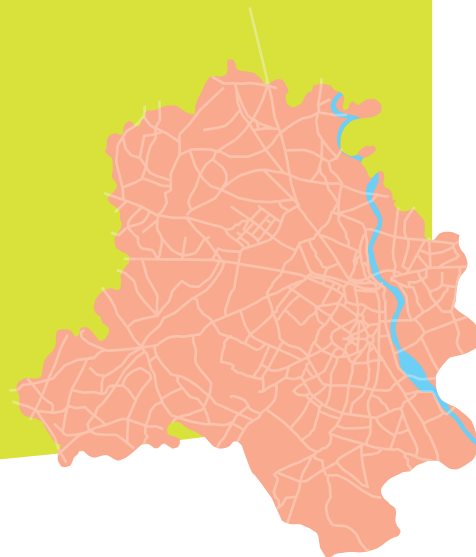


# Making Delhi Swachh

## *Participatory Solid Waste Management Policy for Delhi*



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# Table of Contents



<b>Index of graphs, table and figures</b> _____	8
<b>Introduction</b> _____	13
<i>So what to do about all this trash?</i> _____	13
<b>Data Highlights</b> _____	15
<b>Summary of Key Recommendations</b> _____	17
<b>Methodology and the Context of Municipal Solid Waste Management in Delhi</b> _____	21
<i>Generation and Characterization of Solid Waste in Delhi</i> _____	21
<i>Status of Solid Waste Recycling Technologies in Delhi</i> _____	22
<b>Objectives and Methodology of the Study</b> _____	23
<i>Methods</i> _____	24
<b>11 Key Beliefs: About Solid Waste Management</b> _____	29
<b><i>Belief no. 1: Most people don't think waste management is a serious problem</i></b> _____	30
What are the research findings? _____	31
Measures that can be taken by the Government of NCT of Delhi? _____	42
<b><i>Belief no. 2: People in Delhi do not source segregate because of attitudinal habits</i></b> _____	43
What are the research findings? _____	43
Case study – Introducing segregation in Bangalore _____	50
Measures that can be taken by the Government of NCT of Delhi _____	51
<b><i>Belief no. 3: People either do not pay or are unwilling to pay for waste management services</i></b> _____	52
What are the research findings? _____	52
Case study – Pune and its informal sector _____	60
Measures that can be taken by the Government of NCT of Delhi? _____	61
<b><i>Belief no. 4: Reducing consumption, and therefore waste, is not an option for India at the moment, because it is on a fast track towards economic progress</i></b> _____	63
Can Delhi adopt a Refuse, reduce and reuse measure? _____	63
What are the research findings? _____	63

Case study – Plastic bags _____	67
Measures that can be taken by the Government of NCT of Delhi _____	69
<b><i>Belief no. 5: Waste cannot be managed within city limits – it is extremely messy and dirty</i></b> _____	71
What are the research findings? _____	71
Case study – Advanced Locality Management in Mumbai _____	77
Measures that can be taken by the Government of NCT of Delhi _____	78
<b><i>Belief no. 6: 100% Doorstep collection is a distant possibility for Delhi</i></b> _____	80
What are the research findings? _____	80
Case study – NGO facilitation, the experience of Chintan in Delhi _____	88
Measures that can be taken by the Government of NCT of Delhi _____	89
<b><i>Belief no. 7: The integration of the informal sector in the waste collection system is not desirable</i></b> _____	90
What are the research findings? _____	90
Case Study – Legal and policy measures towards the informal waste sector in Brazil _____	99
Measures that can be taken by the Government of NCT of Delhi _____	99
<b><i>Belief no. 8: Composting should be carried out away from residential areas owing to the odour it produces</i></b> _____	101
What are the research findings? _____	102
Case Study – Bangalore’s growing market for home composting services and products _____	104
Measures that can be taken by the Government of NCT of Delhi _____	105
<b><i>Belief no. 9: The scale of Delhi’s current waste crisis can only be managed effectively by government actors, and with a large use of public funds</i></b> _____	106
What are the research findings? _____	107
Case study: Waste Management in San Francisco, a successful public-private partnership _____	108
Measures that can be taken by the Government of NCT of Delhi _____	109
<b><i>Belief no. 10: Corporate providers of waste services can turn waste management into an efficient commercial venture, with benefits for all – from residents to municipalities</i></b> _____	111
Where is the national debate headed? _____	112
Case Study: A2Z in North India _____	113
Are corporate providers the solution? _____	114
Measures that can be taken by the Government of NCT of Delhi? _____	114
<b><i>Belief no. 11: Extended Producer Responsibility (EPR) is an appealing concept but is difficult to apply for post-consumer waste, especially hazardous ones</i></b> _____	116
What is the situation? _____	117
Case study – Compact Fluorescent Lamps in India _____	118
Measures that can be taken by the Government of NCT of Delhi? _____	119
<b>Recommendations</b> _____	120
What are the main waste management priorities of Delhi residents? _____	120
Measures that the Government of NCT of Delhi can take _____	123
<b>Frequently Asked Questions</b> _____	128
<i>What is solid waste?</i> _____	128
<i>Is waste bad?</i> _____	128

<i>Is all waste bad?</i> _____	128
<i>What is Solid Waste Management?</i> _____	129
<i>Who is responsible for Solid Waste Management?</i> _____	129
<i>What kinds of waste exist?</i> _____	129
<i>How much waste does India produce?</i> _____	130
<i>How much waste does Delhi produce?</i> _____	130
<i>How much waste do I produce?</i> _____	130
<i>How can waste tell whether a person is rich or poor?</i> _____	130
<i>Who is responsible for waste in Delhi?</i> _____	131
<i>What is a citizen's role in waste in any city?</i> _____	131
<i>How much does a municipality spend on handling my waste?</i>	
<i>Does all of it come from the taxes I pay?</i> _____	131
<i>What is the ideal waste scenario from the perspective of an individual, a household, a colony, an office, a ward and a city?</i> _____	132
<i>What kinds of wastes are the worst?</i> _____	132
<i>What is the first step I need to take to handle waste?</i> _____	132
<i>Does waste cause pollution? If so, how?</i> _____	132
<i>Does waste damage our health? How?</i> _____	133
<i>Why should we think of wastepickers as useful to our city?</i> _____	133
<i>Wastepickers dirty the entire pavement when they sort out the waste-why isn't that being stopped? How can it be stopped?</i> _____	133
<i>Wastepickers are poor, but how poor?</i> _____	133
<i>Why don't we recycle our waste in India?</i> _____	134
<i>Paper is not recycled in India. What should I do? Shall I start recycling it?</i> _____	134
<i>I want to do something to handle the waste in my office-shall I set up a paper recycling unit?</i> _____	134
<i>I want to be part of Making Delhi Swachh. What shall I do?</i> _____	134
<i>I feel that we have to first and foremost stop littering. If we do that, India will become a clean country. Am I right?</i> _____	135
<i>We can't move ahead without segregation of waste. Am I right?</i>	
<i>Is this the biggest problem with India and our waste?</i> _____	135
<b>Glossary of Hindi terms</b> _____	136
<b>Secondary sources and references</b> _____	137
<b>Appendix 1: Survey Questionnaire</b> _____	142
<b>Appendix 2: Focus group discussion participants and interviewees</b> _____	150
<i>List of interviewees:</i> _____	150
<b>Appendix 3: Existing Policies and Delhi Master Plan</b> _____	155
<i>National Policies</i> _____	155
<i>National Rules</i> _____	155
<i>Other National-Level Documents</i> _____	155
<i>Regional and Urban Plans</i> _____	156
<i>Local Policies and Bye-Laws</i> _____	157
<i>Other Relevant Local-Level Documents</i> _____	157

## Graphs

Graph 1: Per capita waste generation (individual estimates) – responses by municipality _____	31
Graph 2: Per capita waste generation (individual estimates) – responses by socioeconomic category _____	31
Graph 3: Percentage of people who think that waste management is among the most urgent problems for Delhi - responses by municipality _____	32
Graph 4: Awareness amongst different municipalities of where their waste ends up _____	32
Graph 5: Support for landfilling – responses by municipality _____	33
Graph 6: Awareness of landfill conditions – responses by municipality _____	33
Graph 7: Access to community bin/ <i>dhalao</i> – responses by municipality _____	34
Graph 8: Access to community bin/ <i>dhalao</i> – responses by socioeconomic category _____	34
Graph 9: Incidence of roadside/open dumping – responses by SEC categories _____	35
Graph 10: Percentage of people who know that improper waste management causes pollution – responses by socio-economic category _____	35
Graph 11: Perceptions regarding current waste handling (end-of-pipe destination) – responses by municipality _____	36
Graph 12: Support for landfilling – responses by municipality _____	36
Graph 13: Percentage of people who think better access to information regarding waste management operations is a priority – responses by municipality _____	37
Graph14: Percentage of people who think better access to information regarding waste management operations is a priority – responses by socioeconomic category _____	38
Graph15: Percentage of people who think including citizens in monitoring waste management is a priority – responses by municipality _____	38
Graph16: Percentage of people who think including citizens in monitoring waste management is a priority – responses by socioeconomic category _____	39
Graph17: Percentage of people who think recycling is a priority – responses by municipality _____	39
Graph18: Percentage of people who think recycling is a priority – responses by socioeconomic category _____	40
Graph19: Willingness to earn less from sale of recyclable items – responses by municipality _____	40
Graph20: Willingness to earn less from sale of recyclable items – responses by socioeconomic category _____	41
Graph 21: Percentage of people who think that reusing is better than buying new things – responses by municipality _____	41
Graph 22: Percentage of people who think that reusing is better than buying new things – responses by socioeconomic category _____	42
Graph 23: Percentage of respondents who segregate waste – responses by municipality _____	43
Graph 24: Percentage of people who believe metals and glass are biodegradable – responses by municipality _____	44

