is often not officially approved, recognized and acknowledged, besides the fact that they potentially contribute to waste recycling practices of cities by collecting, sorting, processing, storing and trading waste materials in the recycling value chain.

India's households, itinerant waste dealers (*raddiwalas*), and waste collectors collectively recover nearly 1.2–2.4 million tonnes of newspapers, 2.4–4.3 million tonnes of cardboard and mixed paper, more than 1.3 million tonnes of glass, more than 2.6 million tonnes of metal waste and 4–6.2 million tonnes of other recyclable materials each year. Overall, 30–60 per cent of all paper and cardboard, 50–80 per cent of all plastic and nearly 100 per cent of all glass bottles manufactured in India are recycled.[1] Annual generation of plastic waste is nearly 3.36 million tonnes, which means 2–2.35 million tonnes of it are being recycled. However, studies on material flow of waste estimate that nearly 6.5–8.5 million tonnes of plastic are being recycled in India. The discrepancies in numbers might be due to the fact that a major fraction of plastic waste is recycled informally by waste pickers and *kabadiwala* associations and is not reflected in the formal waste management chain. This shows how much recycling of plastic waste fractions is possible because of interventions of the informal sector in the waste chain.

While reliable estimates of the number of people involved in this work are difficult to come by, it has been reported that the informal waste economy employs about 0.5–2 per cent of the urban population worldwide (2.49–2.8 billion people), yielding an estimated number of roughly 12.5–56 million people.[2] Waste pickers alone account for 0.1 per cent of India's urban workforce.[3] *Table 1: Population range, number of reported informal workers and percentage share in terms of population* is a compilation of reported sizes of the informal sector in different regions in India.

According to another study, nearly 1.7 million urban poor are engaged in collecting 15–20 per cent of the MSW generated in India.[4] This does not

Table 1: Population range, number of reported informal workers and percentage share in terms of population

City	Population range (year)	Number of reported informal workers (range)	Percentage of informal actors in overall population
Ahmedabad	4,800,000–5,570,585 (2003–11)	20,000–50,000	0.36–0.42
Amritsar	1,132,761–1,183,705 (2011)	3,000–3,500	0.25–0.31
Bengaluru	5,000,000–8,425,970 (2000–11)	25,000–70,000	0.30–1.40
Delhi	11,007,835–18,680,000 (2010–11)	80,000–300,000	0.43–2.73
Kanpur	2,767,031–2,920,067 (2011)	15,000–20,000	0.51–0.72
Kolkata	4,486,679–15,100,000 (2010–11)	20,000–80,000	0.13–1.78
Mumbai	12,478,447–19,200,000 (2010–11)	85,000–135,000	0.44–1.08
Overall (India)	364,459,000 (2010)	1,500,000	0.41

Source: Linzner and Lange, 2013

include the many informally working companies and reprocessing units in the formal and informal sectors participating in waste management, which are likely to underestimate the statistics. There were an estimated 5,511 plastic recycling units in industrial areas in 60 Indian cities in 2010–11, of which only 2,108 (38 per cent) were registered.[5] Similarly, the Delhi Pollution Control Committee (DPCC) has specifically established 5,695 informal waste recycling units with a workforce of over 40,000 employees in different parts of Delhi.[6]

What is the informal sector in waste management?

In developing countries like India, the informal sector plays a major role in waste management, recycling and resource recovery. Who are the people working in this sector. How are they organized and classified and how do they conduct their business and lives?

Classification of the informal sector

The informal sector in waste management can be broadly classified into four groups depending on the function (see *Figure 1: Pyramid of the informal waste recycling system*):

1) **Stage 0 recyclers**: Informal sector workers who may or may not have means of transportation and incur zero or minimal input cost. These stakeholders primarily collect from roadside dustbins, landfills and, sometimes, households.

TYPES OF INFORMAL WASTE WORKERS

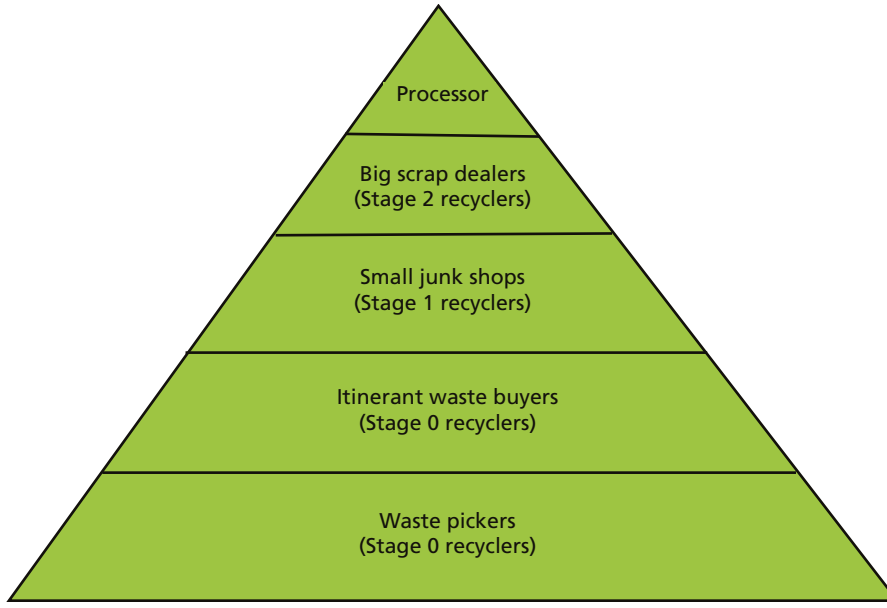
Itinerant waste buyers (*raddiwalas* or *pheriwalas*): The itinerant waste merchants, who comes to the doorstep of homes, usually owns a bicycle, purchases high-value recyclable materials such as newspapers, plastic, glass, unsoiled mixed paper, cartons and metal, and sells large quantities of well-sorted clean material at a higher price to a specialized waste trader (*kabadiwala*), who accumulates a particular material and sells it to recycling plants.

Street waste pickers: They recover recyclable materials from mixed waste discarded in community bins before it is collected by formal waste collectors. Most waste pickers collect either unsoiled or only moderately soiled materials (paper, cartons, etc.), or materials that can be cleaned (plastic, metal, glass, tetra packs, etc.) and focus on materials with high recycling value. Waste pickers usually sort the materials and sell each category separately to obtain a better rate. Traditional waste pickers (*kuda-uthanewaley*) do not own any mode of transport. They recover recyclable materials from mixed waste, work on bus terminals and in train stations, on streets and markets, and around municipal waste collection points.

Waste picking from collection vehicles: Recyclable materials are recovered from vehicles transporting municipal solid waste to landfills or dumpsites.

Waste picking from dumpsites: Waste pickers often sift through waste at dumpyards before it is treated. This kind of work is often done by communities that live in the vicinity of dumpsites to obtain a livelihood.

Figure 1: Pyramid of the informal waste recycling system



Source: CSE

2) **Stage 1 recyclers**: These stakeholders are the informal sector workers who have storage space and aggregate material from **Stage 0 recyclers** and residents. They do minimal or no processing of waste materials collected by them.

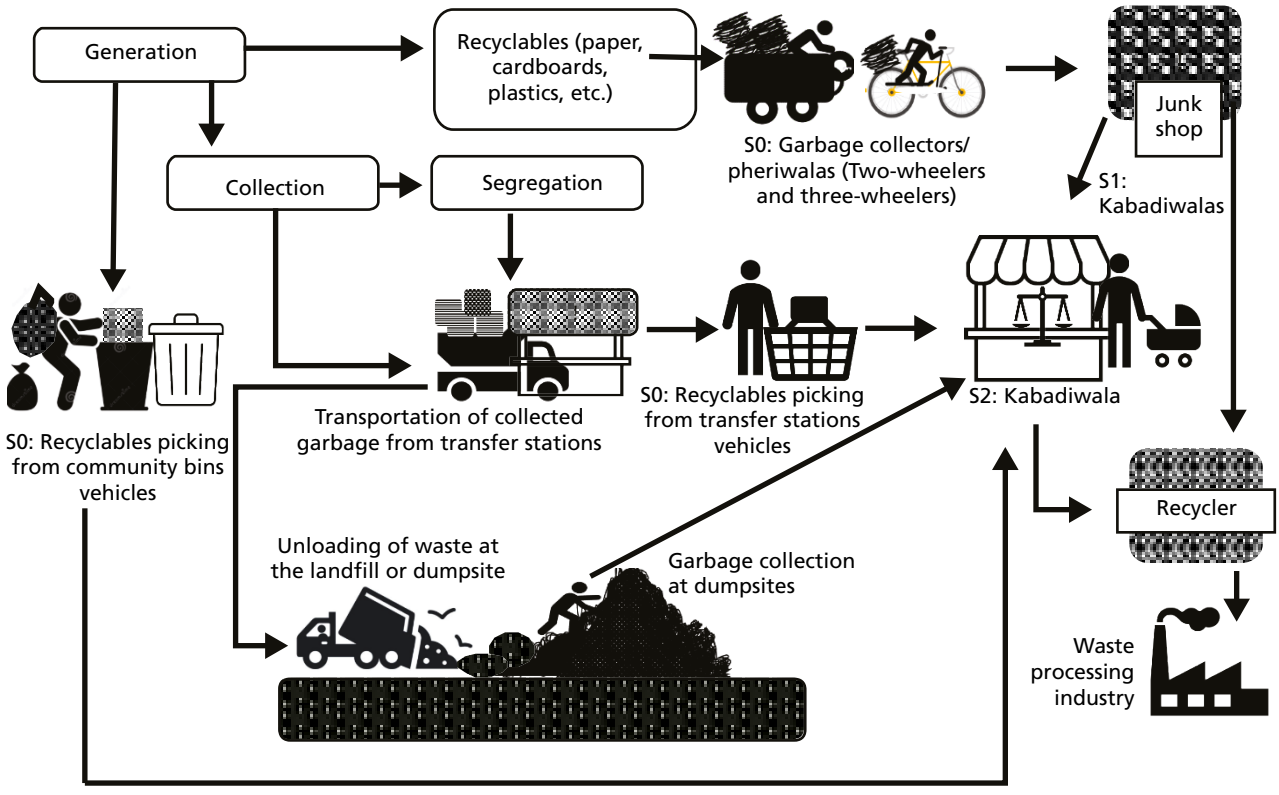
3) **Stage 2 recyclers**: The stakeholders in the informal sector that need large storage capacities to keep materials and supply it according to the market demand. They have storage spaces that are many times larger than those of **Stage 1 recyclers** and aggregate materials directly from both **Stage 1 recyclers** and other commercial sources in bulk. Typically, they specialize in a single-source category of materials and get their supply of resusable waste in bulk from small *kabadiwalas* (Stage 1 recyclers). In some cases, they might keep it to produce secondary raw materials.

4) **Waste processors**: Stakeholders who buy specific grades of post-consumer scrap material from **Stage 1** and **Stage 2 recyclers** and convert them into secondary raw material for the manufacturing industry.

Informal sector and the waste chain

The informal waste chain displays an interesting hierarchy. The first step is a household, which typically disposes of its waste on a daily basis and stores recyclables, mainly comprising of newspapers, cardboard, metallic objects and glass bottles. Waste is also generated in public places such as parks, roadsides and markets. High value recyclables are typically sold to itinerant buyers, sometimes also known as *raddiwalas*. Waste generated daily is collected by door-to-door collectors who make an extra income by sorting and segregating recyclables from the wet waste and discarding the rest in community dumps. Waste from community bins is collected by ULBs or private companies and

Figure 2: Informal sector in waste management



Source: CSE

transported to local dumps, landfills or treatment facilities. At a landfill or local dump, informal waste collectors sift through the waste to collect more recyclables. The recyclables collected by waste pickers at different stages (during door-to-door collection, or at community bins and dumpsites) are sold to junk shops or *kabaddiwalas* who segregate them into finer categories. Sorted recyclables are processed and eventually sent to recyclers or re-processors. A crucial point to note here is that informality exists at almost all levels in recycling of waste (see *Figure 2: Informal sector is waste management* and *Figure 3: Stage 0 and Stage 1 recyclers in the waste management chain*).

