

**Mainstreaming Informal sector in Municipal Solid Waste Management in Ludhiana,
Punjab**

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Abstract: *Municipal Solid Waste Management has become a critical challenge in urban India. Increasing per-capita income and disproportionate population increase has strained the carrying capacity of land and infrastructure. Municipal Corporations continue to be incapacitated due to administrative, financial and human resource constraints. Mainstreaming informal waste collectors/ waste pickers into the formal chain of collection, transportation, treatment, recovery and disposal of the Municipal Solid Waste can help to institutionalize a sustainable model of Municipal Solid Waste Management and inclusive urban growth. Such policy will also be constructive in environmental conservation through effective implementation of the Solid Waste Management Rules, 2016 with respect to at source waste segregation and decentralized waste disposal.*

Introduction

Rapid urbanization and increasing consumerism due to access to various income avenues has made ‘sustainability of the cities’ one of the biggest challenges in the 21st century. Increasing population pressure due to in- migration from rural areas has strained the urban infrastructure and civic amenities beyond its carrying capacity. In such a scenario, Municipal Solid Waste Management (MSWM) continues to remain one of the most neglected and challenging issues of urban governance in India. Non segregated waste collection and unscientific disposal of the Municipal Solid Waste has become a threat to public health and a major factor of environmental degradation. The fundamental issue with waste management in India is that it has always been considered someone else’s problem. The continued apathy of the waste generator and the ubiquitous attitude of ‘Not in my Backyard’ (NIMBY) has resulted in piles of garbage and wastes getting collected on the landfills at the outskirts of the city. The inadequate capacity of the Urban Local Bodies in terms of financial and human resources, underscore the need for all stakeholder inclusive and self-sustaining solutions in the process of Municipal Solid Waste Management.

Research Objective

This paper attempts to highlight the role of informal sector in efficient MSWM practices in urban areas. Mainstreaming the informal sector in the process of Municipal Solid Waste Management can provide solutions which are self sustainable and efficient from the aspect of cleanliness and sanitation. It will also help in the social objective of socio-economic upliftment and dignifying the work of these self employed cleanliness workers, who largely come from the marginalized sections of the society. This will also help to augment the capacity of the Urban Local Bodies, who are confronted by financial and human resource constraints. A policy endeavor in this direction will help in accomplishing the dual objectives of Mahatma Gandhi's vision of '*Swachhta*' aur '*Shram Pratishtha*' (Cleanliness and Dignity of Labour).

Research Methodology

The purpose of the study is to attempt an exploratory and descriptive research of the current Municipal Solid Waste Management practices in Ludhiana city of Punjab. Quantitative and qualitative analysis of the Detailed Project Report for Integrated MSW Management¹ has been undertaken for empirical research of the MSWM practices in the city. The research uses primary data collected through purposive and stratified sampling of self- employed informal sector workers to underscore the importance of mainstreaming them into Municipal Solid Waste Management, to fulfill the social objective of inclusive urbanization and efficient door-to-door waste collection services. The Case Study of SWaCH (Solid Waste Collection and Handling) -an autonomous informal sector workers cooperative is undertaken as an example of such self-sustaining and inclusive solutions towards urban solid waste management. Although the Municipal Solid Waste (MSW) includes the residential, commercial and bio-medical waste (Municipal Solid Waste Management and Handling Rules, 2000), this paper restricts its focus on MSW generated in only residential areas (waste

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generated from households, street sweeping and litter control) as the projected land use under residential areas in Ludhiana city is proposed to be increased to 50.08 percent of the total urbanisable area by the year 2021(Ludhiana CDP, 2006). Policies towards efficient handling of waste generated from these areas would hence contribute in a major way towards fulfilling the objectives of Swachh Bharat Abhiyaan (Urban).