Graph 25: Percentage of people who believe metals and glass are biodegradable – responses by socioeconomic category _____	44
Graph 26: Percentage of people who sell any items to the <i>kabariwala</i> – responses by municipality _____	45
Graph 27: Percentage of people who sell any items to the <i>kabariwala</i> – responses by socioeconomic category _____	45
Graph 28: Items sold to the <i>kabariwala</i> – responses by municipality _____	46
Graph 29: Items sold to the <i>kabariwala</i> – responses by socioeconomic category _____	46
Graph 30: Motivation for sale of items to the <i>kabariwala</i> – responses by municipality _____	46
Graph 31: Explanation for lack of source-segregation habit – responses by municipality _____	47
Graph 32: Explanation for lack of source-segregation habit – responses by socioeconomic category _____	48
Graph 33: Percentage of people who think separate infrastructure and services for dry and wet waste is a priority – responses by municipality _____	48
Graph 34: Percentage of people who think separate infrastructure and services for dry and wet waste is a priority – responses by socioeconomic category _____	49
Graph 35: Percentage of people reporting to be ready to start source-segregation – responses by municipality _____	49
Graph 36: Percentage of people reporting to be ready to start source-segregation – responses by socioeconomic category _____	50
Graph 37: Incidence of payment for waste services – responses by municipality _____	53
Graph 38: Incidence of payment for waste services – responses by socioeconomic category _____	53
Graph 39: Waste payment collectors – responses by municipality _____	54
Graph 40: Waste payment collectors – responses by socioeconomic category _____	54
Graph 41: Doorstep collection fee levels – responses by municipality _____	55
Graph 42: Doorstep collection fee levels – responses by socioeconomic category _____	55
Graph 43: Willingness to pay more for better doorstep collection – responses by municipality	56
Graph 44: Quantification of willingness to pay more for better doorstep collection – responses by municipality _____	56
Graph 45: Quantification of willingness to pay more for better doorstep collection – responses by socioeconomic category _____	57
Graph 46: Incidence of waste fees beyond doorstep collection fees – responses by municipality _____	57
Graph 47: Incidence of waste fees beyond doorstep collection fees – responses by socioeconomic category _____	58
Graph 48: Nature of payments to government for waste services – responses by municipality _____	58
Graph 49: Nature of payments to government for waste services – responses by socioeconomic category _____	59

Graph 50: Percentage of people who think the government should manage harmful waste – responses by municipality _____	59
Graph 51: Percentage of people who think the government should manage harmful waste – responses by socioeconomic category _____	60
Graph 52: Percentage of people who see waste reduction as a priority – responses by municipality _____	64
Graph 53: Percentage of people who see waste reduction as a priority – responses by socioeconomic category _____	64
Graph 54: Percentage of people who think that reusing is better than buying new things – responses by municipality _____	65
Graph 55: Percentage of people who think that reusing is better than buying new things – responses by socioeconomic category _____	65
Graph 56: Percentage of people who see a conflict between waste reduction and economic development – responses by municipality _____	66
Graph 57: Percentage of people who see a conflict between waste reduction and economic development – responses by socioeconomic category _____	66
Graph 58: Percentage of people who think living without plastic bags is practical – responses by municipality _____	68
Graph 59: Percentage of people who think living without plastic bags is practical – responses by socioeconomic category _____	69
Graph 60: Incidence of roadside/open dumping – responses by municipality _____	72
Graph 61: Incidence of roadside/open dumping – responses by socioeconomic category _____	72
Graph 62: Access to community bin/ <i>dhalao</i> – responses by municipality _____	73
Graph 63: Access to community bin/ <i>dhalao</i> – responses by socioeconomic category _____	73
Graph 64: Management of community bins – responses by municipality _____	74
Graph 65: Management of community bins – responses by socioeconomic category _____	74
Graph 66: Satisfaction with cleanliness of community bins – responses by municipality _____	75
Graph 67: Satisfaction with cleanliness of community bins – responses by socioeconomic category _____	75
Graph 68: Satisfaction with conditions of Delhi landfills – responses by municipality _____	76
Graph 69: Satisfaction with conditions of Delhi landfills – responses by socioeconomic category _____	76
Graph 70: Incidence of doorstep collection – responses by municipality _____	81
Graph 71: Incidence of doorstep collection – responses by socioeconomic category _____	81
Graph 72: Satisfaction with doorstep collection – responses by municipality _____	81
Graph 73: Satisfaction with doorstep collection – responses by socioeconomic category _____	82
Graph 74: Frequency of doorstep collection – responses by municipality _____	82
Graph 75: Frequency of doorstep collection – responses by socioeconomic category _____	83
Graph 76: Doorstep collection fee levels – responses by municipality _____	83



Graph 77: Doorstep collection fee levels – responses by socioeconomic category _____	84
Graph 78: Willingness to pay more for better doorstep collection – responses by municipality _____	85
Graph 79: Willingness to pay more for better doorstep collection – responses by socioeconomic category _____	85
Graph 80: Quantification of willingness to pay more for better doorstep collection – responses by municipality _____	86
Graph 81: Quantification of willingness to pay more for better doorstep collection – responses by socioeconomic category _____	86
Graph 82: Quantification of willingness to pay for introducing doorstep collection – responses by municipality _____	87
Graph 83: Quantification of willingness to pay for introducing doorstep collection – responses by socioeconomic categories _____	87
Graph 84: Percentage of people who think wastepickers dirty public spaces – responses by municipality _____	91
Graph 85: Percentage of people who think wastepickers dirty public spaces – responses by socioeconomic category _____	91
Graph 86: Percentage of people who think that informal sector workers are potentially involved in criminal activities – responses by municipality _____	92
Graph 87: Percentage of people who think that informal sector workers are potentially involved in criminal activities – responses by socioeconomic category _____	92
Graph 88: Percentage of people who think that informal sector workers recycle most solid waste – responses by municipality _____	93
Graph 89: Percentage of people who think that informal sector workers recycle most solid waste – responses by socioeconomic category _____	93
Graph 90: Percentage of people who think that informal sector workers have always been involved in recycling – responses by municipality _____	94
Graph 91: Percentage of people who think that informal sector workers have always been involved in recycling – responses by socioeconomic category _____	94
Graph 92: Percentage of people who believe that unsorted waste is a hazard for waste workers – responses by municipality _____	95
Graph 93: “There is no place for wastepickers/ <i>kabaris</i> in India in the 21st century” – responses by municipality _____	96
Graph 94: “There is no place for wastepickers/ <i>kabaris</i> in India in the 21st century” – responses by socioeconomic category _____	96
Graph 95: “I think wastepickers/ <i>kabaris</i> need to be organized – responses by municipality _____	97
Graph 96: “I think wastepickers/ <i>kabaris</i> need to be organized – responses by socioeconomic category _____	97
Graph 97: Percentage of people who think involving wastepickers in collection and recycling is a priority – responses by municipality _____	98

Graph 98: Percentage of people who think involving wastepickers in collection and recycling is a priority – responses by socioeconomic category _____	98
Graph 99: Willingness to start composting – responses by municipality _____	103
Graph 100: Willingness to start composting – responses by socioeconomic category _____	103
Graph 101: Composition of municipal solid waste in Delhi (MCD, 2004) _____	107
Graph 102: Respondents’ priorities for solid waste management in Delhi _____	121

**Figures**

Figure 1: Developing a participatory SWM policy _____	23
Figure 2: The internationally sanctioned waste hierarchy (US EPA) _____	109
Figure 3: Waste management hierarchy (US EPA) _____	124

**Table**

Table 1. Waste composition at various points in Delhi _____	21
Table 2. Frequency and proportional distribution of SEC categories _____	25
Table 3. Target sample distributions across municipalities and SEC categories _____	26
Table 4. Actual sample distribution across municipalities and SEC categories _____	26
Table 5. Comparison of population to sample proportions _____	27
Table 6. Comparison of population to sample SEC distribution _____	27
Table 7. Comparison of population to sample age distribution _____	27

# Introduction



In the past few years, Delhi has been experiencing tremendous increase in the amount of waste that is being generated by its occupants. Although the exact amount of waste generated cannot be accurately calculated, most conservative sources suggest that Delhi produces at least 8000 tons of waste every day. This counts amongst the highest any city produces in India, next only to, or perhaps equal to, Mumbai.

The growing heaps of trash that are littered in open sites or disposed inappropriately have become a concern for the health of the citizens and the environment of Delhi. Flies find wet waste the ideal breeding ground. When CFL bulbs break, the mercury in them is released into the air, eventually entering the human body. In landfills, waste pollutes our water as dew and rain mix with trash to form a toxic *leachate* that ruins our underground water, and our river.

## So what to do about all this trash?

Before any solutions were sought to tackle the waste issue, it was decided that taking into

account the awareness level and the opinion and willingness of the residents of Delhi in the context of solving the waste issue was crucial. Drawing on their responses, the team brought in their own domain knowledge to complement their perspectives, ideas and suggestions. The 'team' here comprises the Department of Environment, Government of Delhi, the German Bi-lateral Agency for Sustainable Development (GIZ's Indo German Environment Partnership (IGEP) programme), and Chintan Environmental Research and Action Group. The outcomes of the shared knowledge and learnings were used to suggest new and urgent policies that could be adopted by authorities.

The study is probably the most inclusive study in India so far, as the methodology shows. A range of persons across socio-economic categories, and across municipal geographies were interviewed. Nearly a hundred in-depth interviews with sector specialists were conducted. In addition, thematic round tables with a range of actors for each issue were held. However, the massive amount of data – qualitative and quantitative – posed its own challenges. It took data specialists nearly three months to analyze and validate everything.

The report highlights some burning waste management problems articulated by Delhi's inhabitants. A participatory approach enabled us to better understand the knowledge, attitudes and practices of all waste management stakeholders. Based on these learnings, specific policy recommendations that address the issues that emerged from the study have been elaborated.

The results of the research have been presented in the form of "11 beliefs" that sum up the key challenges and potential SWM issues facing Delhi. Each belief is discussed in light of the new data collected in Delhi, and discussed with the help of short case studies, from Delhi, from other cities in India, and from around the world. Emerging issues in Delhi have been linked with relevant best (or even

bad) practices, and the conclusions have been tied to the cumulative SWM experience of major cities in India and abroad.

This report intends to make recommendations to design and implement a number of policies, from decentralization to citizen involvement to effectively impact Delhi's waste regime. If the expectation is that Bharat will be swachh because citizens will help make it so, it is reasonable to expect that Bharat will be swachh because the government also considers citizens viewpoint towards governance and service delivery. It is therefore expected that the key recommendations presented in this report will anchor in Delhi, at the ground level and throw some light upon how waste can be handled across India cities.

*The results of the research have been presented in the form of "11 beliefs" that sum up the key challenges and potential SWM issues facing Delhi.*

# Data Highlights

## Waste Management and Health in Delhi

- 90% of Delhi residents think that **waste management is among the most urgent problems facing them**;
- 94% of Delhi residents know that improper waste management causes **pollution**;
- over 99% agree that littering of municipal solid waste can choke drainage systems and cause backflow;
- the majority of residents of South Delhi Municipal Corporation and New Delhi Municipal Council believe that **burning waste** is safe as long as it is done outside the home.