Figure 3: Stage 0 and Stage 1 recyclers in the waste management chain

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A Stage 0 recycler collecting waste from a dhalao or community bin

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A Stage 0 recycler collecting waste from a dumpsite

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A Stage 0 recycler collecting waste from streets

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A Stage 0 recycler (itinerant waste worker)

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A Stage 1 recycler – junk shop

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Stage 0 recycler (itinerant waste buyer)

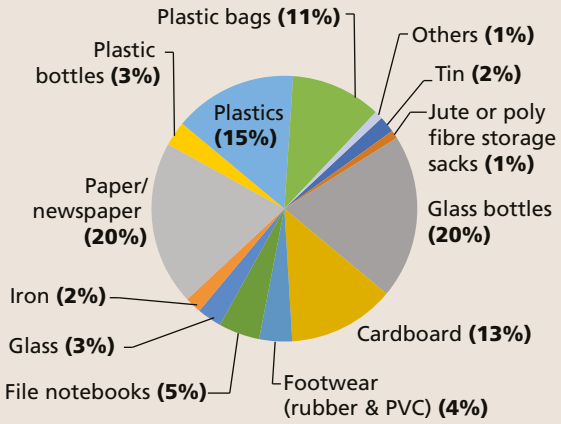
Source: CSE

QUALITY AND QUANTITY OF WASTE COLLECTED BY THE INFORMAL SECTOR

The quality and quantity of waste collected by the informal sector varies from place to place. *Graph 1: Distribution of recyclable materials by quantity* shows the distribution of recyclable materials (by quantity) collected by informal waste collectors and *Graph 2: Distribution of recyclables adjusting for price of those materials* represents the distribution adjusting for price of those materials, as reported by Chintan (2018). Both graphs show the relative importance of different recyclable materials in the informal waste trade, one in terms of quantity and the other in terms of economic value as determined by prices. Evidently, the relative importance of commodities in recycling markets changes according to the economic value they offer to waste pickers. Plastic waste becomes more important as a source of revenue for waste pickers than paper and newspaper waste even though larger quantities of the latter are collected and traded on a daily basis.

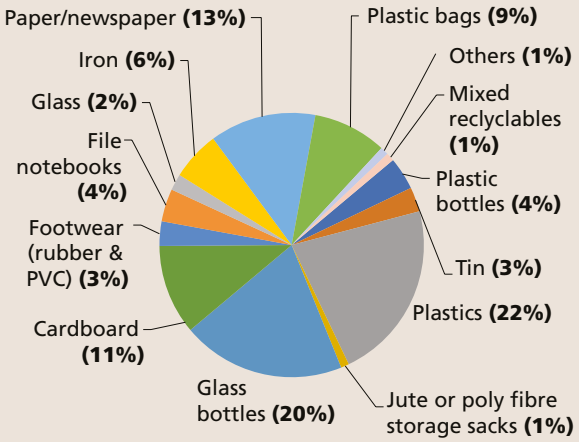
A major fraction of waste collected by waste pickers comprises of paper and newspapers (20 per cent), glass bottles (20 per cent), cardboard waste (13 per cent) and plastic waste (26 per cent). Metal fractions (i.e., iron and tin) contribute nearly 4 per cent to the total waste collected. Waste markets also adapt to existing recycling infrastructure and changes in waste composition. For example, the city of Moradabad in northern India has traditionally been a vibrant regional hub for reprocessing non-ferrous metals. More recently, it has emerged as a hub for recycling e-waste. Alang has historically been considered a hub for ship recycling and its scrap steel reprocessing accounts for more than 40 per cent of the recycling in the world. Dharavi alone recycles more than 80 per cent of the plastic waste generated in Mumbai, providing employment to nearly 10,000 people. Recyclable commodities work as a capital asset for the informal economy. Obviously, both the quantity as well as quality of recyclable materials affects their price.

Graph 1: Distribution of recyclable materials by quantity



Source: Chintan, 2018

Graph 2: Distribution of recyclables adjusting for price of those materials



Source: Chintan, 2018

Profile of informal waste workers

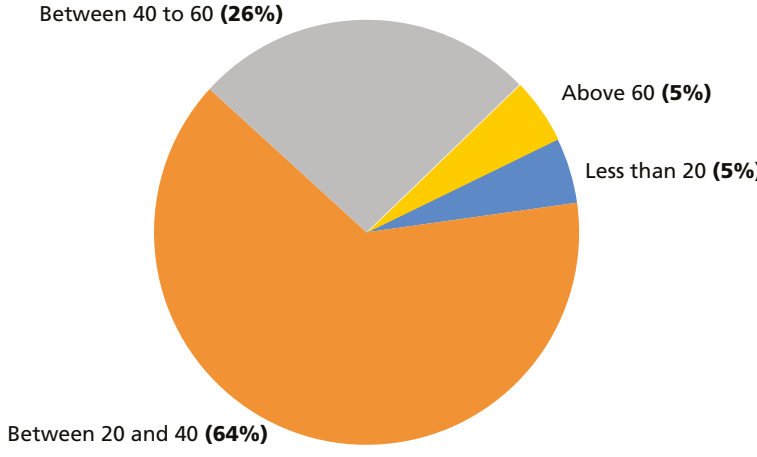
About 60–65 per cent of waste pickers are in the age group of 20–40 years and 30–35 per cent are in the age group of 40–60 years. Nearly, 5–10 per cent are in the age group of less than 20 and above 60 years (see *Graph 3: Age profile of waste pickers in Bengaluru*).[7] These numbers are for Bengaluru but they can be extrapolated for the whole country. Nevertheless, the age of waste pickers is a contentious issue as most of them do not have clear records of birth.

On an average, a waste picker collects about 60–90 kg of waste per day, working for about 8–10 hours. Working conditions vary between those who collect waste in sacks on their back, those who move waste in tricycles or pushcarts, and iterant buyers who work for specific dealers collecting only high value items, often newspapers and paper waste. Vehicular waste collectors are also more mobile, and can collect more waste and sell it to a more suitable middleman.

Income of Stage 0 recyclers or waste pickers varies according to the region in which they are working. For example, a waste picker collecting recyclable material from Sangam Vihar (Delhi) might earn lesser than a waste picker working in Connaught place (Delhi). This is because high-income areas have higher quality of recyclables in the waste they generate. On an average, waste pickers without vehicles (Stage 0 recylers) earn nearly Rs 400–500 per day in Delhi, while the ones with tricycles or pushcarts earn around Rs 1,200–1,500 per day. The latter collect food items, hair and thermocol, which is typically not collected by the waste pickers without vehicles. They sell the food waste to dairy and pig farms as animal feed at the rate of Rs 7 per kg. Waste hair from domestic sources is sold by waste pickers at the rate of Rs 2,000 per kg. For these reasons, waste pickers with vehicles earn more money than the ones without them.

Waste pickers earn less money than *kabadiwalas* and small and big junk dealers due to fine sorting and cleaning of recyclables which takes place at

Graph 3: Age profile of waste pickers in Bengaluru



Source: Chandran et al, 2009

the higher level in the waste chain (see *Table 2: Selling price of recyclable materials in Old Delhi* and *Table 3: Selling price of recyclable materials in Seemapuri in Delhi*).

Table 2: Selling price of recyclable materials in Old Delhi

Material	Price (Rs /kg)		
	***Kabadiwalas* take material from waste pickers**		**Small junk dealers take material from kabadiwalas**
	Site 1	**Site 2**	
Plastic	3	4–5	7
Panni/thaili	3	2	3
Cardboard/gatta	9	3	9
Plastic bottles	20	15	20
Dabba/baalti	15	15	17
PVC	3	3	20
Glass	1.5	1.5	5
Paper	1.5–1.75	1.5–2	11
Shoes	1–2	2	5
Wood	2–3	2.5–3	6–7
Glass bottle (per bottle)	1–2	2.5	1.5
Tyres	2–2.5	2	4–5
White paper	7	6–7	9
Iron/loha	16–17	15	18
File	8–9	9	12
Thermocol	70	65–70	82–85

Source: Not in My Backyard, 2016

Table 3: Selling price of recyclable materials in Seemapuri in Delhi

Material	***Kabadiwalas* take material from waste pickers (Rs/kg)**	Material	**Small dealers take material from kabadiwalas (Rs/kg)**
Doplar/dabbe/ mithai	2	Rangeen (coloured) polypropylene	32–33
Plastic		Milky polypropylene	40–42
Panni/thaili	5	Panni	31
Cardboard/ gotta	5	Dabba(high density)	48–49
Plastics bottles	15–16	Plastic bottles	31
Dabba/baalti	22	Natural polypropylene	50–51
PVC	8	Milk packets	22–23
White paper	3	Kadak	17–18
Glass bottles (per bottle)	1	Kali plastic	17–19
File	6	Red bottles	
		HM (mixed high-density)	11–12

Source: Not in My Backyard, 2016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Sorting and segregation of waste by informal waste workers who work on a contract-basis (deehadi) in Delhi

There are different godowns for different waste fractions such as paper, plastics, glass and metals. Godown owners rent their space for waste segregation to local dealers. However, godown owners are often at risk of losing the spaces due to interference of police, because their work is considered 'pollution-causing'. They are subjected to threats and it is difficult for them to run their business in a decent manner.

Waste is segregated and sorted into different fractions at the godowns. For example, plastic waste may be segregated into basic types like polyethylene terephthalate (PETE), high-density polyethylene (HDPE), polyvinyl chloride (PVC-U), polypropylene (PP), polystyrene or styrofoam (PS) and others. There could be another 50–200 sub-categories into which plastics can be classified based on the demand of the waste processing industry. Segregation of plastics is also done by informal labourers (mostly women) who work for about eight hours a day for Rs 200–300.

Socio-economic status of the informal sector

It is widely recognized that the informal sector engaged in waste collection and sorting carries out the most labour-intensive and least rewarding job of recovering recyclable materials from unsegregated waste. Despite the crucial role informal waste workers play in sustainable recycling, they continue to be

subjected to systemic marginalization economically as well as socially. They are treated as dirty and unwanted elements of society, and they have to deal with exploitative social behaviour. While the wages and living conditions of different strata of informal waste workers differ greatly, a majority of them (street waste pickers) work and live in hazardous conditions. They typically lack access to sanitary and healthcare facilities. Furthermore, child labour is quite prevalent and life expectancy is low. Sadly, waste pickers are not covered under any labour legislation. As a result, they do not benefit from social security and medical insurance schemes. Thus, there is a dire need to initiate policy action for their social and economic upliftment.

Poor living and working conditions: Despite their significant contribution in SWM, people working in the informal waste sector live very vulnerable lives. Their living quarters are frequently in close proximity to dumpsites, and they work under unhygienic and unhealthy conditions. Often, they have no access to drinking water or public toilets. Ragpickers have to walk many a mile every day to pick up waste, under the hot sun or in torrential rain. They carry heavy loads on their heads and backs or use bicycles and pushcarts to transport the waste they have collected. They do not have appropriate personal protective equipment (PPE) such as gloves, gumboots and aprons. Due to the poor living and working conditions, malnutrition, anaemia and tuberculosis are common among them.

Occupational health hazards: Waste pickers are potentially exposed to a wide range of occupational hazards (see *Figure 4: Occupational health hazards faced by the informal sector*). Community waste bins and dumpsites act as breeding grounds for various types of bacterial and viral diseases. As a result, waste pickers often face gastrointestinal ailments. They have to segregate recyclables from mixed waste. At times, they handle sanitary waste, domestic hazardous waste and household biomedical waste with bare hands, which may cause various infections. Infections are also caused by their contact with human and animal excreta, bodily fluids and dead animals. They also get cut by sharp objects, ragged metal edges and broken glass in the mixed waste.