Municipal Solid Waste Management and Swachh Bharat Abhiyan (Urban)

Swachh Bharat Abhiyan was launched on 2nd October 2014 with an aim of making urban India free from open defecation and achieving 100 percent scientific management of Municipal Solid Waste (MSW) in 4,041 statutory towns in the country. Hundred percent door to door collection and scientific disposal of Municipal Solid Waste (MSW) in urban areas was one of the targets under this mission. Municipal Solid Waste Management (MSWM) refers to a systematic process that comprises of waste segregation and storage at source, primary collection, secondary storage, transportation, secondary segregation, resource recovery, processing, treatment, and final disposal of solid waste (Guidelines for SBM, 2014). The implementation of the program has been decentralized under the Ministry of Urban Development, with the State Level High Power Committee having the mandate to clear the Solid Waste Management proposals. The important objectives of the mission are adoption of modern and scientific municipal solid waste management (Mission objective 2.1.3 of the Swachh Bharat Abhiyan -Urban) and capacity augmentation of the Urban Local Bodies (Mission objective 2.1.6). Detailed Project Reports are prepared by the Urban Local Bodies in consultation with the state government for effective MSWM. The guidelines also emphasize the role of the state government in integration of informal sector workers in waste management into the formal system of SWM in the cities.

Punjab generates 3900 Metric Tonnes of Municipal Solid Waste per day, while the per-capita waste generation is 140.77 Grams/ day (Swachhta Status Report, 2016). However, nearly 3510 MT/day waste generated remains unprocessed and is disposed directly at the landfill sites (Narain & Sambyal, 2016). The government of Punjab has adopted a unique cluster approach for the purpose of setting up Integrated Municipal Solid Waste Management Plants. Under the action plan, all the Urban Local Bodies of Punjab have been divided into eight MSW clusters, viz.: Jalandhar cluster, Ludhiana cluster, Ferozepur Cluster, Patiala

Cluster, Pathankot cluster, Bathinda Cluster, Amritsar Cluster and GMADA cluster. Punjab Municipal Solid Waste Management Plan 2014 has been formulated by the state government for managing the MSW of all ULBs of Punjab on Public Private Partnership (PPP) mode for a concession period of 25 years. A common Action Plan has been formulated by the government for 100 percent door to door collection of 'segregated' municipal solid waste, transportation, processing and scientific disposal in the common engineered landfill facilities to be developed in each MSW cluster. The Directorate of Local Government is the implementing body and the Punjab Pollution Control Board is the monitoring body of the Action Plan.

Municipal Solid Waste Management in Ludhiana City

Ludhiana is the largest city in Punjab in terms of area and population (District Census Handbook Ludhiana, 2011). It has emerged as a major trading and industrial hub of India. The city is located in Ludhiana district in the Malwa region of Punjab. It is famous for its woolen garments, hosiery goods and leather items, due to which it is also known as the Manchester of India. Spread over an area of 153.97 sq km, the city accommodates approximately 18.9 lakh in terms of population (Municipal Corporation Ludhiana, 2016). Rapid industrial development in the region has led to disproportionately high in-migration from the neighboring states in search of employment opportunities and better living conditions.

The rapid urbanization has made MSW a pervasive social problem rather than a low priority localized issue in the city. The most neglected areas of urban governance has today become important due to challenges of inefficient collection, handling and disposing which pose a threat to public health and environment. The city secured an abysmal 163rd on the recent Swachh Survekshan 2019, a lower position than the previous years. This clearly highlights the increasing burden of handling the municipal solid waste in an urbanizing city. Formalization of informal sector workers becomes imperative for sustainable solutions. Treatment and scientific disposal of this waste using proper technology/processes to convert it into useful resource becomes imperative for least ecological footprint.

Table 1: An estimate of Population and Municipal Solid Waste generation in Ludhiana city.

Year	Population	Average MSW generation including C&D waste (TPD)
2017	1964227	1201
2021	2239094	1370
2025	2552425	1613
2029	2909603	1839
2033	3316763	2096
2035	3541235	2238

Source: DPR for Integrated MSWM, 2014

Table 2: Land use distribution in Ludhiana city

S.no.	Land use categories	Area (in acres)	Percentage of developed area	Percentage total of mcl area
1	Residential	12570	42.32	31.93
2	Commercial	1867	6.28	4.74
3	Industrial	5560	18.72	14.13
4	Agriculture	8678	-	22.05
5	Miscellaneous	10689	32.68	27.15
Total area	M.C. Area	39364	-	100