## Delhi Residents and Solid Waste

- 80 gr/day is how much solid waste Delhi residents (on average) *think* they generate, individually (600 gr/day is what was last estimated, in 2002);
- 38% do not know where their waste ends up;
- only 31% declared to be aware of the conditions of Delhi **landfills** – less than 13% in North and East Delhi municipal Corporations;
- 78% of respondents reported that roadside dumping is still a common practice in their neighbourhood.
- 2% of Delhi segregates;
- 58% of people in Delhi report not **source segregating** due to lack of separate waste collection systems for wet and dry waste, which nullifies their efforts.
- 97% in East Delhi Municipal Corporation think that glass and metal are bio-degradable, 76% across the city;
- 62% of Delhiites openly admit not knowing

the difference between **biodegradable and non-biodegradable**.

- 70% of Delhiites are willing to start **composting**.
- 51% of Delhi residents think that at this moment of India's development, **reducing consumption** may not be an option, but only 2% are against taking steps to reduce waste generation, leaving large scope for more responsible consumption;
- 81% declared that it would be practical for them to live without plastic bags;

## Delhi residents and Waste Management Infrastructure

- Waste is collected daily from 87% of houses in Delhi, and at least twice weekly from 99%.
- 80% of people have **access to a dhalao** (community bin)
- 63% of respondents report that **dhalaos are cleared on a daily basis**.
- 44% of people currently pay **doorstep collection fees**
- 59% of people in Delhi pay between Rs. 30 and 50, 19% up to Rs. 100.
- In North Delhi Municipal Council, 25% of respondents are **willing to pay or pay more for better waste services**, and 66% of residents would pay up to Rs. 50 a month for doorstep collection specifically, with an additional 22% willing to pay even more.

## Delhi Residents and the Informal Waste Sector

- 76% of Delhi residents believe that **reusing** is better than buying new things;
- 97% **already segregate** a number of items for sale to *kabariwalas* through the traditional informal recycling sector;
- 50% of residents are aware of the positive

environment impact of the recycling done by *kabariwalas*;

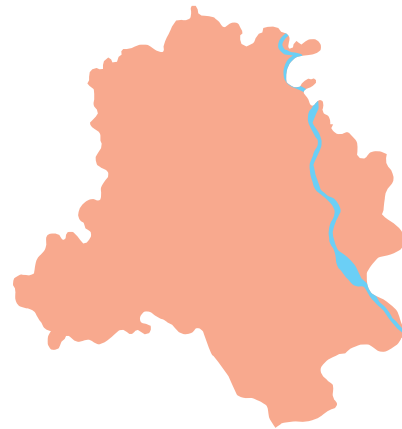
- 80% of residents recognize that the **informal sector** has always recycled Delhi's waste;
- 98% also recognize that recycling in the city depends on the informal sector;
- 94% of people think that waste collectors and *kabariwalas* need to get formally organized;
- half of residents think that **there is place for the informal waste sector in 21st century India**, despite entrenched social stigma against them: 80% of Delhiites still believe that the informal sector could be cheating them;
- 99% recognize that **waste collectors get hurt by handling unsorted waste**,

and 76% of residents are ready (and an additional 5% would consider) segregating immediately to make waste management more efficient and to safeguard the health of waste workers;

- 80% of **people in Delhi are ready to accept a lower price for the material they sell.**

### The Priorities of Delhi Residents

- 96% asked for **more effective street sweeping, including night sweeping, and access to collection schedules, more bins, particularly closed bins**;
- 95% demanded to be included in the **monitoring of waste collection**;
- 93% said they would also **prioritize better collection, and the use of closed vehicles for waste transportation** across the city.



*Only 31% declared to be aware of the conditions of Delhi landfills – less than 13% in North and East Delhi municipal Corporations*

# Summary of Key Recommendations

Based on the extensive documentation of the stakeholders' knowledge, attitudes and practices around waste management in Delhi, five key recommendations have been put forward. In order for them to work efficiently, it is suggested that these recommendations be implemented concurrently. The recommendations are summarized below:

## 1. Spread awareness and involve residents in waste management.

- The Government can encourage public involvement in waste management in the following ways:
  - i. spread awareness about why, what and how to segregate among waste generators (residents, bulk waste generators, RWAs);
  - ii. set clear indications regarding rights and responsibilities with regard to waste management, as residents of Delhi;
  - iii. share relevant information with the public, such as up-to-date collection schedules and clear procedures with regard to segregation and collection, including penalties for non-compliance and incentives for high compliance.
- Develop a citizen-led solid waste monitoring system. The residents of Delhi are the best monitoring agencies for waste handling. The Delhi government must work with them to use the advantages they offer—they are present everywhere, they have an incentive to keep the city clean and safe,

and are present in large numbers. Citizens are ready to be trained to monitor specific waste related indicators so that they can compensate for the deficit in official human resources for monitoring compliance.

- The government should set up a training course for waste service providers across all levels to enable improved quality and upgrading knowledge.
- ## 2. Redefine and implement an appropriate integrated waste management framework that includes strategic actors such as MSW generators and waste workers in the informal sector.
- In light of people's willingness to engage more, and more directly, in MSW, move away from reliance on single service providers for end-to-end waste management. This will insure citizens and the Government against the failure of waste management monopolies other cities in India are facing. The space for corporate service providers should be limited to what they can achieve best, based on existing evidence. To do this, the following key steps are essential:
- Guarantee universal doorstep collection in Delhi. Where it is impossible to make it financially viable due to socio-economic conditions, it should be treated as a public health issue and as a rare input, subsidized to fill the gap.
  - Train waste collectors to collect, transport and store segregated waste separately, and to refuse unsegregated waste;
  - Empower RWAs to sign MOUs and contracts with either organizations of wastepickers or organizations working with wastepickers with the condition that 80% of their waste should be handled within the colony itself.
  - NGOs and Citizens' groups should be given priority over corporate companies to seek local solutions to handle the waste that they produce. For example, if a hotel chain

or a residents' association wishes to handle its own waste then it must be allowed to do so instead of taking the services of a vendor. They must also be compensated for this if they are able to show that they are diverting up to 80% of the waste generated from landfills or open dumps.

- Compensate any organization that diverts wet waste and horticultural waste preventing it from leaving the premises. **The compensation should be equal to the amount paid to private concessionaires per ton for transportation and removal.**
- Set up a series of standards for waste handling that are practical but safeguard occupational health and the environment for doorstep collection, MRFs, transportation, etc. that are not covered by the existing waste management rules.
- Help existing recycling units to formalize their work through registration in industrial areas, including newly declared industrial areas. Awareness camps must be set up in these areas to guide them through the process.

**3. Implement and encourage decentralized waste management infrastructure.** Delhi has little space for new large-scale solutions, but still enough for decentralized ones. In light of residents' willingness to engage in decentralized waste management, the Government could provide infrastructural and financial support to transform *dhalaos* (community bins) into integrated material recovery facilities to cut transportation and landfilling costs; technical and implementation guidance, as well as incentives (administrative or financial), to RWAs to innovate in decentralization, from source-segregation to composting.

To do this, the following key steps are essential:

- Creation of adequate space and micro-infrastructure in every existing ward for handling of dry and wet waste, ie, segregation, storage, treatment, keeping in mind the projected increase in waste per capita and population. Provision of separate storage and collection infrastructure at the neighborhood level, leveraging and re-qualify existing *dhalaos*. This must be reflected in the Masterplan and the Zonal Plans.
  - Empowerment of the informal sector to offer such services, in order to implement a successful decentralization system. This would include training them in composting, setting standards for material recovery facilities and issuing ID-Cards for all.
  - Include citizens in monitoring of SWM infrastructure at all levels.
- 4. Introduce composting as a viable waste treatment solution.** The Government can encourage composting at the household, neighbourhood and, if otherwise not possible, at the ward level. Delhi residents showed overwhelming support to the idea. Public awareness campaigns, implementation support, and standards and financial incentives that make it a viable endeavour need to be carefully designed.
- Offer a minimum support price for compost made from waste by those handling less than 10 tons a day at a given site/ facility. The prices should be calculated to enable minimum wages for the workers, transportation and packaging of the compost and other running costs.
  - Compensate any organization that diverts wet waste and prevents it from leaving the premises. The compensation should be equal to the amount paid to private concessionaires per ton for transportation and removal.
  - Ensure that agencies such as the DDA, PWD



and the municipal corporations are able to allocate space for this effort within a reasonable amount of time, on the basis of requests received.

- All civic and Delhi government agencies and their horticultural departments could be ordered to buy compost manufactured only from waste at the minimum support price. No other form of manure should be allowed till there is no further waste – based compost available.
- Hold training sessions on composting for all RWAs and informal sector players so not only can they compost but also, monitor proper composting.

**5. Organize and formalize the informal sector:** Delhi residents are aware of the city's reliance on the informal sector to manage their waste, and want to see it organized and formalized. The Government can recognize the work of the informal sector by issuing them identification cards which legitimizes them as private providers of public services, establish protocols and standards for the professionalization of their work, and train them to follow the established protocols and standards. To do this, the following key steps are essential:

- Since many residents access informal doorstep collection, formalize it into either cooperatives or companies. This may be done under an advisory body to ensure that it is inclusive of women wastepickers.
- Formally recognize the informal sector as an essential resource for Delhi
- Register all wastepickers and give them ID-Cards that establish that their work of waste picking, segregation, and doorstep collection is recognized and encouraged by the State.
- Enable special registration camps for them for available social security.
- Train government hospitals and municipal

clinics to work with wastepickers and their specific health needs.

- Enable doorstep collection to be undertaken only by registered wastepickers.
- Training wastepickers in value addition of waste through composting etc as well as making new products from waste.
- Work to notify minimum space for waste in the Masterplans and zonal plans at the colony, ward and zone levels for handling over 80% of the waste generated.

The research findings discussed in this report show overwhelming potential and support from residents with regard to these measures. By adopting these measures, the Government of the NCT of Delhi would also be able to **implement the internationally accepted waste management hierarchy** in Delhi's solid waste management (SWM).

Further steps that are highly compatible with these measures and that – based on the present research – already have, or have the clear potential to garner residents' strong support, include the following:

**I. Identify the waste streams that are the biggest contributor to the problem.**

For instance, non-recyclable multi-layered plastic waste materials are used for packaging consumer goods – it is a problem that is set to grow with changing lifestyles and a solution must be found. To do this, the following key steps are essential:

- a. A list of practices that result in materials efficiency must be identified and professions linked with these identified. These will be those professions linked to reuse, repair and prevention of waste. Some professions include cobblers, mobile and electric repair stores, those who sharpen knives, itinerant waste buyers, traders of cloth and old steel etc. Such professionals must be mapped and given I-cards, access to clients and other

incentives for them to continue to their work.