A study conducted by Chokhandre et al (2017) on ragpickers residing near the Deonar dumpsite in Mumbai reported serious concerns regarding diseases and injuries among the waste picker population.[8] Reportedly, at 75 per cent people affected, physical injuries were remarkably higher among waste pickers in the comparison cluster (average 17 per cent). The injuries were primarily because of lacerations caused by shards of glass, followed by muscle sprains. Field insights stated frequent incidences of severe injuries and deaths among waste pickers as they are hit by vehicles or dozers while unloading waste carrier vehicles. Similarly, exposure to various hazardous fumes at disposal sites resulted in respiratory problems. The prevalence of respiratory symptoms was significantly higher among waste pickers (28 per cent) in the comparison group (average 15 per cent). Notably, the prevalence of dyspnoea (difficulty in breathing) and chronic cough was found to be higher among waste pickers. Field insights also reported that most waste pickers were not using any protective clothing such as gumboots, gloves and masks, which increased their vulnerabilities and health risks.

Figure 4: Occupational health hazards faced by the informal sector

Source: CSE

Harassment: In a study conducted by Routh (2014), it was reported that most waste pickers who were interviewed during the study had been taken into police custody at least once in their lives and had been booked under petty cases.[9] To get released from the lockup, they had to pay fines or bribes from their meagre earnings, thus impacting their financial and physical well-being. Harassment at work is very common for waste pickers, especially women. Despite the significant and active role women play in informal SWM and recycling, there are indications that meaningful gender integration in the sector is still a distant dream. Women waste pickers face harassment from police as well as male municipal workers. Due to the informality of the sector, there is lack of anti-harassment policies and penalization.

Public behaviour: The contribution of waste pickers in improving the quality of the environmental by diverting waste—that would otherwise litter the surroundings—to the recycling process, is critical. Despite their crucial role, they are not treated well by the public. Waste picking is not seen as a decent and

dignified occupation. It is seen as a job for a 'particular stratum' of the society. The collection of waste is largely done by Dalits and other marginalized-caste communities. Waste pickers are regarded as 'thieves', thereby bringing into questioning their fundamental right of living a decent and respectable life.

Child labour: As per the provisions stipulated in the Child Labour (Prohibition and Regulation) Act, 1986 and the National Policy on Child Labour, there is a restriction on the employment of children in any hazardous or dangerous occupation. Waste picking has been included in the Schedule of Hazardous Occupations, 2001. However, children continue to be employed in the informal waste management sector. Reportedly, around 20 per cent of the 51,000 street children in Delhi are waste pickers.[10] Many children begin collecting materials to recycle at the young age of five to eight years.[11] Child waste pickers are vulnerable, given their poor knowledge and awareness regarding occupational and environmental hazards. Not only this, they often find themselves attacked by adult waste pickers who see them as a threat to their livelihoods. They work long hours for low wages and are also vulnerable to exploitation, child abuse and trafficking.

A study found that children engaged in waste picking are 2.5 times more likely to fall ill compared to other children.[12] For example, worm infestation and upper respiratory tract infection are common among such children and may

Child waste pickers are vulnerable, given their poor knowledge and awareness regarding occupational and environmental hazards

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be related to the home environment (cooking in poorly ventilated conditions, with overcrowding increasing the rate of person-to-person transmission). Susceptibility to diseases may also be coupled with lowered resistance because of poor diet, physically demanding work (carrying waste materials) and possible infection from waste. Lymph node enlargement was also found to be a common disorder among waste picker children. Some of the child waste pickers who were part of the study were found to be suffering from tuberculosis, xerophthalmia (vitamin A deficiency) and dental caries (tooth decay).

Migrant workers: Inter-district and inter-state short-term migrant workers are another disadvantaged group in the informal sector living on subsistence wages. Several micro-studies indicate that incidence of short-term migration is particularly high from states like Bihar, Madhya Pradesh, Odisha, Rajasthan and Uttar Pradesh.[13] Migration creates certain vulnerability for workers. Lack of a support system in a new city denies them bargaining power and the ability to protect their basic rights. Migrant waste pickers face regular harassment from authorities. A study in Delhi among 2,000 households whose members worked in the informal sector found that nearly half of them were waste pickers who were extremely poor and illiterate and have no access to social or physical infrastructure such as basic sanitation, water and power supply.[14]

Exploitation by scrap traders: The relationship between waste pickers and traders is almost always exploitative. A 2016 study reported that most (women) waste pickers have no idea at what price the trader resells the products and have no bargaining power.[15] Moreover, as a result of their lack of education, waste pickers are exploited at every turn—traders under-weigh the waste products, count money inaccurately or manipulate prices. Under-weighing of scrap, random cutting of weights, price manipulation, deferred payment of dues and financial abuse are some of the common exploitative practices. Scrap traders do not issue any receipts so there is no record of transactions. Credit arrangements with traders is a double-edged sword—on one hand it helps the worker tide over lean periods and emergencies (and provides a steady source of scrap supply for the trader), but it also results in the trader sourcing the material at highly exploitative rates.

Risk from privatization of waste management services: With an increase in privatization and contractualization of waste management services, there has been a proportional increase in the vulnerability of the informal sector. Nowadays, most ULBs engage private concessionaires to manage waste, from collection, and transportation to final disposal. The informal sector is denied access to areas served by private companies. This adversely affects the informal sector by creating an imminent threat of displacement and loss of livelihood. Reportedly, waste pickers working at secondary bins and dumpsites as well as *kabadiwalas* have experienced a decrease in income primarily due to the predatory efforts of private companies to ask households for recyclables that were traditionally given to itinerant waste buyers (see *Table 4: Income loss due to privatization of the waste sector in Amritsar*).[16]

Chintan reports that nearly 50 per cent of waste pickers lost their jobs due to privatization of the waste collection system.[17] WEIGO reports that the threat

Table 4: Income loss due to privatization of the waste sector in Amritsar

Category	Income before private operations began (average monthly earnings)	Income after private operations began (average monthly earnings)	Average decline	Average decline percentage
	In rupees			
Waste pickers (landfill)	5,500	4,000	1,500	27
Waste pickers (roadside and secondary containers)	5,000	3,500	1,500	30
Waste pickers (households)	6,000	2,000	4,000	60
Itinerant waste buyers	10,000	9,000	1,000	10

Source: Sandhu et al., 2017

of privatization is of great concern to fixed waste pickers working with Solid Waste Collection and Handling (SWaCH), Pune.[18] The study found that waste pickers used to have an informal sharing system that allowed a large number of them to collect waste within the same area. However, fewer people were able to earn a living from the same volume of waste after privatization.

Unstable income source: Incomes generated in the informal recycling sector, especially those of waste pickers, are below the poverty line set by the erstwhile Planning Commission of India. However, a majority of formal waste collectors earn marginally higher than poverty-line incomes. The poverty of waste pickers is not temporary but chronic as they have no opportunity to enter the category of so-called formal waste collectors or higher-level waste traders in order to reduce the risk of unstable income.

Role of the informal sector in solid waste management

How the informal sector contributes to environmental sustainability

The informal sector plays a significant role in achieving higher recycling rates because recycling is crucial for sustaining the livelihood of the workforce involved. Many recyclable materials are segregated and processed according to the demands and technological capacity of the recycling industry. The informal sector also helps in achieving "extended landfill capacity" by minimizing the quantities of waste reaching dumpsites and landfills. In the absence of recycling measures, many valuable recyclables will find their way to landfills, clog drains and malign roads and railway tracks. It will also create health hazards for man and cattle alike.

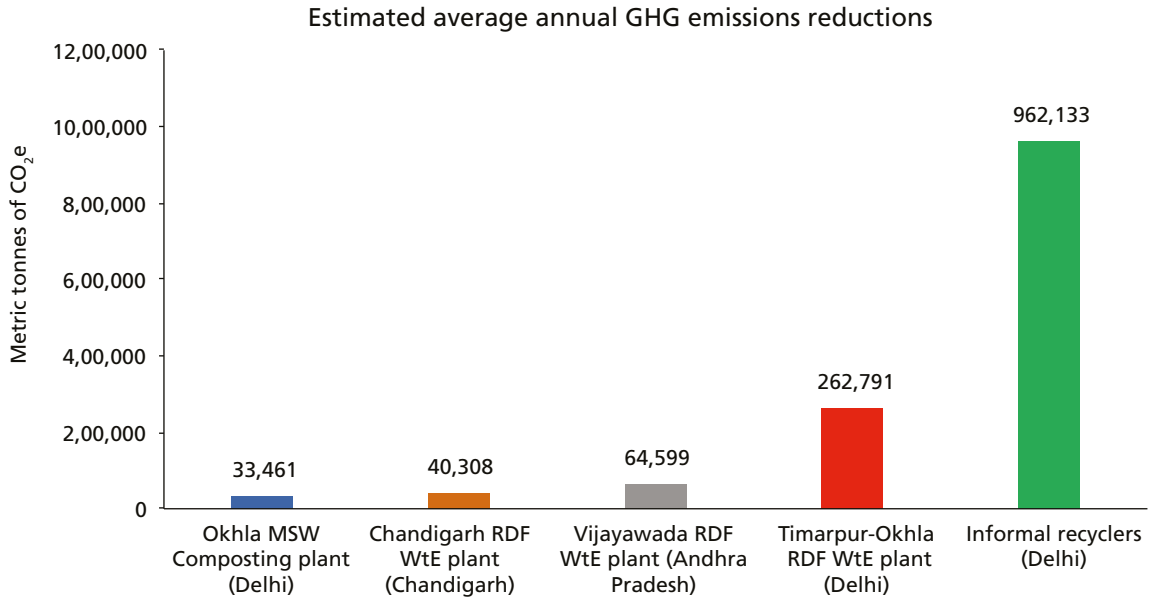
This makes recycling an essential part of urban planning. For example, about 700 million TPD of plastic waste is generated in Mumbai alone, almost all of which is collected for recycling by an estimated 150,000 waste pickers.[19] Without the intervention of the informal sector, all of this plastic waste would find its way to dumpsites, water bodies and drains and contribute to marine litter.

Many of the advantages associated with the informal sector's recycling activities are difficult to monetize. Recycling by the informal sector also helps save energy as making products from recycled materials requires less energy than sourcing and processing virgin raw materials. There is a significant reduction in emissions of greenhouse gases into the atmosphere due to recycling, which is vital in the fight against climate change. Chintan reports that reductions from the informal sector also compare favourably to the yearly emissions reductions of other projects in Delhi.[20] For example, the annual contribution of the informal recycling sector to emissions reductions is more than three times the estimated annual emissions reductions from the proposed Timarpur–Okhla Integrated Waste-to-Energy (WTE) project (see *Graph 4: Greenhouse gas reduction potential of different waste treatment technologies and informal recycling*).

Additionally, informal recovery scores considerably over formal recovery in terms of reduced fossil energy use. This is because many informal activities rely on human muscle traction rather than on motorized transport. See *Graph 5: Average annual cost savings due to informal recycling in six cities across the globe* for the carbon benefits in terms of avoided externality costs.