Source: Ludhiana City Development Plan, 2006

The enactment of the Constitution (74th Amendment) Act 1992, which inserted Part IX-A in the Indian constitution, recognized the Municipal Corporation as the third tier of government. ‘Public health sanitation, conservancy and solid waste management’ comes under the

jurisdiction of these Urban Local Bodies². The Municipal Corporation of Ludhiana (MCL) is spread over an area of 159.37 km² (39,364 acres). For the purpose of efficient MSWM, the city has been divided into four administrative zones: Zone A, Zone B, Zone C and Zone D. Each zone is headed by a Zonal Commissioner who is accountable to the Municipal Commissioner. An integrated MSWM and processing facility has been proposed by the corporation based on PPP mode. The main components in this facility are: Pre-sorting unit for segregation into organic, combustible and segregated plastic, compost plant, Refused Derived Fuel (RDF) plant, plastic recycling unit, Construction and Demolition (C&D) waste recycling unit and Sanitary Landfill (SLF) for safe disposal of the generated waste (Detailed Project Report, 2014). Municipal Corporation of Ludhiana has engaged M/s A2Z Waste Management Pvt. Ltd. for the operation and maintenance of the integrated MSWM facility against a tipping fee which would include collection, transportation, treatment, recovery, re-sale (of recovered material) and final disposal of the residue in sanitary landfill. The concession agreement has been signed for a period of 25 years at Rs. 395/T/Day. An independent agency has been appointed by the MCL to monitor the progress of the implementation of agreement.

Table 3: Status of Municipal Solid Waste in Ludhiana city as on April, 2017

Population (2016)	18,95,364 (Approx.)
No. of Administrative Zones	4
No. of Wards	75
No. of Households (5)	Approx. 3,80,000
Waste Generation	1100 Tonne per day
Per capita waste generation per day(excluding C&D Waste)	520 gm

Source: Municipal Corporation Ludhiana (MCL), 2017.

² Section 7, Twelfth Schedule, The Constitution of India.

The company is involved in door to door waste collection in 36 wards out of 75 wards, while the rest are covered by the informal sector. It has placed 250 bins at 84 major collection points across the city. The MCL has also installed a Static Compacter at Dugri Dump Point to reduce the transportation cost between transfer station and the waste disposal site. Since the east west expansion of the city is larger than the north south expansion, two dumpsites have been constituted for the purpose of installing Waste Processing and Treatment Plants. The Jamalpur site located at the North-West of the city, caters to Zone A, Zone B and Zone C, while the Jainpur site located in the East hitherto catered to Zone D and some parts of Zone A. Currently, the city waste is disposed at a common Jamalpur site as the Jainpur site has reached its saturation point (DPR Report, 2014). The corporation has also installed three trammel of 20 tons capacity per hour at Jamalpur Dumpsite (650 MT). However, safe handling and disposing of waste at the site has become an insurmountable challenge, with heaps of waste demanding urgent solutions.



Figure 1: A General Location map of four zones and Jamalpur and Jainpur MSW Disposal Sites for Solid Waste disposal sites in Ludhiana City (authors work using Google Earth Map TM of May 20, 2017)

Table 4: Details of MSW disposal sites

s.no.	site	Land	Area	Average	Future	Distance
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		(Acres)	depth (m)	expected life span (years)	from city centre
1	Jamalpur	57.04	0 to 5	20	11 km
2	Jainpur	34	0 to 5.5	20	10 km

Source: DPR for Integrated MSWM, 2014

Table 5: Waste generation and collection points in different zones (2014)

MCL Zones	Waste generated (TPD)	Total collection sites
Zone A (21 Wards)	250	65
Zone B (17 Wards)	170	72
Zone C (18 Wards)	238	39
Zone D (19 Wards)	310	93

Source : Ludhiana City Development Plan, 2006

Solid Waste Management Rules, 2016 (SWMR) have been drafted by the government to provide detailed criteria on efficient and safe handling of the urban waste. Section (4) of the SWMR elaborates the duties of the waste generator to segregate and store the waste in three separate streams: bio-degradable, non-biodegradable and domestic hazardous wastes before handover to the authorized rag-pickers or waste collectors. Sanitary waste including diapers, sanitary pads etc. are required to be wrapped and collected separately as dry/non bio-degradable waste for safe handling by the waste collector (Section 4(2) of SWMR, 2016). The rules also suggest the use of state of the art technology for treatment of bio-degradable waste into compost, residual waste to be treated in Waste to Energy and disposal of only rejects from the treatment plant and inert material at the engineered landfills (Section 15-v of SWMR, 2016). The rules make it mandatory to not dispose the recyclable waste having calorific value of 1500 K/cal/kg or more, on the landfills. Such waste is to be utilized only for generating energy through RDF Waste to Energy Technology.