- b. On the other hand, materials that are unlikely to be able to be handled in a reasonably safe manner, such as multi-layered plastic packaging and polystyrene, should simply be banned.

## II. Assess environmental impact of technology, invest in small scale technology:

Where large-scale technology has been invested in, as in landfills and waste processing plants, the Government must enforce pollution control standards strictly to protect public health. Otherwise, Public Interest Litigations may continue to pose significant challenges.

- a. Low-tech, pliable and environmentally friendly solutions nurtured by the informal sector, like man-powered cycle carts to support doorstep collection, should be prioritized over the introduction of motorized hopper vehicles. Any equipment or technology or mode of transportation that does not require fuel, or is non-motorized, should be given priority in local and ward level operations.
- b. Introduce an environmental impact analysis for all technology and equipment adopted for SWM. For each option, introduce the obligation to assess impact on air pollution, water contamination, greenhouse gases. An environmental impact index should be developed by an expert group based on this analysis, and made public as part of the municipality's reporting.
- c. All business plans for any technology to process more than one ton a day should be made available in the public for 60 days before being finalized for shortlisting and, contractual purposes.

## III. Implement Extended Producer Responsibility (EPR) for specific materials

**in the waste stream.** The concept has been successfully implemented for managing different kinds of wastes all over the world. Instead of being deterred by low public demand and awareness, Delhi should instead lead the country in embracing EPR as a valid waste management solution by implementing EPR where policies have already prescribed its implementation (e.g. e-waste, CFLs and plastic waste). To do so, the government should identify specific waste streams for which producer accountability is a priority (e.g. sanitary waste, multi-layered packaging). To do this, the following steps are essential:

- a. Materials not being recycled currently, or which are hard to recycle, should be identified. Some obvious materials are multilayered plastic packaging, polystyrene, sanitary napkins and diapers.
- b. EPR must be mandatory and not voluntary for all materials that are not currently recyclable (Sanitary Waste and Styrofoam) or are known to be toxic (batteries and CFLs) or are legally covered under EPR laws (e-waste, multi-layered packaging)
- c. The manufacturing companies should be required to take back such toxic wastes via existing collection systems or set up collection systems compatible with existing ones.
- d. The Delhi government should begin talks with the manufacturers and brand owners of one material at a time, and identify both the materials chain and the financial investments they will need to ensure that this waste does not end up polluting.
- e. An EPR Committee should be set up comprising officials from the DPCC, the MOEF, NGOs and health professionals and other experts. The committee will lead the effort towards implementing EPR and all its deliberations should be made available in the public domain.

# Methodology and the Context of Municipal Solid Waste Management in Delhi

## Generation and Characterization of Solid Waste in Delhi

The National Capital Territory (NCT) of Delhi generates approximately 8,000 tons of municipal solid waste per day. Waste is expected to rise as the urban population grows and per capita generation rates grow with increasing incomes. Current per capita waste generation estimates for Delhi are at

about 0.57 kg/capita/day<sup>1</sup>. Some estimates predict per capita waste generation rates to more than double by 2030 expanding the gap between supply and demand of waste services by more than 4 times<sup>2</sup>. Over 50 percent of the total waste generated is organic or wet waste. Typically, less than 20 percent is recyclable solid waste and about 30 percent is either inert or non-recyclable dry waste. Waste composition is also expected to shift over time with economic growth and concomitant increases in consumption levels. Knowing the composition of waste is important because it allows for selecting the most appropriate technology solutions.

In 2004, MCD commissioned a feasibility study to assess solution options for managing Delhi's waste<sup>3</sup>. The estimates of waste generation and characteristics from this study are the most

**Table 1. Waste composition at various points in Delhi**

Source	Composition				Moisture Content (%)	LCV <sup>4</sup> (kcal/kg)	HCV <sup>5</sup> (kcal/kg)
	Bio-degradable (%)	Recyclable (%)	Inert (%)	Other (%)			
Residential Areas							
High Income	72	23	<1	5	59	1623	4907
Medium Income	77	21	<1	2	65	1339	4942
Low Income	58	16	23	3	54	1398	3446
JJ Cluster	69	14	16	<1	63	884	3429
Commercial Areas	16	68	Nil	16	18	3532	4576
Institutional Areas	60	34	4	2	50	1693	4159
Vegetable Markets	97	2	<1	Nil	76	497	3827
Streets	28	12	56	4	19	1598	2199
Landfills	74	9	11	6	47	1777	3927

1 Hoorweg, D. and P. Bhada-Tata. 2012. *What a Waste: A Global Review of Solid Waste Management*. Washington, DC: World Bank  
 2 McKinsey Global Institute. 2010. *India's Urban Awakening: Building Inclusive Cities, Sustaining Economic Growth*. New Delhi: McKinsey  
 3 COWI and Kadam Environmental Consultants. 2004. *Feasibility Study and Master Plan for Optimal Waste Treatment and Disposal for the Entire State of Delhi based on Public Private Partnership Solutions*. Delhi: Municipal Corporation of Delhi  
 4 Lower calorific value (LCV) is determined by subtracting the heat of vaporization of the water vapor from the higher heating value. This treats any H<sub>2</sub>O formed as a vapor. The energy required to vaporize the water therefore is not released as heat.  
 5 Higher calorific value (HCV) is determined by bringing all the products of combustion back to the original pre-combustion temperature, and in particular condensing any vapor produced.

recent ones available and are described in the table below. This study took samples at different points along the waste management process: at neighborhood collection points or *dhalaos* and waste entering landfills. Further, neighborhood collection points were categorized by type of neighborhood (residential, commercial, institutional, vegetable markets, and streets). Waste sampled from residential collection points or *dhalaos* was categorized by income (high, medium, low and JJ clusters). A total of 160 samples were collected.

From this table, what emerges clearly is that waste composition is based on where waste is sampled from, and on whether it has already been partially processed. Regardless, it is clear that municipal solid waste in Delhi is composed mostly of biodegradable waste and by the time waste reaches landfills, the proportion of recyclables decreases to less than 10 percent because of the recycling and recovery work of waste pickers in the informal sector. Further, according to the study commissioned by the MCD, landfill samples were taken from trucks with a lower proportion of inert waste which means that actual waste composition entering the landfills is likely to be different, with a higher proportion of inert material and a lower overall calorific value.

## Status of Solid Waste Recycling Technologies in Delhi

Recycling of municipal solid waste is done primarily through a complex chain of actors in the informal sector. The informal sector is involved in all stages of recycling: collection, segregation, transportation, and reprocessing. A survey of informal recycling units in Delhi conducted by Chintan for the Delhi Pollution

Control Committee showed that there were over 5,500 such units employing over 40,000 workers.<sup>6</sup> These units are involved in trading, dismantling and reprocessing glass, metal, plastics, cardboard, paper and electronic wastes. A CPCB survey of plastics reprocessing in 60 Indian cities concluded that there were more plastics recycling units in the informal sector than registered ones. Of a total of 7,500 units surveyed, approximately 60 percent were in the unorganized sector<sup>7</sup>. Aside from those employed in processing units, many in the informal sector do the work of collection, segregation and transportation to supply raw materials for this informal yet vibrant recycling industry.

Typically, waste collectors working at homes, offices, and shops, separate recyclable materials from the waste to sell it to small-scale waste traders. Waste generators also typically sell high value recyclables to itinerant buyers or *kabariwalas*. Other buyers commonly referred to as *thiawalas* operate in commercial areas and trade in high value recyclables from offices for instance. In addition to these, waste pickers scan the city's streets, local garbage dumps, and landfills to collect and subsequently sell recyclables. Small-scale traders sell recyclable materials to larger traders or directly to suppliers who then supply single stream of specific recyclable materials to reprocessing units. In each case, informal workers provide the labour of segregating and even reprocessing the materials to create new products. Overall, some estimate informal labour in this work accounts for approximately 1 percent of the urban population. This industry not only provides a crucial source of income to some of the city's poorest sections, it also allows for recycling rates that are among the highest in the world. Any efforts to change existing waste

6 Chintan, Environmental Research and Action Group, *Survey of Recycling Units in Non/authorized Industrial Areas Including Areas Notified for Redevelopment in Delhi* [unpublished Report Commissioned by the DPCC, New Delhi] (New Delhi, India, 2013).

7 Central Pollution Control Board CPCB, *Website Material on Plastic Waste Management* (New Delhi, India, June 2013).

management systems must keep this complex economy in mind so as to not dismantle its important contributions to the environmental health and safety of our urban ecosystem.

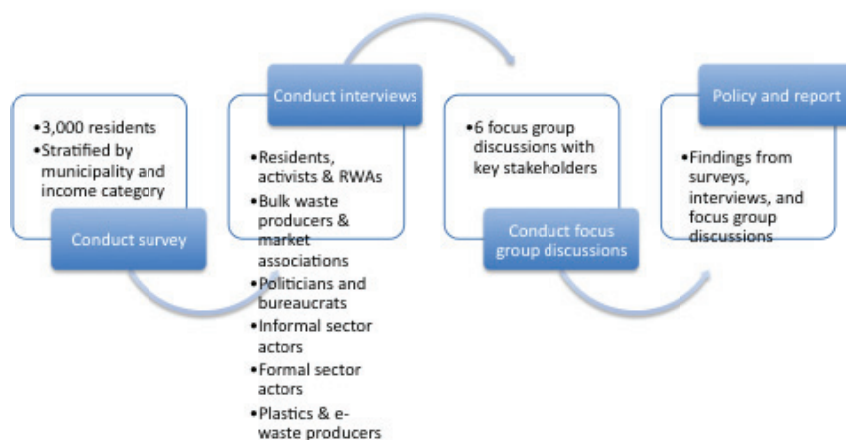
## Objectives and Methodology of the Study

To address the growing waste management problem, the Government of Delhi has made several investments and implemented various initiatives over time. However, it has been an ongoing challenge. Part of the challenge can be attributed to the lack of community participation. Although the municipality has taken steps to address citizens' needs (including a Facebook page through which citizens can register complaints on solid waste management issues), these were unable to achieve a collaborative partnership between stakeholders. The implementation model and approach need to be altered as presently growing community participation is being catalyzed by citizen and informal sector activism on grounds that private waste service providers have not been able to deliver according to contracts.

Given the rate and quantity of waste generation and its upward trajectory, the major concerns begin right from the stage

when the waste is generated. What can be done to reduce the amount of waste that is being generated in the city? Who should be responsible for the increasing amounts of waste? Should the responsibility lie with the consumers who consume or the producers who produce the products that generates waste? Or should it be shared between producers, consumers and the local governments? What does an ideal waste management system look like? A major requirement is to make the system of solid waste management more inclusive by creating more formal spaces for citizens, civil society organizations, and those impacted by waste management policy. Taking into consideration the new knowledge about what Delhiites know, think and feel about their role with regard to waste in the capital, this research suggests a way forward for inclusive policies and participatory solutions.