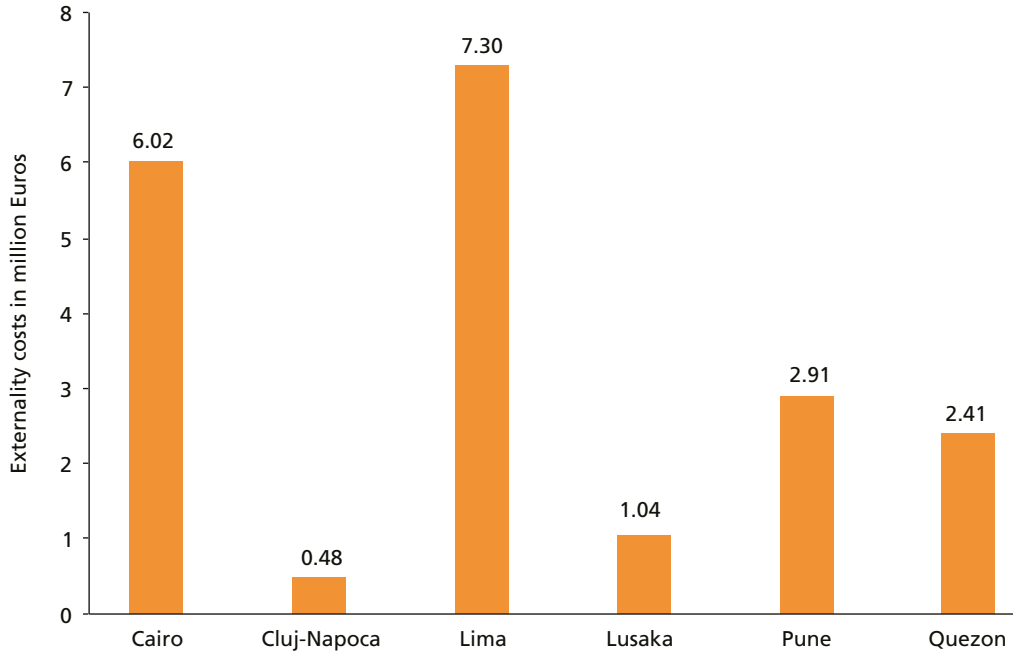
On the other hand, there are a few negative environmental impacts of informal recovery activities as well. Informal sorting and collection of waste from various locations might lead to scattering of waste, thereby polluting the surrounding

Graph 4: Greenhouse gas reduction potential of different waste treatment technologies and informal recycling



Source: Chintan, 2009

Graph 5: Average annual cost savings due to informal recycling in six cities across the globe



Source: The Economics of the Informal Sector in Solid Waste Management, 2011

localities. By integrating, organizing and training informal workers, practices that lead to scattering of waste can be controlled and reduced.

How the informal sector contributes in economic development

While the informal sector's waste recycling operations are unlicenced and unregulated, they can potentially contribute to the national economy. The informal waste management sector turns waste into usable and tradable goods. New businesses emerge; trade networks develop; capital is accumulated and invested; and raw material, transportation, and energy costs are reduced due to interventions of the informal sector. The informal sector also creates new jobs and offers income benefits to vulnerable social classes. According to a recent study, most informal waste management operations generate a net profit. In contrast, formal waste management operations generate a net expense.[21] This is in part because the informal sector specializes in waste valuation while the formal sector focuses on waste management services (collection and disposal). It is also because, to be self-sustaining, the informal sector is far more focused on efficient use of waste materials than formal actors.

The informal recycling sector reduces the cost incurred in the treatment and disposal of solid waste by extracting recyclables before the mixed waste is subjected to any specific treatment technology. It enormously contributes in reducing the economic burden of ULBs.

For instance, the Bruhat Bengaluru Mahanagara Palike (BBMP) became the first municipality in the country to register waste pickers and catalogue scrap dealers. If we assume that, on an average, 70 kg of waste is picked up by a single waste picker daily, the quantity of waste diverted from landfills to waste pickers would be 10,6671 tonnes per annum (considering that organic waste is 60 per cent; dry waste, 30 per cent; and inert waste, 10 per cent of the mixture). The 4,175 registered waste pickers save the city about Rs 23 crore annually, which would otherwise cost the BBMP an additional Rs 23 lakh of the budgeted 450 crore (see *Table 5: Contribution of waste pickers in Bengaluru*).

Table 5: Contribution of waste pickers in Bengaluru

Parameter	Contribution of 4,175 registered waste pickers	Contribution of 15,000 waste pickers
Waste collected per day (As each waste-picker picks up 0.07 tonnes of waste daily)	292.25 tonnes	1,050 tonnes
Percentage of waste collected by waste pickers in a day (of the total 4,500 TPD waste generated)	6.40 per cent	23.30 per cent
Gross waste diverted from landfills per year	106,671 tonnes	383,250 tonnes
Savings per day taken (Current cost for BBMP to landfill a tonne of waste is Rs 2,210)	Rs 6.43 lakh	Rs 23.1 lakh
Savings per year (approximately)	Rs 23.4 crore	Rs 84.3 crore

Source: Chandran et al., 2009

Informal waste recycling activities are not liable to pay any kind of tax. Reportedly, most of the manufacturing units in Dharavi (the Mumbai slum) and Tikri (Delhi) are unregistered, which saves them income tax. This also has a negative aspect, because they forfeit the opportunity of receiving the advantages of government funding schemes. Thus, their integration into the formal waste management chain would definitely widen the tax base of the waste economy as well as make them beneficiaries of government welfare schemes.

Informal recycling, SDGs and the circular economy

The informal sector, when organized and supported by public policies and inclusive governance, is able to contribute to the Sustainable Development Goals (SDGs).[22] A majority of the workforce in the informal recycling sector comes from disadvantaged communities traditionally occupying the most marginalized place in the Indian caste system. Although considerable differences exist along the recycling chain, the sector employs hundreds of thousands of people in India and supports the livelihood of many. Thus, it helps in achieving SDG 1, i.e., **no poverty** by providing the poorest and most marginalized people a constant source of income.

Every year, a quantity of five million tonnes of plastic waste is recycled in India. Without the informal sector's contribution, this waste would end up in landfills, roadsides or waterways, and oceans. Thus, the informal sector plays a significant role in achieving SDG 14, i.e., **life below water** by minimizing the quantity of recyclables (especially plastics) ending up in oceans.

Moreover, recycled secondary raw materials replace virgin raw materials in new products; in the Indian case, the requirement of virgin plastics is reduced by 30 per cent through recycling. At the local level, land degradation from inadequate dumping and the release of hazardous chemicals is being avoided by informal sector's interventions, particularly with the recovery of metals from waste electrical and electronic equipment supporting the achievement of SDGs 12 and 14.

The informal sector has effectively increased collection areas to peri-urban regions of cities, a target for SDGs 1 and 6, avoiding inadequate dumping. This avoids accumulation of waste in drains that leads to stagnant water fostering environments for the spread of vectors and disease to which children are most vulnerable. At the global level, recycling is one of the cheapest methods to reduce GHG emissions, thus contributing to SDG 13. Avoiding 1 tonne of CO_2 emissions through recycling costs 30 per cent less than doing so through energy efficiency and 90 per cent less than installing wind power.[23] Using the WARM model developed by the USEPA, a Chintan initiative estimated that the informal recycling sector in Delhi avoided emission of 962,133 tonnes of CO_2 equivalent annually, referring to waste pickers as "cooling agents".[24] Recyclers' logistics and processes emit significantly less GHG than formal sector recycling practices.[25]

Figure 5: Contribution of informal recycling of waste to SDGs

Provides waste recycling workers the opportunity to generate income and sustain their families

Waste recycling avoids hazardous emissions-causing incineration

Women form a majority of waste pickers. Women have an equal job opportunity and participate in leadership and decision making

Management of waste by the informal sector helps avoid waste disposal in water bodies, thereby reducing water pollution

The informal waste recycling sector adds value to the economy by transforming waste into tradable goods

Pushes the transition towards a circular economy and encourages technological innovations for recycling

Recycling services provided by waste pickers make cities more sustainable (by reducing the risk of water logging and flooding). Cooperatives promote citizenship building, social inclusion, de-stigmatization, increased self-esteem and community building; making cities more resilient. Costs associated with management of waste by urban local bodies are also reduced

Recycled waste reduces the need of virgin raw material, thereby minimizing resource depletion

Diverting more waste to recycling instead of for incineration or thermal treatment

Minimization of recyclables (especially plastics) ending up in the oceans

Source: CSE

Collection of recoverable materials by the informal recycling sector supports the drivers of sustainable solid waste management characterized and connected to the SDGs (see *Table 6: Contribution of the informal recycling sector to achievement of SDGs and circular economy*).

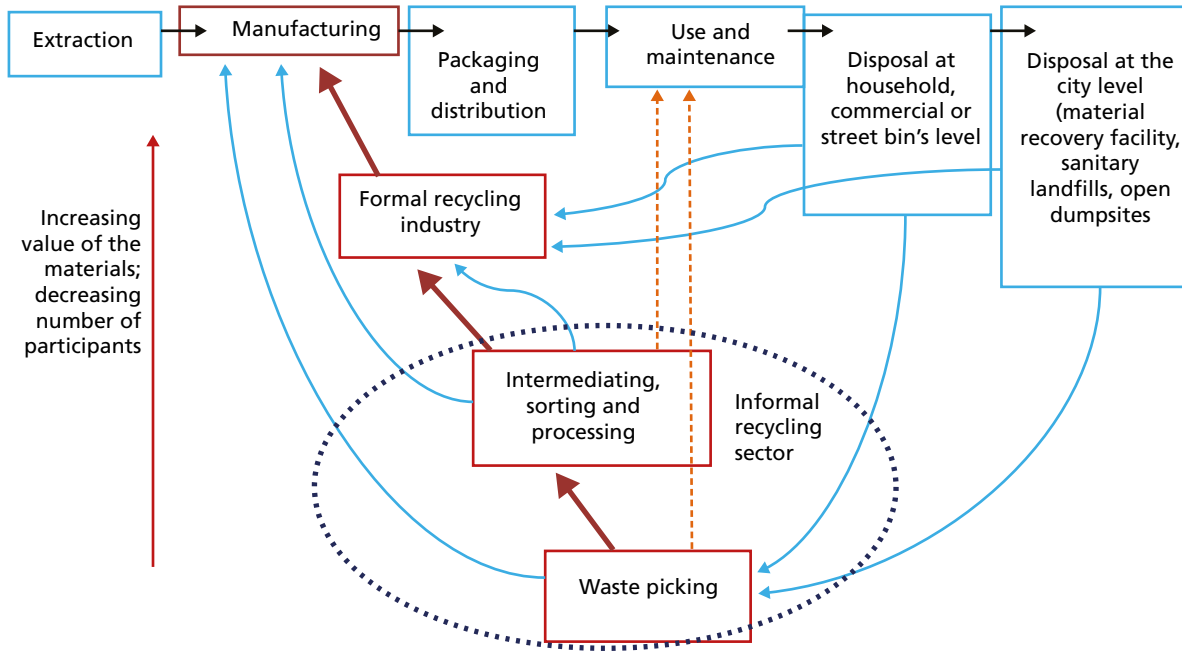
However, informal waste recycling sector in India faces several challenges that negatively influence achievement of the SDGs as well. For example, informal plastic recycling does not provide decent working conditions: waste pickers, including children, suffer from exposure to hazardous materials and taxing manual labour. Workers can be exposed to dangerous chemicals, leading to health risks. Additionally, while cities can experience a reduced cost in waste management, due to the uncertain legal status of the informal sector, there can be negative impacts for citizens that have little or no legal status as workers, or for communities that do not receive taxes from businesses that are not registered entities.

Table 6: Contribution of the informal recycling sector to achievement of SDGs and circular economy

Driver		Sustainable development goal (SDG)	Relevance of/for the informal recycling sector
Protection of public health		SDG 11: Sustainable cities	The informal recycling sector has been effective in catering to peri-urban areas that would otherwise have no collections services available, preventing inadequate dumping of waste and the proliferation of associated vectors
		SDG 3: Good health and well-being	
Protection of the environment	Local	SDG 6: Clean water and sanitation	
		SDG 12: Responsible consumption and production	The informal recycling sector, particularly in its involvement in recycling of electrical and electronic waste, helps avoid the release of hazardous chemicals into the environment, many times at the expense of their health, although better capacity building is needed to reduce the environmental impact of mismanagement
		SDG 15: Life on land	
	Global	SDG 7: Affordable and clean energy	The recovery of organic waste by informal recyclers to produce biogas for energy usage has been documented in India with a scalable model
		SDG 13: Climate action	Recycled material used in manufacturing reduces GHG emissions through avoided energy consumption and land use change during extraction
		SDG 14: Life below water	IRS already provides services of collection and recycling, avoiding inadequate dumping and feeding manufacturing to industry
Resource value		SDG 12: Responsible consumption and production	Waste reclaimers recover material for new production in technological cycles, and many uses organic waste as food to eat, animal feed, or compost, also feeding biological cycles. The recovery of organic material further supports SDG 2 by reducing food waste
		SDG 2: Zero hunger	Waste reclaimers recover material for new production in technological cycles, and many use organic waste as food, animal feed, or compost, thus feeding biological cycles. The recovery of organic material further supports SDG 2 by reducing food waste
Inclusivity		SDG 1: No poverty	Around 15 million people earn 0.7–4 times a minimum wage through waste picking. Conditions need to improve in order for this green job to be "decent" as per ILO standards
		SDG 8: Decent work and economic growth	
		SDG 5: Gender equality	In Latin America and India, a majority of recyclers are women. Many women recyclers have been directing the movement of informal recycling sector to be included in SWM worldwide. Many women in the sector still earn less than their male counterparts
		SDG 10: Reduce inequalities	In many cities worldwide, the informal recycling sector is composed of minorities and migrants who have been historically marginalized

Source: Valencia, 2019

Figure 6: Role of the informal recycling sector from a life cycle perspective



Source: Valencia, 2019

Circular economy: Life cycle thinking is all about going beyond the traditional focus on production sites and manufacturing processes to include environmental, social and economic impacts of a product over its entire life cycle and closing the loop for recyclable materials (see *Figure 6: Role of the informal recycling sector from a life cycle perspective*). Waste picking, in this case, represents individual recyclers as well as cooperatives. Depending on the material and the level of association, waste pickers sell to intermediaries, formal recyclers, or directly to the manufacturing industry. The informal recycling sector connects waste generated at household-, commercial-, and street-level, and disposal sites, to manufacturing facilities. In the general transition from the informal recycling sector to the formal sector, the value of material increases up the ladder and the number of participants goes down.