Municipal Corporation of Ludhiana has adopted centralized segregation and integrated processing facility at two sites: Jamalpur and Jainpur. Municipal Corporation has constructed concrete based transfer stations in four zones for dumping of waste by the informal sector, beyond which the contractual company is authorized to compact and transfer it further to the

dump site at the outskirts of the city. An empirical analysis of the MSWM practice in Ludhiana city suggests that the waste collected from the city is un-segregated at source, as a result of which the entire waste collected is dumped at the SLF site at Jamalpur. This centralized model adds to the undue transport and handling cost of the Urban Local Bodies and the A2Z Waste Management Company. It also results in in-effective handling at the disposal site, as around 15 % of the Municipal Solid Waste generated consists of Construction and Demolition Waste (DPR for Integrated MSWM, 2014). The considerable amount of sand/earth portion in the waste adds to the recurring expenditure on transportation, handling and disposal at the centralized processing and disposal sites. Moreover, the non-segregated waste collected cannot be used as compost directly due to non conformity to the Fertilizer Control order (FCO) standards for compost quality as the waste contains higher sand/earth content. The presence of metals like copper (89.24 mg/kg), nickel and chromium (43.2mg/kg) in the leachate higher than the prescribed limit, at the Jainpur site, confirms the occasional discharge of industrial waste into Municipal Solid Waste stream, which makes it unfit for use as compost (DPR for Integrated MSWM, 2014). A large amount of the waste generated can be recovered and recycled such as paper, plastic, metal, rags, glass etc.

At-source segregation of waste through behavioral change among citizens forms an important pillar of Swachh Bharat (Urban) Mission. The MCL has provided twin bins to encourage segregated collection across the city. However, behavioral change in collection practices is not seen at the ground level. Total waste generation (excluding C&D waste) in the city is estimated to increase to 1122 MT by the year 2020 with biodegradable component at 40 % and RDF component at 30 % (DPR, 2014). The proposal for installation of processing facilities such as RDF, Compost (1 plant of capacity 350 TPD at Jamalpur and 150 TPD at Jainpur) and Bio-remediation of two dumpsites (Removal and Screening of 7.5 Lakh tons of dumped waste) would also prove to be non-sustainable in the long term due to the presence of high calorific value products (DPR for Integrated MSWM, 2014). At source waste segregation and formal authorization of the informal waste collectors to segregate the recyclable components are crucial to optimize collection fleet and efficient decentralized management to reduce the carbon footprint at the SLF site.

Table 6: Physical composition of the waste generated in residential and market areas

Physical composition	Residential area	Market Area
RDF (Non Biodegradable)	17.22 %	20.61 %
Compostable (Bio-degradable)	34.93 %	45.79 %
Recyclables	12.0 %	12.15 %
Inert	31.22 %	18.45 %

Source: DPR for Integrated MSWM, 2014

Table 7: Estimated quantity of recoverable waste from future accumulation of Municipal Solid Waste from Ludhiana

	plastic		Mixed textiles + paper+ polythene		C&D		Sand and soil	
Jamalpur	Available	Recoverable	Available	Recoverable	Available	Recoverable	Available	Recoverable
Future MSW , TPD	55	55	106	59	35	32	162	162
Jainpur								
Future MSW, TPD	27	27	58	26	9	7	102	102

Source: DPR for Integrated MSWM, 2014

Informal Municipal Solid Waste Collector in Ludhiana City

The informal sector workers dealing with the Municipal Solid Waste in the city are mainly involved in door-to-door waste collection, street sweeping and recovering recyclable waste from the collected waste at various levels from bins to disposal sites. Recovery of recyclable materials provides them an additional source of income, besides contributing towards the reduction of waste reaching the landfills. The waste is collected using tricycle and wheel

barrow, which is then transferred to the collection points or the transfer stations. The waste collected from the city is largely non-segregated at source. Large air space (landfill space) can be saved and smaller footprint for the proposed scientific landfill (SLF) can be achieved if recyclable waste and compostable material can be adequately separated from the total waste collected. Cost effective recovery options need to be adopted.