Quantitative and qualitative methods were combined including a survey, interviews, and focus group discussions with key stakeholders like residents and residents' associations, government officials, plastics and e-waste producers, and formal and informal waste management service sector representatives. The overall study approach is depicted in the figure below.



**Figure 1:** Developing a participatory SWM policy

## Methods

In the following sections, we provide a detailed account of the research methods we have employed.

### Household-level survey

The survey was conducted on a sample of 3,047 households assessing their knowledge, attitudes and practices with regards to solid waste management. This primary data collection took place across a sample of wards in the trifurcated Municipal Corporation of Delhi (MCD) as well as the New Delhi Municipal Council (NDMC) area, to cover all municipalities, socio-economic strata and geographic areas. The final survey instrument in English and Hindi can be found in Appendix 1. The survey questions focused on the following themes:

- Demographic information about the respondent and the household: age, gender, household size, literacy level, and SEC category;
- Waste generation, storage and segregation: amount of waste generated, waste storage systems at home, and segregation behaviours and attitudes;
- Doorstep waste collection: information about waste collection service provider, collection frequency, and collection coverage;
- Waste disposal: attitudes towards community bins and landfills, condition of community bins and landfills;
- Payment and accountability for waste management: level and type of payment and responsibility for waste management service provision by government, citizens, or producers of commodities; and
- Priorities for improvement of waste management services in Delhi.

The objective of the sampling strategy was to ensure that the sample was representative of

the underlying population in terms of socio-economic characteristics, which influence knowledge, attitudes and perceptions related to waste. We relied on the socio-economic classification (SEC) system widely used to understand market segmentation and consumer behaviour in India. The SEC system developed by the Market Research Society of India (MRSI) uses two variables to classify households:

- Education of the chief wage earner (CWE): The CWE is defined as the person who contributes the most to the running of the household, also sometimes referred to as the head of the household. The SEC classification system relies on the following seven categories to capture the education level of the CWE: illiterate; literate but no formal schooling or schooling up to 4 years; schooling between 5 and 9 years; senior secondary or higher secondary education; some college (including a diploma) but not a graduate; graduate or post graduate (general); and graduate or post graduate (professional).
- Number of consumer durables in the household: The list of durables has 11 items ranging from electricity connection to cars and air conditioners.

Based on a matrix of education levels and number of durables, the SEC classification of a household was determined. As a starting point, data was obtained on SEC profiles from the Indian Readership Survey conducted by A.C. Nielsen, an authoritative approach that many public institutions have embraced in recent years. As expected, each ward in Delhi is not homogeneous and is composed of multiple SEC categories. To be able to determine sample sizes, however, the proportion of the population under each SEC category in each municipality was needed. To calculate this, a frequency table showing the number of times an SEC category appears in wards in each municipality in the trifurcated

MCD was created. Using this data, the overall distribution of SEC categories across all municipalities was calculated. For instance, SEC A accounts for 37 percent (268 out of 730) of Delhi’s population. Within a municipality, East Delhi, for instance, SEC A accounts for 35 percent of the population (55 out of 160). These results are shown in table 2.<sup>8</sup>

area would be too small to be statistically significant, a minimum sample size of 300, which accounts for 10% of the total sample. This means that the target sample size from the trifurcated MCD municipalities was 2,700 households (3,000 total minus 300 NDMC households).

**Table 2. Frequency and proportional distribution of SEC categories**

Municipality	A	B	C	D	Total
East Delhi	55 (35%)	50 (31%)	34 (21%)	21 (13%)	<b>160</b>
North Delhi	108 (38%)	83 (29%)	83 (29%)	10 (4%)	<b>284</b>
South Delhi	105 (37%)	89 (31%)	85 (30%)	7 (2%)	<b>286</b>
<b>Total</b>	<b>268 (37%)</b>	<b>222 (30%)</b>	<b>202 (28%)</b>	<b>38 (5%)</b>	<b>730</b>

To estimate the required sample size from the trifurcated Municipal Corporation of Delhi (MCD) – East, North, and South – and New Delhi Municipal Council (NDMC), the frequency distributions above normalized against the population distribution of those municipalities according to the 2001 Census were used.

Based on 2001 Census, NDMC accounted for approximately 3 percent of the city’s population<sup>9</sup>. Because a proportional sample size across all SEC categories in the NDMC

SEC classification data for New Delhi was not available therefore the overall SEC distribution from the table above was used to estimate the sample size within each SEC category in New Delhi<sup>10</sup>. To estimate the sample sizes within the trifurcated MCD, the total sample size in each municipality based on the 2001 Census proportional population distribution for those municipalities was calculated<sup>11</sup>. To estimate sample sizes for each SEC category within each municipality, the frequency distributions from the table above were used<sup>12</sup>. The results of this exercise are provided in the table below.

8 For more details about the SEC system, see <http://imrbint.com/research/The-New-SEC-system-3rdMay2011.pdf>.

9 <http://delhi.gov.in/DoIT/DES/Publication/abstract/SA2012.pdf>

10 For instance, 37% of households in our target sample of 300 households would be from SEC category A. This yields a sampling target of 111 SEC A households in NDMC.

11 For instance, East Delhi accounts for approximately 21% of the population, therefore the sample size from East Delhi was estimated to be 567 households (21% of 2700).

12 For instance, the proportion of SEC A households to be sampled from East Delhi was estimated to be 35% (55 out of 160). This yields a sampling target of 198 SEC A households (35% of 567) in East Delhi.

**Table 3. Target sample distributions across municipalities and SEC categories**

	A	B	C	D	Total
East Delhi	198	176	119	74	<b>567</b>
North Delhi	421	321	321	44	<b>1107</b>
South Delhi	380	318	308	21	<b>1026</b>
New Delhi	111	90	84	15	<b>300</b>
<b>Total</b>	<b>1110</b>	<b>905</b>	<b>832</b>	<b>154</b>	<b>3000</b>

Before the start of the survey, ward names were identified through purposive sampling in an attempt to ensure that the target sample size within each SEC category and appropriate geographic coverage were achieved. A total of 7 wards were selected in each of the municipalities. The selection of these wards followed the criterion that for each SEC category there are at least 2 wards where the target sample could be collected. From each ward a minimum of 30 households

were surveyed for a particular SEC category. The team followed the Right Hand rule for selection of the household so that the sample was random. More than 25% of all city wards were surveyed to ensure geographic representation in the sample that was covered for the study.

The results of the survey however, have been different from our sample projections<sup>13</sup>. The actual samples are tabulated in the table below.

**Table 4. Actual sample distribution across municipalities and SEC categories**

	A	B	C	D+E	Unknown	Total
East Delhi	296	144	63	16	0	<b>519</b>
North Delhi	579	291	197	95	176	<b>1338</b>
South Delhi	331	290	199	38	16	<b>874</b>
New Delhi	79	114	88	20	15	<b>316</b>
<b>Total</b>	<b>1285</b>	<b>839</b>	<b>547</b>	<b>169</b>	<b>207</b>	<b>3047</b>

<sup>13</sup> First, since SEC categories are defined by the number of items that a household possesses and the educational qualification of the Chief Wage Earner, a single additional household item can change the SEC category of that household. Second, although no existing data on population in SEC E categories was available, we nonetheless expected to find households in that category. However, even in the poorest of neighborhoods, we found very few SEC E category households (approximately 0.2% of the sample). For the purpose of analysis, we have clumped the few SEC E households along with SEC D households. Finally, the SEC system has changed recently, therefore the differences between the actual and target samples might reflect the underlying differences between the two different classification systems used. In the absence of alternatives to ensure a sample that is representative of the socio-economic distribution however, we feel that using this method was the only option.



To validate our sample sizes, we correlated the samples with the population size of the trifurcated MCD municipalities and against the overall SEC distributions. Table 4 compares the Actual sample distribution across municipalities and SEC categories.

46% of the respondents were female and 54% were male. This corresponds closely to the 2001 male to female ratio of 821 females to 1,000 males in Delhi. Household size according to the 2001 Census was 5.1. In our sample, the average household size was 5.6. Literacy

**Table 5. Comparison of population to sample proportions**

	East Delhi	North Delhi	South Delhi
<b>Population proportions</b>	21%	41%	38%
<b>Actual sample proportions</b>	19%	49%	32%

Table 5 compares the SEC category distributions in our sample against the population SEC category distributions estimated through frequencies in Table 2.

rate in our sample was 94%, higher than the literacy rate of 82% according to the 2001 Census.

**Table 6. Comparison of population to sample SEC distribution**

	A	B	C	D
<b>Population proportions</b>	37%	30%	28%	5%
<b>Actual sample proportions</b>	45%	30%	19%	6%

The mean age of survey respondents was 37 years with a standard deviation of 13.2 years. The table below compares the age structure of the sample against the age structure of the underlying population based on census data.<sup>14</sup>

**Interviews**

51 semi-structured interviews were conducted with residents, institutional and commercial establishments, citizen activist individuals and groups, RWAs, market associations, plastics

**Table 7. Comparison of population to sample age distribution**

	< 15	15-19	20-24	25-29	30-39	40-49	50-59	>60
<b>Sample</b>	< 1%	6%	12%	13%	28%	22%	10%	9%
<b>Population</b>	32%	10%	10%	10%	16%	10%	5%	5%

<sup>14</sup> The biggest difference is the 0-14 year old category. For obvious reasons, this age demographic was not the respondent in the household survey.

and e-waste producers, government officials, and formal and informal waste management service providers. These were either telephonic or in-person interviews. Interviews were transcribed and coded to integrate survey data with in-depth discussions. A list of interviewees can be found in Appendix 2.

### Focus group discussions

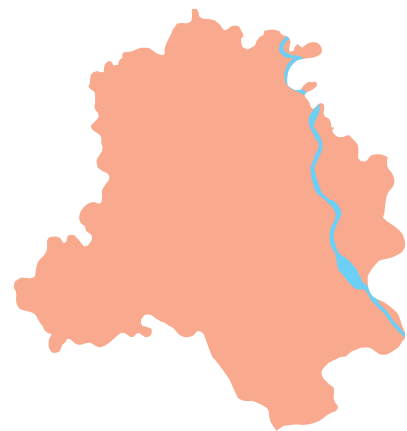
Six focus group discussions that involved a total of 67 people focused around the following themes and waste management processes:

- Waste segregation-at-source
- Waste collection and transportation
- Waste storage, segregation, and recycling
- Composting
- Landfilling

Concept notes and a list of participants who attended the focus group discussions can be found in Appendix 2.