The idea of a circular resource flow has long been central to the work of waste pickers all over the world. Informal recycling workers act independently or in groups, collecting, classifying, and reinserting a wide range of discarded materials into the economy. These grassroots initiatives have accumulated valuable knowledge and offer innovative perspectives on handling waste, informed and framed by their everyday experiences. Waste picker organizations provide selective waste collection services to communities and businesses and contribute to resource recovery and social inclusion, and such practices are at the heart of a circular economy.[26]

Local, regional and national initiatives for integration of the informal sector

Applicable rules and policies and their implementation

Solid Waste Management Rules, 2016: The Rules list as one of the duties of the secretary-in-charge, urban development in states and Union territories that state policies and strategies should acknowledge the primary role played by the informal sector of waste pickers, waste collectors and recycling industry in reducing waste and provide broad guidelines regarding integration of waste pickers or informal waste collectors in the waste management system.

Moreover, local authorities and panchayats shall establish a system to recognize organizations of waste pickers or informal waste collectors and promote and establish a system for integration of these authorized waste pickers and collectors to facilitate their participation in solid waste management, including door-to-door collection of waste.

Beside this, the local authorities and panchayats shall set up material recovery facilities or secondary storage facilities with sufficient space for sorting of recyclable materials to enable informal or authorized waste pickers and collectors to separate recyclables from the waste and provide easy access to waste pickers and recyclers for collection of segregated recyclable waste such as paper, plastic, metal, glass and textiles from the source of generation or from material recovery facilities.

Plastic Waste Management Rules, 2016 apply to the management of plastic wastes, specifically plastic carry bags and multilayered plastic pouches or sachets. These Rules assign municipalities the responsibility for engaging civil societies or groups working with waste pickers. They also assign the responsibility to waste generators to ensure handover of segregated waste to registered waste pickers, recyclers or waste collection agencies.

The National Environment Policy, 2006 states that legal recognition should be given to the informal sector of collection and recycling of various materials and it should be strengthened. In particular, the Policy stresses the enhancement of their access to institutional finance and relevant technologies.

The National Action Plan for Climate Change, 2009 calls the informal sector the backbone of India's highly successful recycling system and berates 'a number of municipal regulations that impede the operation of recyclers, owing to which they remain at a tiny scale without access to finance or improved recycling technologies.'

The Comptroller and Auditor General (CAG) Audit on Municipal Solid Waste in India (December 2008) also recommended that the government 'should consider providing legal recognition to ragpickers so that recycling work becomes more organized and also ensure better working conditions for them.'

The Supreme Court accepted recommendations of the Report of the Committee constituted by it in 1999 (on Solid Waste Management in Class 1 Cities in India). According to the report, ragpickers must be converted into doorstep waste collectors as a means of upgradation.

State laws: Government of Maharashtra, primarily in cities like Pune and Mumbai, has been relatively receptive to integrating the informal sector in the solid waste management chain. The state government issued an order to municipalities to give identity cards to waste pickers in 1999. Another order followed in 2002, directing municipalities to allot collection of waste from homes, shops and market places to organizations and cooperatives of waste pickers and to initiate such organizations where they did not exist. The crisis caused by the Mumbai floods in 2005 spurred the state government into passing the Maharashtra Non-biodegradable Garbage (Control) Ordinance, 2006 for regulating the handling of non-biodegradable waste and material. The Ordinance, converted into an Act soon after, controls ways in which non-biodegradable materials are to be disposed of. The first of its kind in India, this law relating to collection, handling, and disposal of non-biodegradable waste is explicit in setting out the responsibilities of various stakeholders. It recognizes the worth of recycling and waste pickers. An Action Plan for implementing the MSW Rules, 2000 in municipalities was formulated based on the Act. The plan favours integration of the informal sector.

Municipal laws: The Greater Mumbai Cleanliness and Sanitation Bye-Laws passed by the Municipal General Body in 2006 enforce waste segregation and allow for allotting dry waste sorting centers to registered cooperative societies of waste pickers or any other agents. In February 2007, the Pune Municipal Corporation General Body Resolution No. 476 approved the formation of and support for the constitution of a central cooperative that would integrate waste pickers into door-to-door collection of solid waste. In 1995–96, the Pune Municipal Corporation (PMC) had been the first municipality in the country to provide waste pickers identity cards. Soon after, it was again the first one to provide medical insurance cover to all registered waste pickers in the city. In 2007, the PMC again made history by resolving an integration model outside the contractual framework. A pilot-scale preceded the General Body Resolution in Pune to scale, that drew legitimacy from an authorization given by the municipal commissioner using his powers under the Bombay Provincial Municipal Corporations Act, 1949.

CASE STUDIES

THE PLASTIC WASTE MANAGEMENT PROGRAMME IN MUMBAI

The plastic waste management programme, a collaborative effort of the Municipal Corporation of Greater Mumbai and Hindustan Unilever, is driving end-to-end plastic waste management in Mumbai as well as catalyzing behavioural change and improving livelihoods of waste pickers. The project is currently being implemented in three wards of Mumbai: H-west, K-East, and R-North (Greater Mumbai is divided into seven zones, each consisting of three–five wards named alphabetically). It aims to enhance segregation, collection and recycling of all kinds of plastic and dry waste along the waste value chain, creating resource efficiency. This is in line with Government of India's Swachh Bharat Mission, Solid Waste Management Rules, 2016 and Plastic Waste Management Rules, 2018.

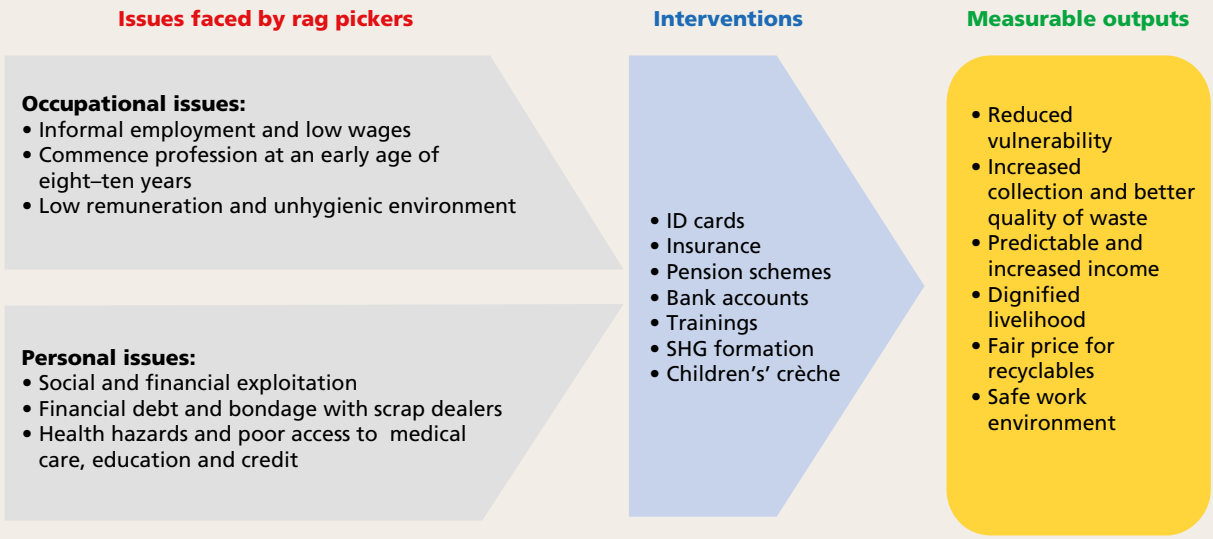
With long working hours and continuous sorting of waste into different categories, the *safai sathis* (informal waste recyclers) would experience excruciating pain in their muscles and would often complain of body aches. The new strong tables enable them to work in ergonomically correct positions, increasing the efficiency of sorting waste and improving the hygienic conditions.

Swachhta kendras (SKs) have been created as a sustainable institutional approach to integrate the informal sector into the solid waste management chain. SKs are defined in the project as integrated material handling facilities for recovery and recycling of all types of plastic waste, which is collected by implementing partners (IPs) with the support of ULBs. The project encourages *safai sathis* to be a part of the larger chain of collection and segregation of waste from a range of institutions, bulk generators, aggregators and municipal collection system at the SKs.

All kinds of plastics, including low-grade, thin plastic bags, multi-layered plastics and styrofoam is collected through *safai sathis* in their designated areas and wards. About 4–5 metric tonnes of plastic waste is segregated daily, which is then re-processed (through shredding, bailing and agglomeration, etc.) as per requirement by back-end recyclers.

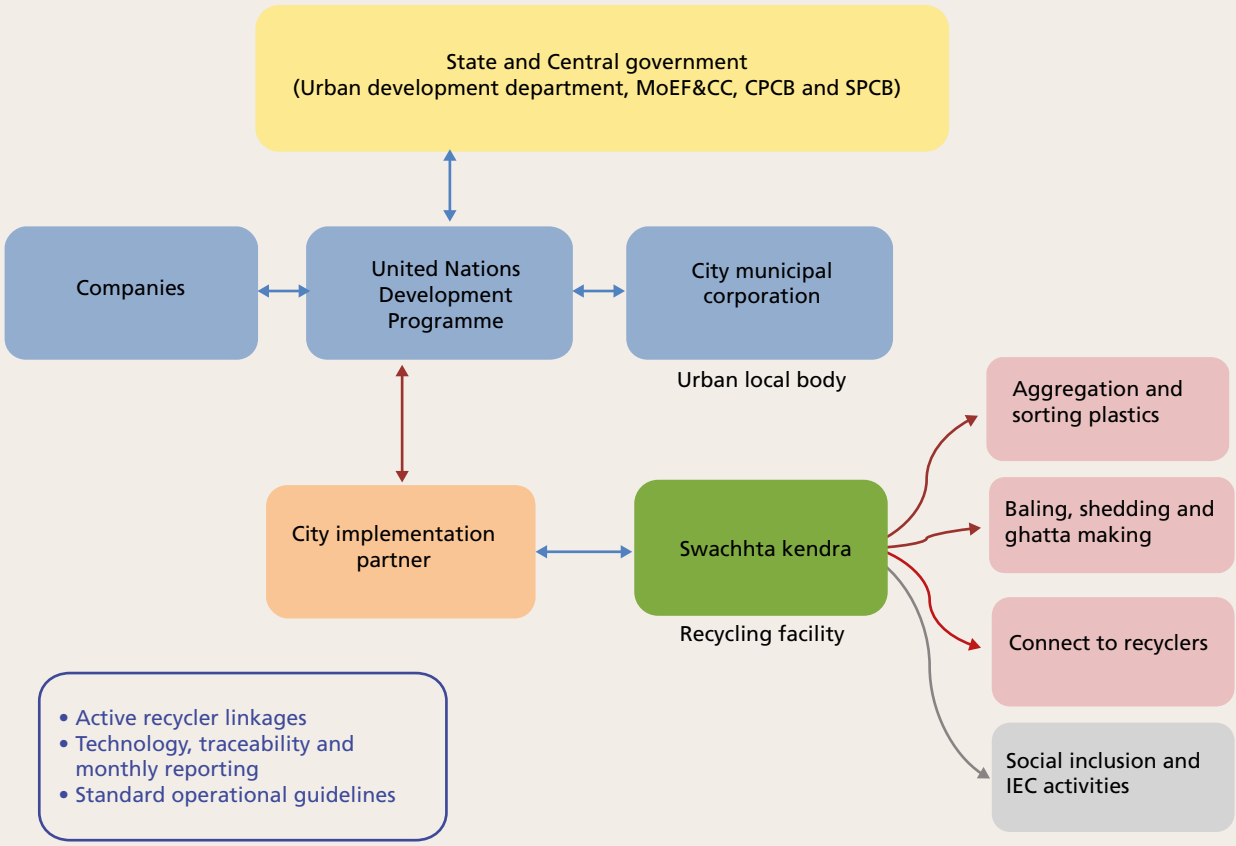
- The SK is equipped with proper machinery for better efficiency
- A business model approach has been created for replicability and scability
- Basic amenities like safe drinking water and toilets, and a safe working environment are provided
- Waste flow data is recorded so that there is traceability in the waste ecosystem