Less than 30 percent of the workers involved in this sector are women. Most of these workers are migrants from the neighboring states of Uttar Pradesh, Haryana and Bihar who have come to the city for better sources of livelihood. These workers have to work in very unhygienic and undignified conditions, without using minimum safety equipments such as gloves, dust-mask, coveralls etc. Lack of social security such as health insurance, medical check-ups etc. and poor living conditions increases their vulnerability towards morbid conditions such as skin and stomach infections, eye ailments etc. Although some of these workers had been incorporated by the A2Z Waste Management Company into the formal set up of waste collection and provided them with uniform, safety gears and TATA Ace vehicles, petrol/diesel driven tricycles, rickshaws etc. for door-to-door collection and transportation of waste. However, the project could not be sustained due to delays in wage payments, insecure tenure due to the nature of contracts and loss of income incurred by these workers as they were not authorized to recover the recyclable waste from the collected waste. Centralized mechanism and lack of grievance redressal portals also resulted in lack of accountability of the service provider to the service user. Many households have opted back for the waste collection by the informal sector waste collectors due to the existing social capital and user fee based collection system. Multiplicity of command and lack of accountability in the administrative echelons is another major challenge in effective implementation of policies and contracts for MSWM.

The informal sector workers are an important base of the pyramidal recycling market structure wherein the itinerant waste buyers and collectors are the sellers of the waste. The informal recovery of material and trading at the level of sub market is entirely market driven, with no subsidy given by the government. They (waste collectors and waste pickers) play an important role in segregating the recyclable materials, before the city waste reaches the disposal site. Organic waste, sanitary waste and C&D waste however, remains non-sorted,

which increases the transport and handling cost being incurred by government and the private enterprise. Increasing quantum of waste has also overburdened the landfill at Jamalpur site, besides the environmental damage being caused to the groundwater through leachate formation. The Urban Local Bodies face acute shortage of financial resources resulting in delayed financial transactions to the private service provider A2Z Waste Management Company which has decelerated the plans of installation of compost and Waste to Energy Plants under the Integrated MSWM project. Human resource and financial constraints of the MCL is thus an important factor behind the inefficient MSWM.

Mainstreaming of informal sector in the formal process of waste management in non-financial arrangements with the MCL can help in not just human resource augmentation with respect to door-to-door waste collection, but also in reducing the amount of waste to be transported through segregation at the primary level, awareness generation for waste segregation by the waste generators, decentralized composting and bio-methanation. MCL will also be able to save its financial resources being spent on door-to-door waste collection, which could be used judiciously in installation of decentralized compost facilities, provision of waste collection equipments and Information-Awareness-Education campaigns for effective MSWM. Formal recognition of their work will also help in inclusive urban development through dignifying their work and making them an important link between the administrative authorities and citizens for implementation of policies on efficient waste management. It will also help the city to be an example of women empowerment and mainstreaming the lower income and middle income household women in avenues of social entrepreneurship. The following case study of SWaCH cooperative, Pune is a leading example in this respect.

Mainstreaming the Informal: A Case Study of SWaCH Cooperative, Pune

SWaCH (Solid Waste Collection and Handling) is India's first wholly owned cooperative of self-employed waste pickers/waste collectors and urban poor. The cooperative and the Pune Municipal Corporation (PMC) work in tandem to ensure effective primary collection, transport, processing and disposal of the waste collected. The cooperative has been authorized by the PMC to provide door to door waste collection, resource recovery, trade and waste processing services to the residents of the city. The organization is promoted by Kagad

Kach Patra Kashtakari Panchayat (KKPKP), which is a union of rag pickers/waste collectors to enable these workers to work with dignity. In a scenario where the local bodies faced challenges of human and finance constraints, KKPKP proposed an alternative model sustainable waste management through participation of workers and other residents (Chikarmane, 2012). In this wholly worker's owned cooperative, majority of the members belong to the marginalized sections of our society- women, Scheduled Caste, Middle Caste and Other Backward Classes.