### Data analysis

To analyze the quantitative data from the surveys, SPSS was used to first produce descriptive statistics for all questions on the survey. The chi-square tests were then used to understand the relationship between the explanatory and response variables because most of our data was categorical. Explanatory variables were the household's SEC category (as a proxy for household income) and geographic differences. All statistical tests were done using a 95 percent confidence level.



*Given the rate and quantity of waste generation and its upward trajectory, the major concerns begin right from the stage when the waste is generated. What can be done to reduce the amount of waste that is being generated in the city? Who should be responsible for the increasing amounts of waste?*

# 11 Key Beliefs About Solid Waste Management

In what follows, we organize the discussion of the study along 12 chapters on waste management in urban settings. Each chapter addresses a common 'belief' which was identified as central to public and policy debates in Delhi, and which therefore needs to be addressed on a priority basis each belief is discussed in light of the data we collected during the study, and in light of the cumulative experience with solid waste management of major cities in India and abroad. Each chapter can be read and used individually, but overall, the 11 beliefs compose a coherent whole. A fundamental point this study makes is that Municipal Solid Waste is a complex problem with financial, social, economic and ecological ramifications. It cannot be effectively addressed by focusing on any single aspect, any single actor, or any single belief. Many aspects and actors that have been so far neglected – from the potential for decentralization to citizens themselves – should however urgently be included in a composite approach. This research provides the evidence that Delhi residents are ready for more effective approaches, even if that means much more effort from their side. The picture of SWM remains complex and enormous this report should be read across all 11 beliefs, as one comprehensive document.

## Belief no. 1

# Most people don't think waste management is a serious problem

According to our survey results, Delhi residents estimate the quantity of waste they individually generate every day to be less than 100 grams per day (0.080 Kg/day). This figure is a severe underestimation: official data from 2000 points to average per capita figures seven and a half times larger (0.6 Kg/person/day in metropolitan cities).<sup>15 16</sup> Combined with anecdotal evidence about Delhiites' lack of willingness to pay for waste collection (see chapter 3) and the common sight of garbage being disposed outside bins, this finding seems to support the widespread belief that Delhi residents lack interest in waste as a serious problem.

A waste worker we interviewed bluntly articulated the issue in these words: *"Here is the problem regarding garbage: local residents are the main problem, people don't cooperate with us, they usually spread the garbage out of the dustbins."*<sup>17</sup> Another discussant argued, along the same lines that: *"the streets not being clean...it's not really the household waste which is making the neighbourhood, making Delhi dirty or not sanitized. It is the people, random people throwing packets here and there, and people littering"*. A representative of the Indian Youth Climate Network further argued that *"community feeling is what is lacking in Delhi; the impersonal attitude of people is a big problem."*<sup>18</sup>

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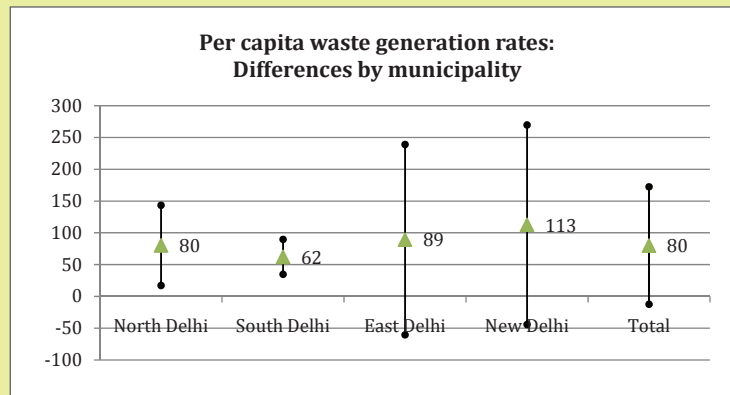
15 Government of India Ministry of Urban Development and JnNURM, *Toolkit on Solid Waste Management*, November 2012.

16 There is no uniformity on the measurement of per capita waste generation, and this comparison should not be considered exact. Our data reflects people' perception, and the data from the Ministry is the result of the calculation of total waste generated divided by the number of people. The first figure might include waste not generated at the household level.

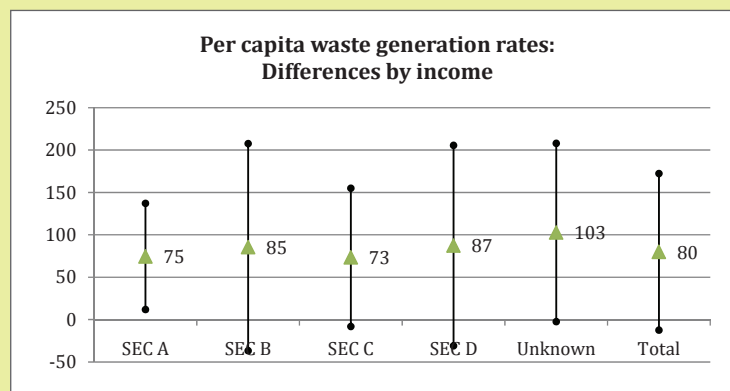
17 Chintan, Environmental Research and Action Group, Interview with Sunil, Safai Karamchari, 2014.

18 Chintan, Environmental Research and Action Group, Interview with Pinaki Das Gupta, IYCN, 2014.

## What are the research findings?



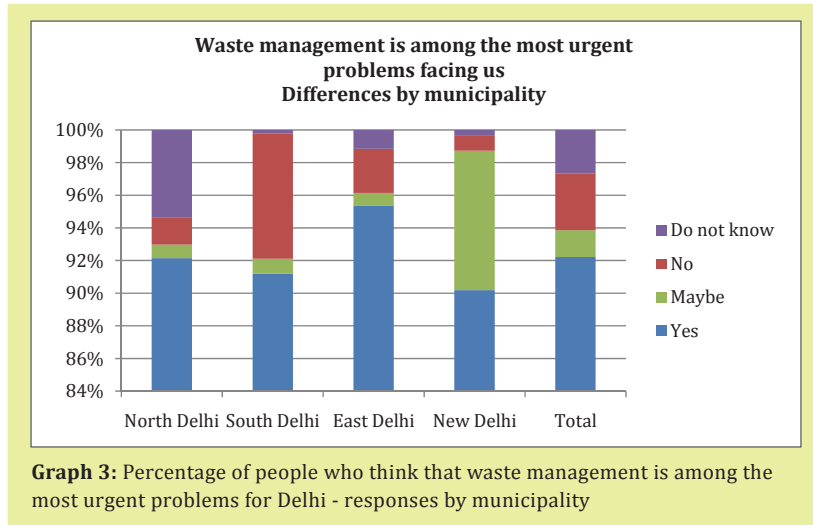
**Graph 1:** Per capita waste generation (individual estimates) – responses by municipality



**Graph 2:** Per capita waste generation (individual estimates) – responses by socioeconomic category

When respondents of our survey were asked how much waste they generate daily, a wide range of estimates emerged. These do not increase, as one would expect, according to Socio-Economic Category, but vary widely across geographical areas, particularly in terms of standard deviation for each municipality. In other words, they show no clear pattern. Delhi residents clearly have little awareness of the scale of solid waste they generate daily, individually and as a whole urban community.

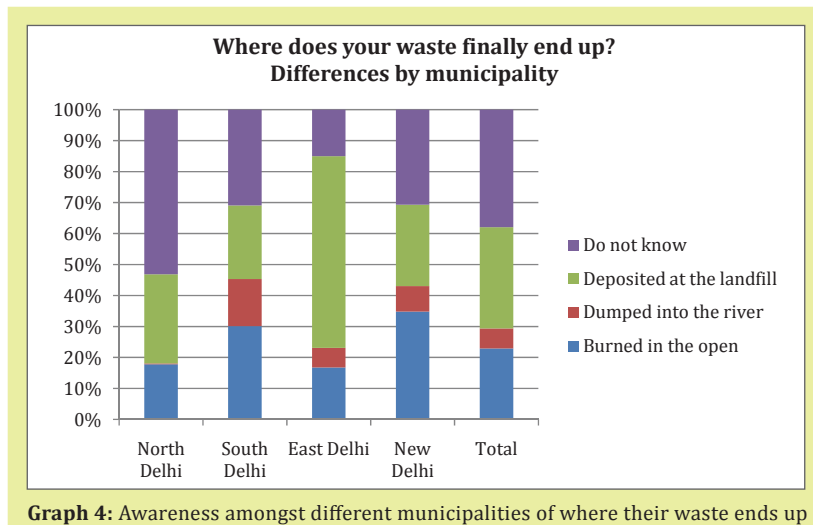
Residents are however conscious of the importance of waste management for the capital 92% of the respondents agreed with the statement that waste management is among the most critical problems the capital is facing today. Another 94% think that improper waste management causes pollution. Virtually everybody, moreover, understands that uncollected waste can choke the city's drainage system.



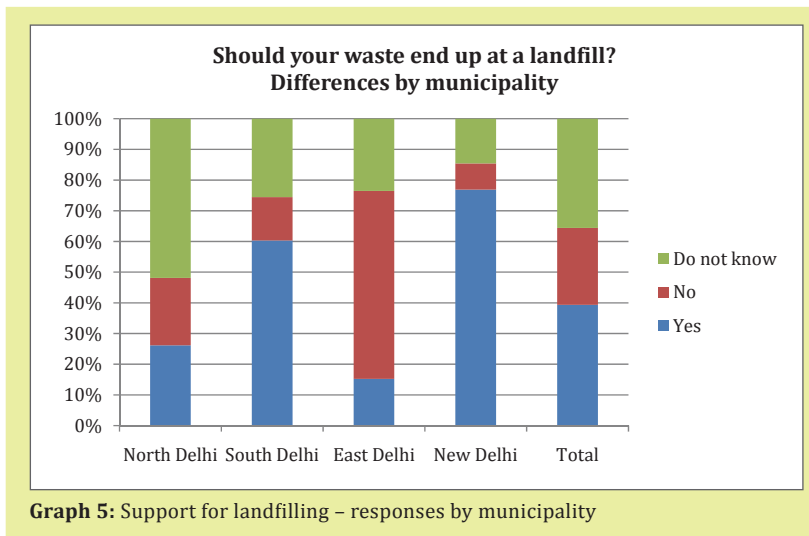
**Graph 3:** Percentage of people who think that waste management is among the most urgent problems for Delhi - responses by municipality