Figure 7: Mainstreaming waste pickers in Mumbai under the UNDP plastic project



Source: Plastic Waste Management Team, United Nations Development Programme, Mumbai

Figure 8: Structure of socio-economic implementation of the UNDP programme for plastic management



Source: Plastic Waste Management Team, United Nations Development Programme, Mumbai

DRY WASTE COLLECTION CENTERS (DWCCS) IN BENGALURU

Bruhat Bengaluru Mahanagara Palike (BBMP) is the primary agency mandated to provide waste management services in 198 wards of the city. Solid waste is collected through *pourakarmikas*, and private contractors and their contractual workers. Citizens and companies have also started providing waste management services in various parts of the city.

Simultaneously, the informal network comprising of waste pickers, itinerant buyers and their organizations provides services in the city. These formal, contractual and informal waste collection and management services have different institutional dynamics and face various challenges.

The informal network of waste pickers, with a floating population of more than 15,000 people, stands at a vulnerable position for many reasons. Most of the workers are migrants and belong to the Dalit community, have minimal or no education, are poor, and have negligible social and political capital. With increasing privatization of waste collection and management services, their condition is worsening. They remain at the receiving end of exclusionary practices and bear the brunt of harassment and illegitimization of their work.

To ameliorate this condition, the BBMP commissioner issued an official circular to register waste pickers and itinerant buyers and catalogue scrap dealer, which was hailed as the first step towards formal recognition of their role. The BBMP also attained the unique distinction of being the country's first urban local body to initiate this process. On 9 August 2011, at the first Waste pickers Convention, 200 waste picker ID cards were distributed following the registration, a step towards officially acknowledging the indirect contribution of waste pickers to the city's solid waste management. As of 2013, the BBMP had distributed over 5,000 ID cards and sanctioned an additional 7,000 registrations.

INDHA, HASIRU DALA

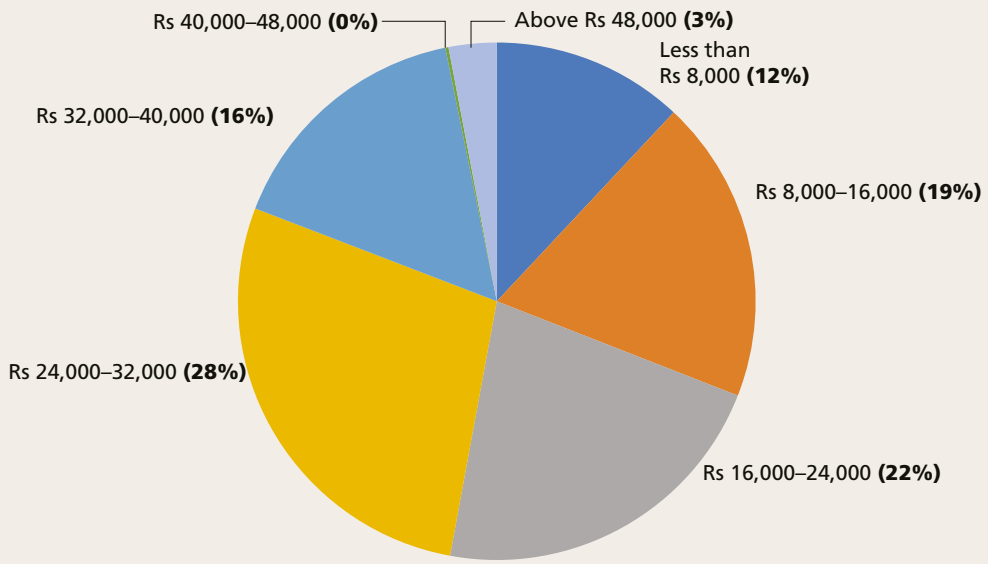
Dry Waste Collection Centers (DWCCs) are an important aspect of decentralized waste management in Bengaluru. Though the concept was modelled after the neighbourhood recycling centres, it is based on the principles of waste hierarchy, to put in practice the three R's—reduce, recycle and reuse—at the neighbourhood level. DWCCs facilitate the collection and buy-back of all dry waste from local residents, contract and waste workers, and scrap dealers; integrate informal waste workers into the operations of these centres; and encourage or implement extended producers' responsibility (EPR) of packaging materials that are not being recycled currently, thus serving as the cornerstone for the triple bottom line of operations—people, planet and profit. Bengaluru became the first municipality to set up DWCCs in the country.

Management models and labour and livelihood impact: The administration and management of each DWCC is facilitated by Hasiru Dala or its partners. Of the 32 centers, 19 are run by scrap dealers and 13 by waste pickers. Each centre has a minimum of two sorters, with some centres employing more than seven sorters. On an average, the centres pay around Rs 350 to male sorters and between Rs 300–325 to female sorters. The average cost of labour per day is around Rs 1,280. Together, the 32 DWCCs have created 161 jobs. Given that India generates 100,000 non-IT blue-collared jobs annually, the 32 DWCCs in Bengaluru have managed to create 0.161 per cent of them.

Eleven DWCCs receive between 300–500 kg of waste per day and nine receive between 500–800 kg per day. Surprisingly, only two DWCCs receive more than 800 kg of waste per day. A focus group discussion with DWCC operators revealed that in wards where on-ground officers are proactive in directing contractors to deposit waste, *pourakarmikas* are trained periodically, and the DWCC is centrally located, waste inflow has been higher.

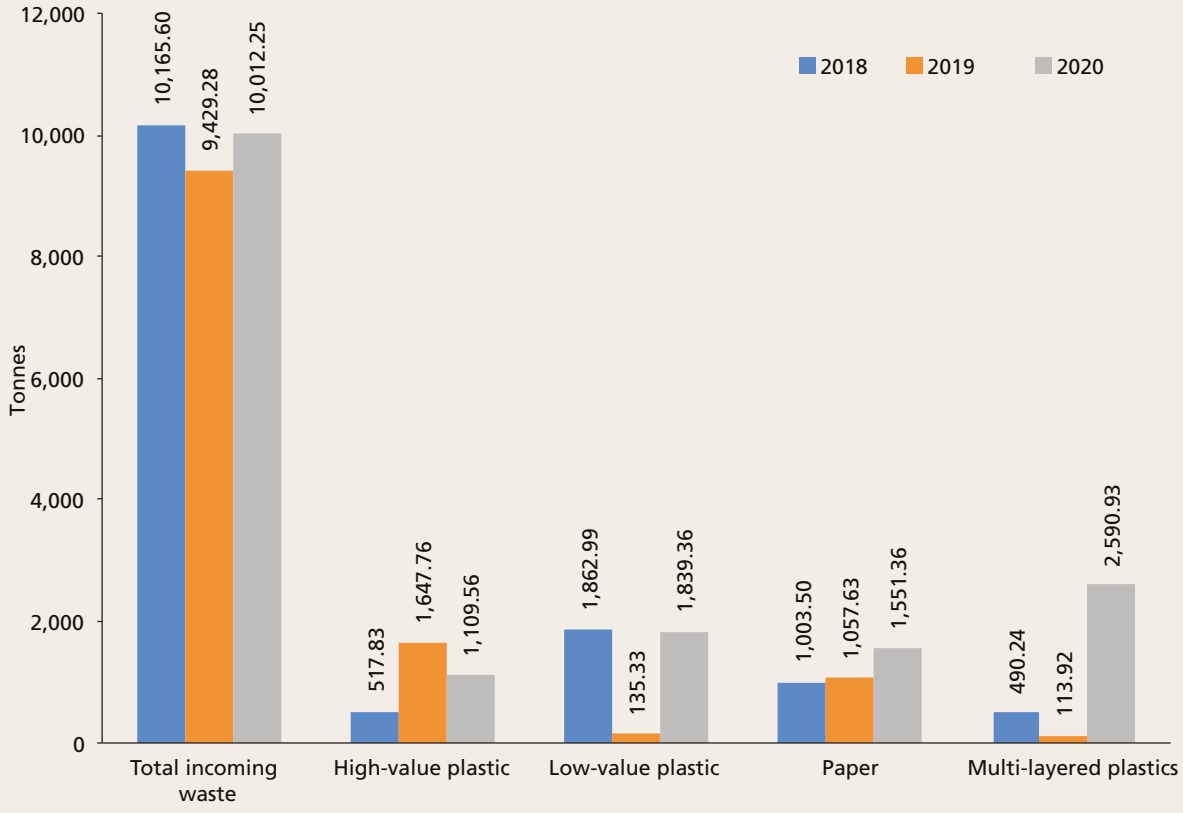
Working capital: Nine DWCCs require a daily working capital of Rs 24,000–32,000. Only one DWCC requires above Rs 48,000 daily, which translates into a higher waste inflow, advances to labour, and transportation costs (see *Graph 6: Capital expenditures of DWCCs in Bengaluru*).

Graph 6: Capital expenditures of DWCCs in Bengaluru



Source: Chandran and Narayanan, 2016

Graph 7: Year-wise waste collection by the informal sector



Source: Compiled on the basis of data from Hasiru Dala

Given the operational challenges vis-à-vis infrastructure, location of centres and lack of enforcement of segregation-at-source, the DWCCs have made exceptional progress in waste diversion and retrieval of dry waste to the tune of over 2,374 tonnes kg in 2018.

In 2018, the DWCCs managed to divert over nearly 2,871 tonnes of plastic waste on its way to landfills. In 2020, nearly 5,508 tonnes of plastic waste was collected and sent for recycling by the DWCCs. Similarly, the quantities of paper collected by DWCCs were estimated to be 1,004 tonnes, 1,058 tonnes and 1,551 tonnes in 2018, 2019 and 2020 respectively (see *Graph 7: Year-wise waste collection by the informal sector*).

INDHA, HASIRU DALA

SOLID WASTE MANAGEMENT BY SWaCH IN PUNE

Kagad Kach Patra Kashtakari Panchayat (KKPKP) was the first waste pickers' and itinerant waste buyers' membership-based trade union to advocate the recognition of waste pickers' work and contributions to waste management and environment. The year was 1993. The city was Pune. In 2005, in collaboration with the Pune Municipal Corporation (PMC) and SNDT Women's University, KKPKP implemented a pilot programme to train about 1,500 waste pickers on door-to-door collection of waste from 125,000 households in the city. The pilot was successful. Subsequently, the municipal government authorized waste pickers and itinerant waste buyers to collect recyclables by issuing them photo identity cards. To provide these services, KKPKP formed the Solid Waste Collection Handling (SWaCH)—a wholly-owned workers' cooperative—as a pro-poor public–private partnership in 2007. The cooperative entered into a five-year contract with PMC in 2008, which was renewed for 2016–20.