The Pune Municipal Corporation and SWaCH work in collaboration in a pro-poor, public private partnership arrangement. Collectors retain rights over recyclables, which are stored in the sheds provided by PMC and sold consolidated to the traders, who also provide transport and sharing costs. The cooperative has also launched a unique initiative to bring together the PMC, SWaCH and recyclable materials traders together on a common platform to deliberate on efficient waste management and recycling.

The cooperative has played a major role in bridging the gap between the government policies and compliance through behavioral change among the citizens. Prior to the formal recognition of these workers by the local authorities, the PMC faced the problems of poor fleet utilization and inadequate material recovery as the unprocessed waste was disposed unscientifically at the disposal site at Uruli village (Chikarmane, 2012). The unrecognized informal waste pickers engaged in recovering the recyclable materials from streets and landfills in demeaning working conditions and inadequate safety measures. The 'transformative resistance' of these workers paved way for public sector unions with greater worker and resident participation. An alternative model proposed by KKPKP of integration of existing waste pickers and informal waste collectors for material recovery and processing into the formal chain of direct collection of source segregated waste from domestic and small commercial generators helped PMC to divert not just recyclable waste, but also organic waste from landfills through adoption of decentralized composting, bio-methanation and non-incineration technologies. The model has not only proved to be constructive in terms of being less energy intensive with a low carbon footprint.

The waste collected by the members is segregated according to the Municipal Solid Waste Handling rules 2000 into categories of dry and wet waste. The wet waste collected is either

processed in the housing complex in decentralized manner or is transferred to the PMC authorities. The cooperative has adopted user fee model based on 'polluters pay' principle for direct accountability to the service user. It has also planned for production of post consumer, pre-recycling goods such as woven plastic bags, beads of magazine paper etc. Collection equipment, safety gear, uniforms, raincoats, footwear and worker benefits are provided by the PMC. The segregated waste (organic and non recyclables) are handed over to the municipal transport system, while the recyclables are sorted by these workers for selling further. The cooperative also carries out resident education campaigns on waste related issues. The 'Red Dot Campaign' has been initiated by the workers for segregation of non-biodegradable and hazardous sanitary waste (napkins and diapers) by securely wrapping such waste in paper and mark it with a red dot. This has enabled the waste-pickers to safely dispose of such waste while segregating and disposing it.

The workers are also trained to deal in allied activities such as operating mechanical composters and Bio-methanation plants established by PMC in a Build-Operate-Transfer (BOT) basis. While the finances for decentralized composting are provided by the PMC, the cooperative enables training of the informal workers, thus helping in effective implementation of SWMR, 2016. SWaCH functionaries facilitate relationships between three stakeholders: the service users, the worker-owners and the grant giving PMC, which includes the municipal administration and elected representatives. Such model can also be implemented in Ludhiana city, where more than 50 percent of door-to-door collection of waste is carried out by the informal sector waste pickers/ collectors. This will serve the twin purposes of cutting down the financial expenditure and augmenting the human resources of the MCL. Besides, it will prove to be a sustainable model where all the important stakeholders: waste generator, waste collector and administrative authorities are involved for implementation of SWMR, 2016.

Conclusion

The informal waste collectors form an integral part of the materials supply chain to the industry by turning into commodities the materials recovered from the Municipal Solid Waste. In order to mainstream them into the formal process of MSWM, there is a need of

political willingness and an enabling policy environment at the local level. The current loophole does not lie in administrative inefficiency. Rather the root cause is the lack of empowerment and the financial constraints faced by the Urban Local Bodies, resulting in lack of implementation of policies and laws. Integration of informal workers and at-source waste segregation need to complement the adoption of right technology so that large amount of waste can be processed and recycled within the city before reaching the landfills. This will help the Municipal Corporation to increase their capacity in terms of human and financial resources and will also help in inclusive urban development. The informal sector has filled the gap between the waste generator and the Municipal authorities by transferring the waste from household to the transfer station. Recognition of their work, who work for little money will open the avenue of protection of their rights so that they are not condemned to live an undignified and self-effacing existence.

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