Nevertheless, people’s instinctive understanding of waste as a major problem needs to be qualified against a general lack of knowledge on the *issue of waste at the scale of the whole city, as opposed to the neighbourhood level*. The number of people who noted that they did not know about the existence of community bins in their neighbourhood, their cleanliness, or the likelihood of people dumping waste on the roadside in their area is, for example, consistently lower than 10% (5% in

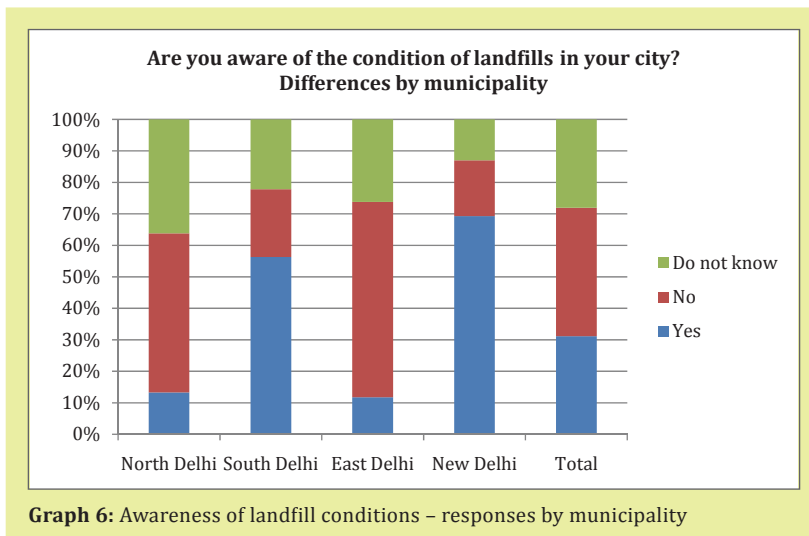
the case of cleanliness). This reflects a general awareness of local habits and neighbourhood infrastructure (irrespective of any assessments regarding their quality or value). Targeted questions relating to landfills, instead, recorded as many as 40% of respondents stating that they do not know. 37% do not know where their waste ends up; almost 70% are not aware of (or openly ignore) the conditions of Delhi landfills; almost 40% has no opinion on whether waste should ever be landfilled in the first place.



**Graph 4:** Awareness amongst different municipalities of where their waste ends up



**Graph 5:** Support for landfilling – responses by municipality



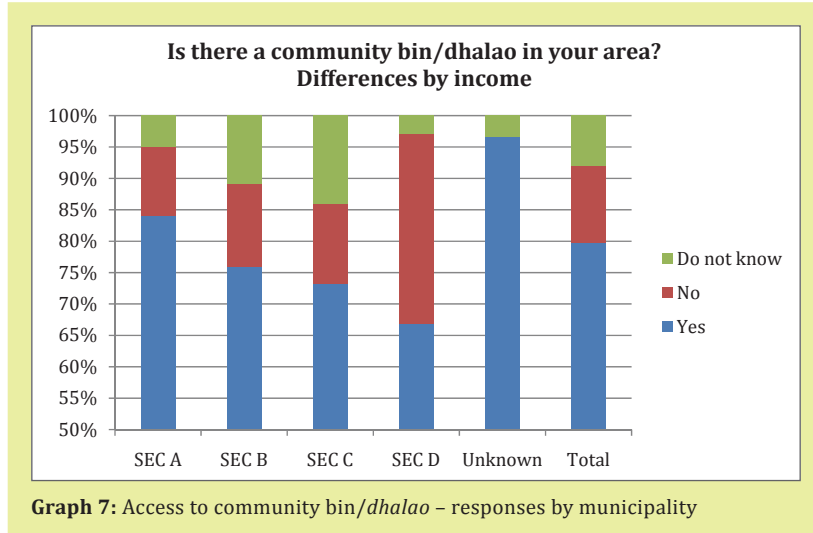
**Graph 6:** Awareness of landfill conditions – responses by municipality

Across municipalities, North Delhi Municipal Corporation is a noteworthy outlier, with up to three times more respondents answering ‘I don’t know’ to questions regarding their immediate neighbourhood, a critical figure that is also linked to significantly higher rate of negative answers on the availability (or the quality) of waste services in the surveyed area (see chapter 8).

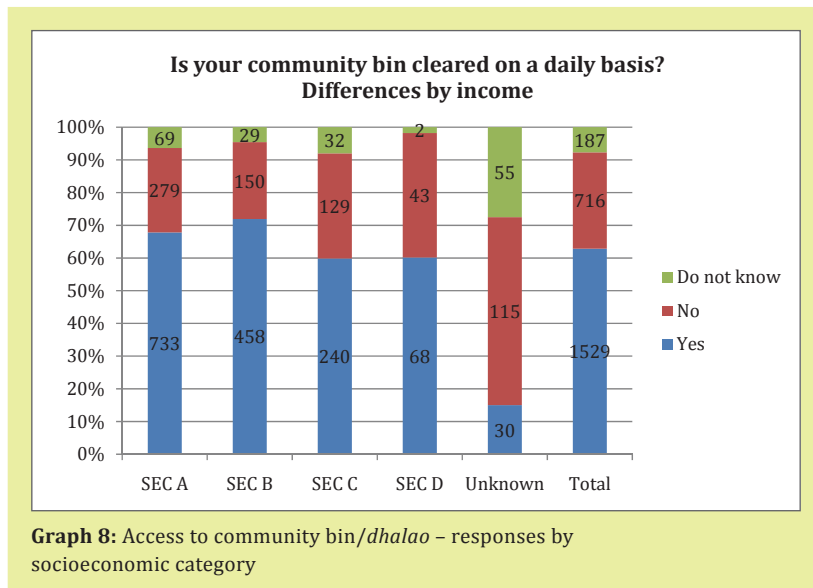
Segregation of responses by socio-economic category offers further insights. The ratio of respondents who answered ‘I don’t know’ with reference to waste infrastructure and services in their neighbourhood increased steadily (across the relevant questions) from the highest socio-economic category (A) to the two middle categories, *but worse off respondents (cat. D) are slightly less likely*

to 'not know' than anybody else. A similar pattern emerged with regard to responses on whether waste management ranks among the worst problem in Delhi, with socio-economic

category D scoring the highest positive response, and socio-economic category C the lowest (with a difference of 7%).

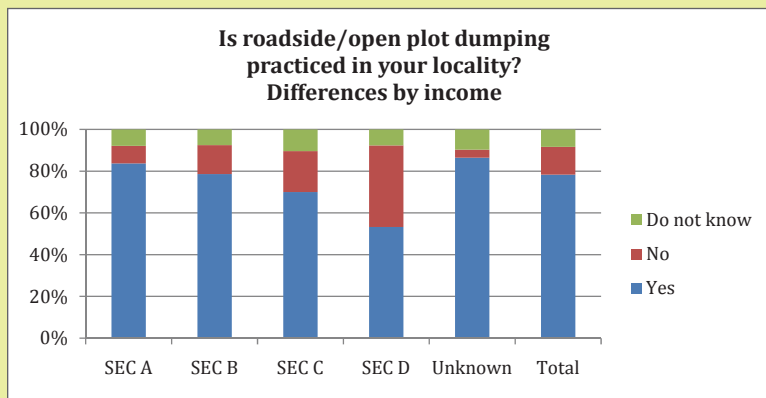


**Graph 7:** Access to community bin/dhalao – responses by municipality

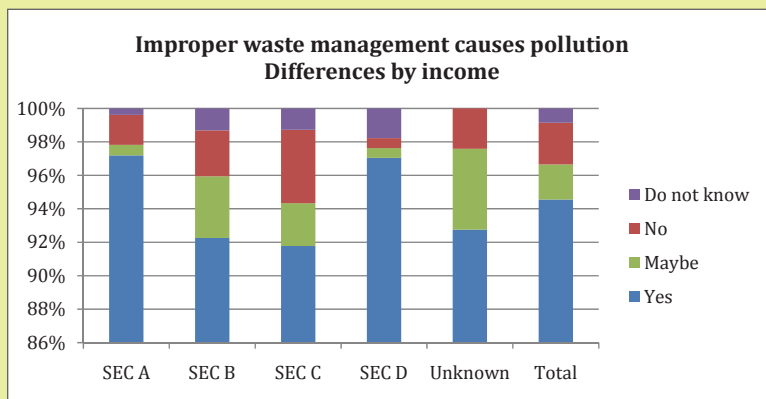


**Graph 8:** Access to community bin/dhalao – responses by socioeconomic category





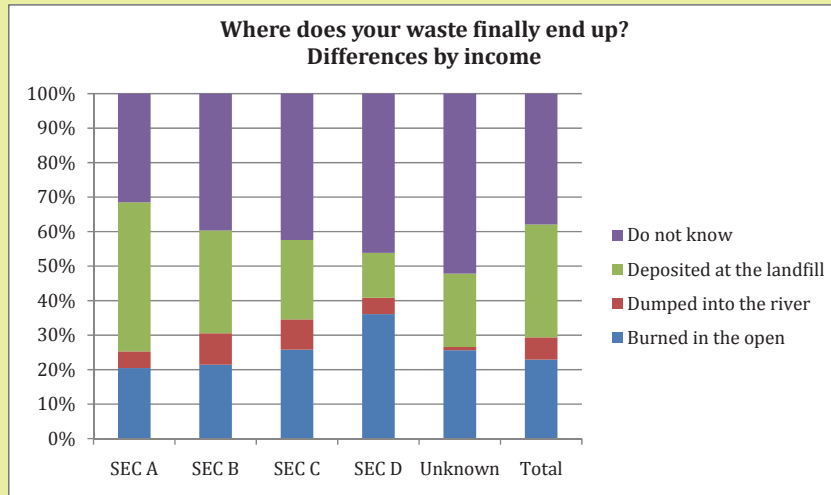
**Graph 9:** Incidence of roadside/open dumping – responses by SEC categories



**Graph 10:** Percentage of people who know that improper waste management causes pollution – responses by socio-economic category

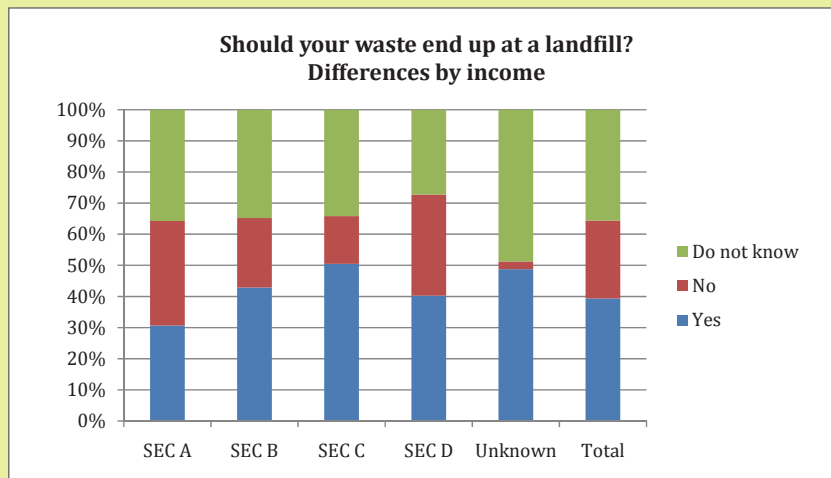
Interestingly, socio-economic categories A and D show similar responses about the impact of waste management and landfills. Over 97% of both categories think that improper waste management causes pollution, against lower figures for socio-economic categories B and C.