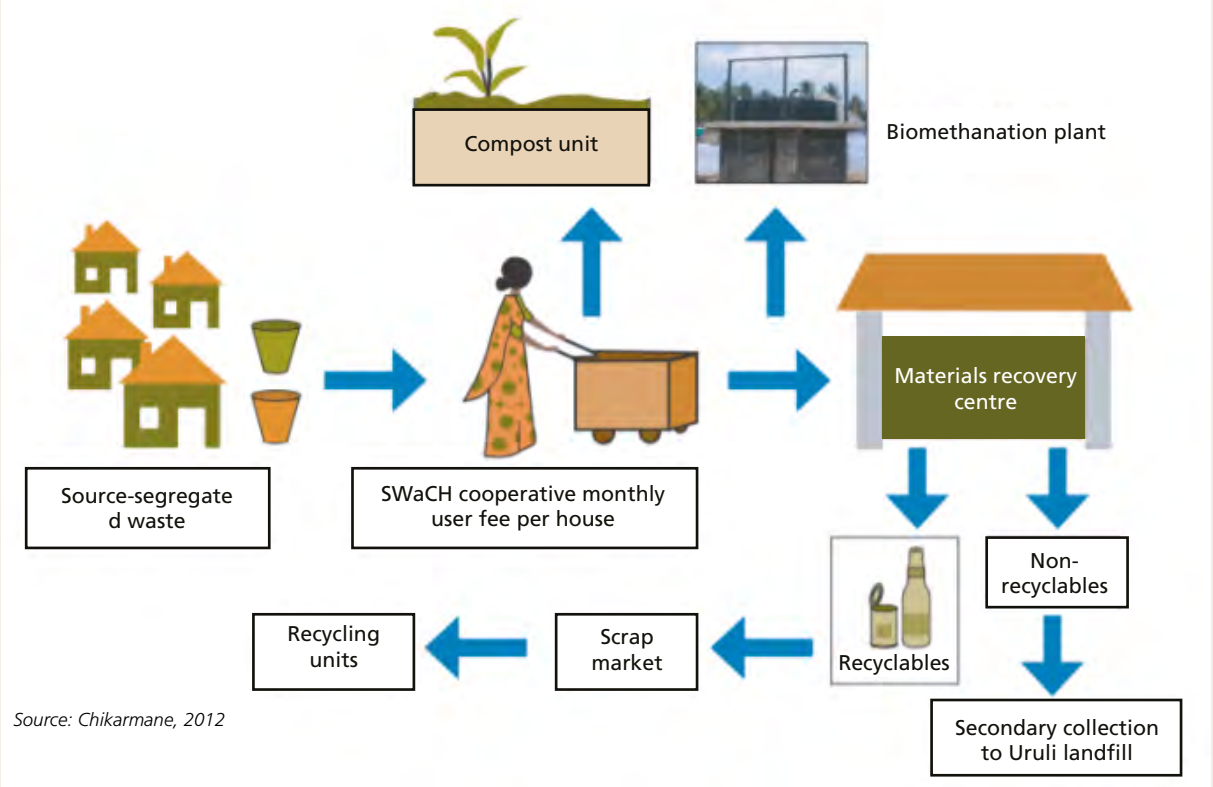
Today, KKPKP has more than 9,000 members, 80 per cent of whom are women from socially backward and marginalized castes. SWaCH has over 3,000 worker-members (all women). They provide door-to-door waste collection services in exchange for user fees paid by each household, sort the waste and drop off non-recyclables at city-run feeder points. They earn incomes from the user fees and by selling recyclables to local scrap dealers. Members are provided with identification cards that are endorsed by the Pune Municipal Corporation (PMC), and can avail of other benefits like interest-free loans and educational support for their children. PMC provides members with identity cards that allow them to avail of other benefits, such as interest-free loans and educational support for their children. PMC also provides safety gear, raincoats, footwear, uniforms and collection equipment.

With time, SWaCH diversified into different verticals such as primary waste collection and sorting by informal sector and extended its service delivery to another city. The SWaCH model, wholly owned by waste pickers, covers 50 per cent of the city, serving over 540,000 households. The cooperative of 2,300 waste pickers collects segregated waste from households and collects a user fee of Rs 45–50 per household. The model, which has been running independently for the past few years, is also the only one in India entirely owned by the informal sector. Two informal workers cover close to 300–400 households every day. The PMC annually saves Rs 5 crore in waste handling, Rs 1 crore in tipping fee and Rs 33.5 crore in labour costs through the model. This has considerably improved the working conditions of waste pickers and upgraded their livelihoods, effectively bridging the gap between households and municipal waste collection services. The initiative brought together two interests—the waste pickers' interest in upgrading their livelihood and the municipality's interest in sustainable SWM.

Today, apart from SWaCH PMC, there is also SWaCH Plus. SWaCH Plus includes all the livelihood-upgradation and income-enhancement activities concerning waste management that go beyond door-to-door collection, such as V-Collect events, where citizens can dispose of their unused household items and clothes; composting; e-waste collection and disposal through proper channels; making and selling disposable bags; and awareness raising events. SWaCH members are competent to handle mechanical composters and do manual composting. Members also work in bio-methanation plants established by the PMC on a build-operate-transfer (BOT) basis.

Another activity still in the incubation phase is up-cycling or development of post-consumer, pre-recycling products. KKPKP SWaCH+ is also in the process of developing *Kashtachi Kamai* (earnings from labour) fair trade centres based on KKPKP's experience of running one such centre in Pune since 1998. Two more centres were started by Pimpri Chinchwad Municipal Corporation in 2011. Space for all the centres is provided

Figure 9: Movement of waste from households in Pune



Source: Chikarmane, 2012

Table 7: Salient features of the PMC-SWaCH partnership in Pune

Memorandum of Understanding (MOU): Signed in October 2008
Nature of the arrangement: Pro-poor public partnership
Main tasks: Door-to-door collection of source-segregated domestic waste: maintenance of separate streams Collection of road sweepings, biomedical waste excluded Collection of garden waste, construction and demolition waste, e-waste on payment of user fees
Mode of collection: Manual push carts (small motorized vehicles introduced in difficult terrain)
Workers involved: Two workers for 200–300 households, offices, shops and other establishments
User fee: From all classes of users
User fee amount: Usually Rs 10–30 per household per month depending upon certain variables; in slums Rs 15 per household per month
Collection from slums: To be partly subsidized (but this clause not implemented)
Rights over recyclables: Collectors have rights over recyclables and retain income from sale of scrap
Provision of collection equipment and safety gear: Pune Municipal Corporation
Office, infrastructure and resource recovery centres: Pune Municipal Corporation
Terms of payment: Operational grant to cover management costs and some operational costs reducing annually
Worker benefits: Provided by PMC
Complaints and customer care helpline: Operated by SWaCH
Performance indicators: Specified in the arrangement
Validity of MOU: Five years
Monthly per household cost to municipality: Rs 4.38

Source: Chikarmane, 2012

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for free by the Pune and Pimpri Chinchwad municipalities. Recyclable materials are purchased at market prices from members. Payment is immediate and in cash, and receipts are issued for every transaction. These practices are not followed in the scrap market. Approximately 100 KKPKP–SWaCH members who sell their scrap at the *Kashtachi Kamai* centres are entitled to profits, calculated as a percentage of daily earnings from sale of scrap. In 2012, the *Kashtachi Kamai* centres distributed a profit share of 18 per cent on the annual earnings of each member. The total amount distributed was Rs 5,88,559. Members invest at least half of this amount in the Public Provident Fund or in a money-back insurance policy towards their retirement benefits. The mere existence of these *Kashtachi Kamai* centres regulates the recycled materials market in the localized area. That offers members greater bargaining power.

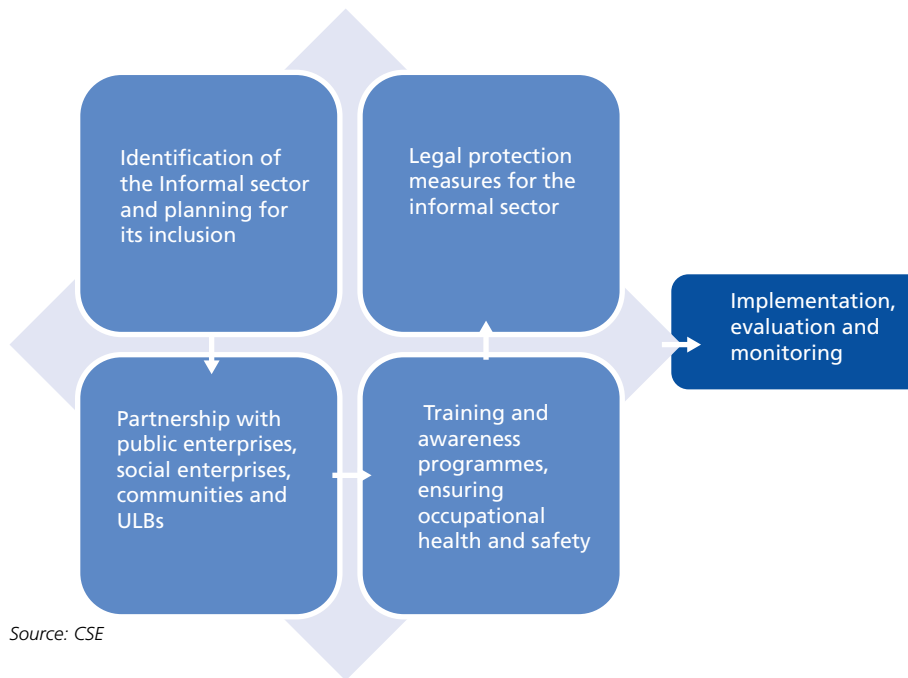
Enabling mechanisms for integration of the informal sector

Identification of informal sector actors and planning for their inclusion

The first and foremost step towards integrating the informal sector in a waste chain is identifying actors involved in the solid waste recycling business. As discussed in chapter 1, informality exists at three levels, i.e., Stage 0, Stage 1 and Stage 2. Ragpickers and *kabadiwalas* are the ones that need to be integrated in the solid waste management chain. It is crucial for ULBs to identify ragpickers and *kabadiwalas* in their operational area, catalogue them, and create their socio-economic profiles, containing the name, age, gender of, and the quantity of waste collected by, every single one of them.

Once the ULBs have detailed lists of waste pickers and *kabadiwalas* operating in their area, the practices and associated challenges in the solid waste management chain and applicable regulations need to be understood. This will help analyze the opportunities and obstacles in the solid waste management systems that are likely to be encountered by ULBs while integrating the informal sector. The next task is to develop a set of goals that can address those challenges and comply with applicable regulatory requirements. Some of the common objectives could be (1) Providing universal doorstep waste collection services by formalizing the informal sector as doorstep collectors (inclusion of

Figure 10: Steps for integrating the informal sector in solid waste management chain



Source: CSE

waste pickers who are already engaged in waste collection activity) (2) Capacity building of the informal waste (3) Enabling and supporting recycling activities by the informal sector by establishing material recovery facilities (MRFs) (4) Establishing targets to monitoring the performance against set objectives.

Partnership with public and social enterprises, communities and ULBs

ULBs should make intense efforts to engage public and social enterprises and association of informal waste recyclers in managing solid waste. There has to be collaboration between ULBs, the informal sector, NGOs working with waste pickers, and CSR intervention of private enterprise in order to integrate waste pickers in solid waste management systems. ULBs can motivate NGOs to take up awareness programmes about door-to-door collection to facilitate resource recovery and waste minimization. NGOs, in turn, can facilitate integration of *kabadiwalas* and waste pickers into the solid waste management system. Municipal authorities may support waste pickers or NGO association in setting up dry waste recycling centres on municipal land where ragpickers can sell recyclables and get a fair price for the materials collected by them. ULBs may also involve waste pickers through NGOs or the private sector for picking scrap polymeric and recycling material, including plastic and other recyclable materials, from the streets in a designated area to make cities litter free and prevent valuable material from going to landfills. These waste pickers could be paid incentive money for carrying out the task satisfactorily. To facilitate sorting of recyclable materials collected by the informal sector and supporting the recycling industry, municipal authorities should set up waste sorting facilities at suitable locations and permit the informal sector to use the facilities to segregate recyclables. There has to be a periodic assessment of the relationship between NGOs and ULBs against the original terms and conditions, regularly meeting with the organization's representatives to understand and address their challenges, and monitoring their performance against benchmarks.

Training and awareness programmes

Despite the occupational and health hazards their job entails, waste pickers hardly use any protective gear and are exposed to frequent injuries like cuts from glass pieces and metal, and stress injuries due to carrying heavy loads. In order to ensure a better health and safety regimen for waste pickers, NGOs should train waste pickers on the importance of using protective equipment and follow safe and ergonomic work practices. ULBs should plan and implement training and awareness programmes to educate municipality workforce, common citizens, educational institutions, commercial establishments, hotels and restaurants, and administrators of public places (bus stands, airports and railway stations, etc.). The training programmes should aim at building capacities for achieving ideal source-segregation of various components of MSW, including waste recyclables.

Legal protection measures for the informal sector

Recognizing the informal sector for the essential services it provides ought to be a primary step in its formalized inclusion into urban waste management systems. However, mere acknowledgment is not enough. ULBs should make

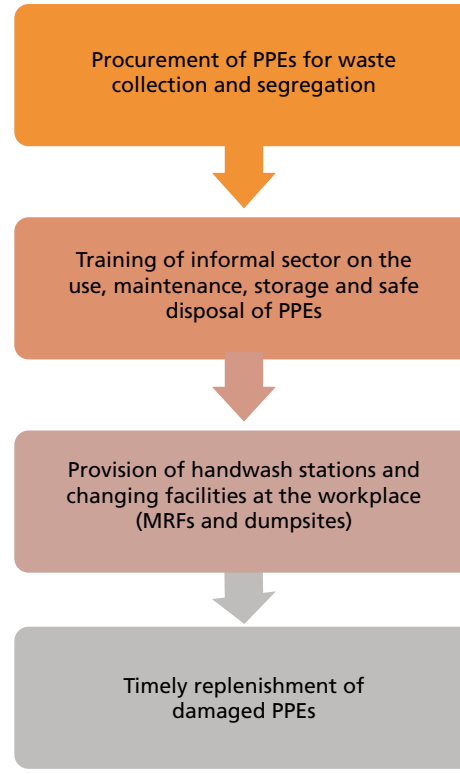
their contribution legal by treating them as legitimate service suppliers. Providing waste pickers identification cards can legitimize them as service providers of solid waste recycling. Signing contracts with informal sector organizations gives their work a legal cloak. Individual informal sector suppliers typically face harassment from public officers and town residents. Formalizing informal service suppliers will help address a number of these issues.

Ensuring occupational health and safety

Workers should follow occupational health and safety protocols by wearing the required safety gear and other equipment specified in municipal protocols. The municipality and its formal and informal organizational partners should ensure that workers have access to safety gear. The Ministry of Urban Development provides detailed guidance on the appropriate safety gear.

ULBs should provide PPEs to sanitation workers engaged by them irrespective of the modality of engagement. ULBs should also ensure that private contractors provide PPEs to sanitation workers engaged by them. To facilitate enforcement of Prohibition of Employment as Manual Scavengers and Their Rehabilitation Act, 2013 and for smooth monitoring of private agencies, ULBs should empanel all private service providers and ascertain adoption of standard operating protocols to ensure the safety of informal waste workers.

Figure 11: Steps for ensuring occupational health and safety of the informal sector



Source: CSE

- Safety boots (always to be used while working outside the buildings)
- Reflective vests (always to be used by all staff working outside the buildings)
- Safety helmets (to be used in case of risk of injuries to the head, e.g., during construction, loading or unloading activities, while operating machinery, etc.)
- Gloves (to be used in case of risk of injuries to hands, e.g., during loading or unloading and maintenance activities)
- Ear protectors (to be used while working in noisy areas)
- Disposable dust mask (to be used in case of exposure to dust, etc.)
- First aid kits to be present in all MRFs
- Training to be provided to staff on how to tend to minor injuries, including cuts, burns and bandages. Also, on how to renew and refill the kits.

ULBs can incentivize the performance of workers by giving them cash rewards, vouchers, awards or displaying the names of well-performing informal waste collectors on appreciation boards.

Implementation, evaluation and monitoring

The final step in the process is to develop an implementation schedule for this set of activities to allow the ULBs to meet their inclusive waste management goals and objectives. When designing such a programme, it is essential to bear in mind the resources required for implementing the activities and the dependencies between various activities. This helps in determining the most feasible timeline for achieving the objectives in a reasonable timespan.

The three important tasks in monitoring the progress are: (1) Periodic reporting (2) Audit programmes (3) Annual progress monitoring.

Informal and formal sector players involved in waste management should provide regular reports on their activities. This can be done on a quarterly or half-yearly basis. Reporting requirements should be written into partnership agreements or contracts. In addition to regular reports, municipalities should also audit the operation of service providers, both formal and informal. Data from such audits should be collated and reported publicly to build and maintain public trust.

Similarly, annual reporting is also essential to monitor overall progress of waste management systems. ULB needs to ensure that they are making progress against annual goals and metrics developed as part of the planning process.

Policy recommendations

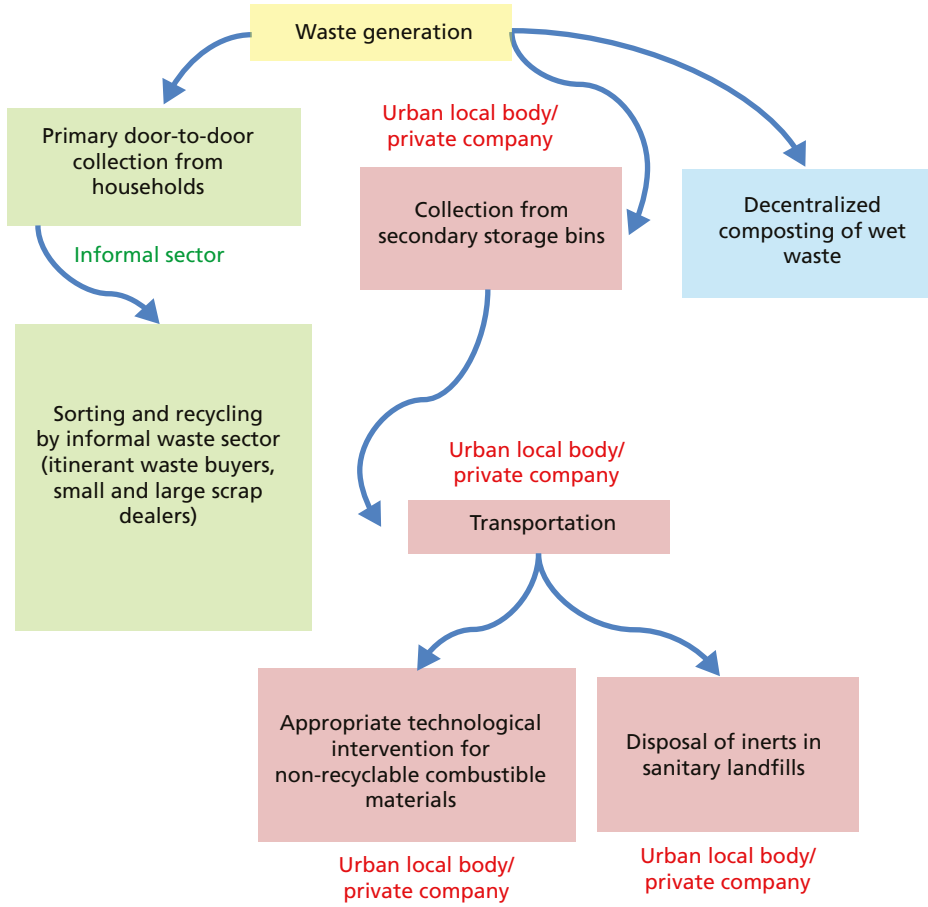
Regulatory oversight: As we have established, there is lack of clear and comprehensive laws and policies to protect the rights of waste pickers in India. There is an urgent need to frame and implement a uniform waste picker welfare law that recognizes and integrates them into the waste management chain. The law must include basic provisions related to mandatory identity cards; access to waste for collection, segregation, and sorting; access to personal protective equipment to minimize occupational hazards; right to basic necessities like water, sanitation and facilities for clean living; and health insurance. The role of waste pickers could be formalized by permitting them to use the designated collection and compaction stations (transfer stations) in a city for the segregation of recyclables.

Formation of waste picker member-based organizations: Inclusion of waste pickers in all social welfare organizations and schemes must be mandated, for instance, through the creation of cooperative banks for marginalized workers. Formation of waste picker's member-based organizations (MBOs) needs to be endorsed. Waste picker MBOs are essentially a means for waste pickers to exercise their collective agency to advocate for their rights and create positive political traction. As member-owned, democratically-controlled enterprises, cooperatives are considered among the best pathways to transition informal economy workers, including waste pickers, to the formal economy through strengthening their collective voice and representation, securing jobs and incomes and facilitating access to basic services and social protection. Cooperatives have played a key role in integrating waste pickers into formal waste management chains, particularly in Brazil, Argentina, Colombia, South Africa and even in India. Some successful initiatives in this regard include Hasiru Dala in Bengaluru, SWaCH in Pune and SEWA in Gujarat. Such MBOs must be promoted and supported by the government.

Designing a model for integration: A model for integration should be designed in which ULBs can integrate the informal waste sector into a city's waste management system holistically. *Figure 12: Proposed model for integration of the informal sector in the solid waste management chain* demonstrates the bare bones of one such model, the details can be filled in to suit local conditions. Primary door-to-door collection of waste should be done by informal sector workers so that they can earn some extra money by sorting and selling recyclable materials. The remaining waste should be collected, transported and disposed of either by the ULB or the private concessionaire.

Formation of an authority to integrate the informal sector: An authority entrusted with regulating waste should be established to implement a nationwide campaign to incorporate the informal sector into formal waste management systems. The authority will also need to develop monitoring criteria, establish institutional mechanisms, and have a process to report the performance data transparently on a disclosure platform. A cooperative

Figure 12: Proposed model for integration of the informal sector in the solid waste management chain



Source: CSE

society or NGO may be an appropriate mechanism to achieve these goals, mainly because government regulatory agencies may not have spare personnel to undertake these tasks.

Training and awareness campaigns: There is an urgent requirement of training programmes to make waste pickers aware of occupational hazards associated with their job.

Allocate working space and other facilities to the waste pickers and *kabadiwalas*: The state could compensate waste workers for their services (both collection and high recycling rates) by providing them with space, equipment (e.g., bicycles, pushcarts, masks, and PPEs), and access to healthcare and pension schemes.

Financial inclusion: While cities struggle to address the problem of waste management, the livelihoods of waste pickers has been hit by the implementation of GST (Goods and Services Tax). Since the implementation of GST, many informal waste workers have lost their jobs or confronted decreased earnings. When scrap dealers sell recyclable products like plastic,

paper, glass and iron scrap to recycling units, 12 per cent GST is levied. This leaves them with less money to pass on to waste pickers. A financial or taxation mechanism is needed to address this problem.

The authorities should also ensure that privatization of waste management does not threaten the livelihood of waste pickers and marginalize them. Private companies have to be engaged in the transportation, treatment and disposal of waste while door-to-door collection can be left to waste pickers.

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Developing countries like India face certain unique challenges in solid waste management. Rapid urbanization and the rise of a middle class lifestyle have led to proliferation of waste. But its management is hamstrung by lack of policy, intent, funds and institutional capacity of city governments.

The reason India has not drowned under its own waste is the workforce called the "informal sector"—apparently unorganized, but a super-efficient contributor to the cause of the circular economy. A lot has been spoken on them, but action reflects it poorly.

This report makes a case for the integration of the informal sector into formal programmes so that the muscle-memory of India's brilliant manpower can synergize with a new policy roadmap to achieve a paradigm shift in waste management.

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