This is true despite clearly opposite exposure to waste flows: respondent from category A are most likely to believe their waste ends up in a landfill, while respondents from category D are most likely to think their waste is burnt in the open.



**Graph 11:** Perceptions regarding current waste handling (end-of-pipe destination) – responses by municipality

Categories A and D also had over a third of respondents state that waste should not end up in landfills, against 22% and 15% for categories B and C respectively.

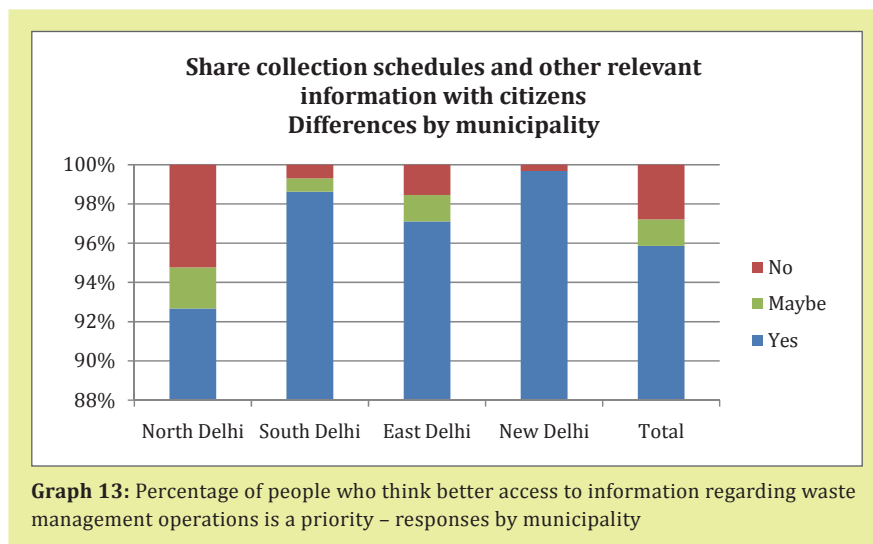


**Graph 12:** Support for landfilling – responses by municipality

Focus group discussions and interviews with a range of actors revealed that Delhi residents are very much in favor of actively contributing to improving the waste situation of the capital. A focus group discussant argued that *“people have become very aware of garbage. People have to get up even on a Sunday morning at 8 AM to make sure that their garbage is out [and indeed] people are doing it today. I’m telling you its very surprising, [...] people are literally getting up, and they are bothered about waste”*<sup>19</sup>. Interviewees also suggested that residents are well aware of the need to initiate flexible alliances with a range of institutional actors: *“What we can do is segregation, sensitize our family, impart education that bandage/battery for example are hazardous waste, RWAs can push policy measures. [The] impetus has to come from local people. Individuals have to take note of*

*that.”*<sup>20</sup> A teacher we interviewed supported this approach: *“The idea is to instill amongst children good waste management practices”*.<sup>21</sup>

Citizen activism and participation ranked high in our research. When respondents were asked to identify a number of options as priorities for improving the city waste management system, less than 4% of respondents were against prioritizing the inclusion of citizens in the monitoring of waste management in Delhi, and over 96% thought that sharing information and schedules with citizens was a top priority. More technical or rather less intuitive solutions such as segregation, recycling and EPR for toxic waste gathered the lowest open support (equal or less than 86%), highlighting the large scope waste education and awareness have to play in the capital.

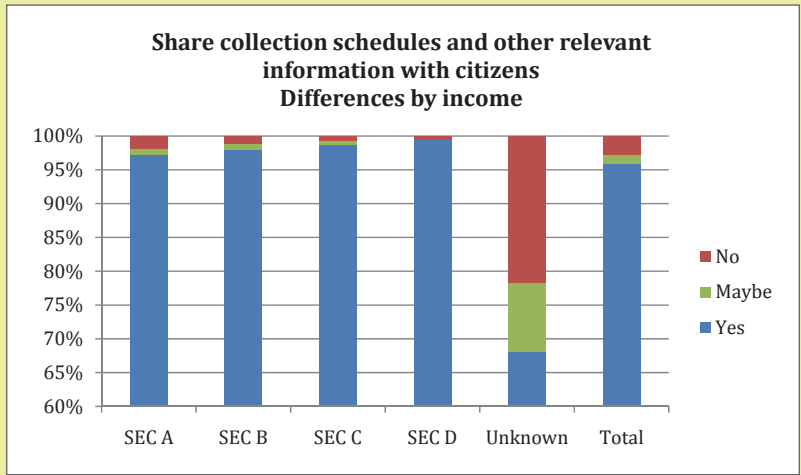


19 Chintan, Environmental Research and Action Group, ‘Focus Group Discussion on Waste Collection and Transportation’.

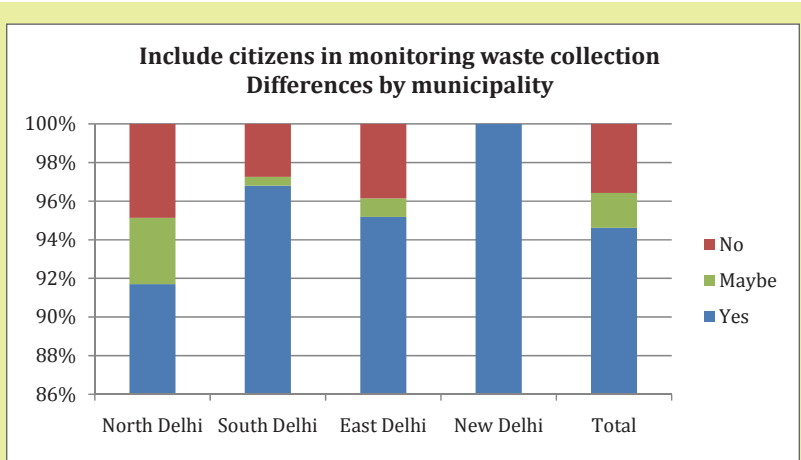
Date/Place needed

20 Chintan, Environmental Research and Action Group, Interview with Pinaki Das Gupta, IYCN. 2014

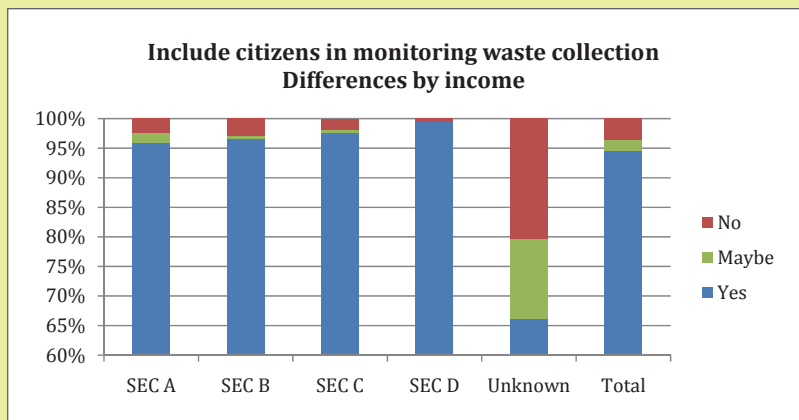
21 Chintan, Environmental Research and Action Group, Interview with Teacher-in-charge, Bal Bharati School, 2014.



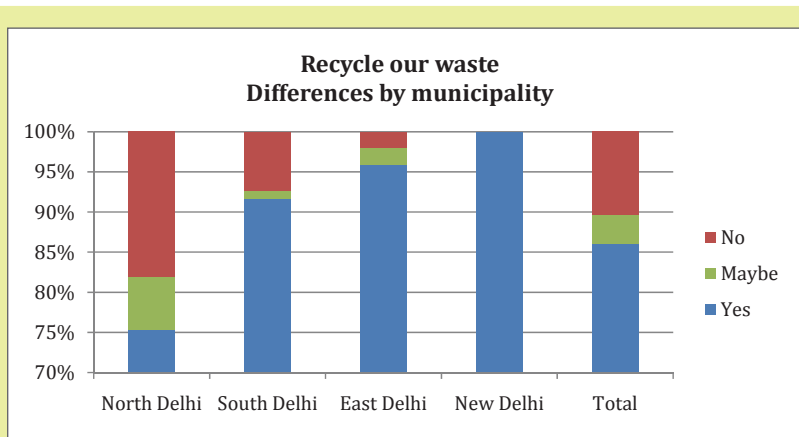
**Graph14:** Percentage of people who think better access to information regarding waste management operations is a priority – responses by socioeconomic category



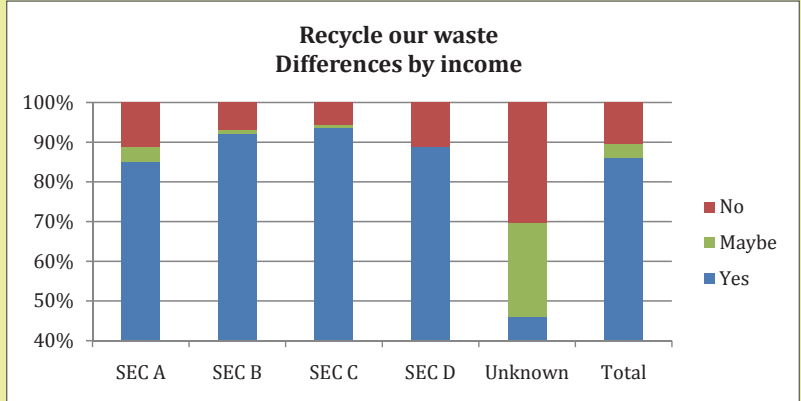
**Graph15:** Percentage of people who think including citizens in monitoring waste management is a priority – responses by municipality



**Graph16:** Percentage of people who think including citizens in monitoring waste management is a priority – responses by socioeconomic category



**Graph17:** Percentage of people who think recycling is a priority – responses by municipality

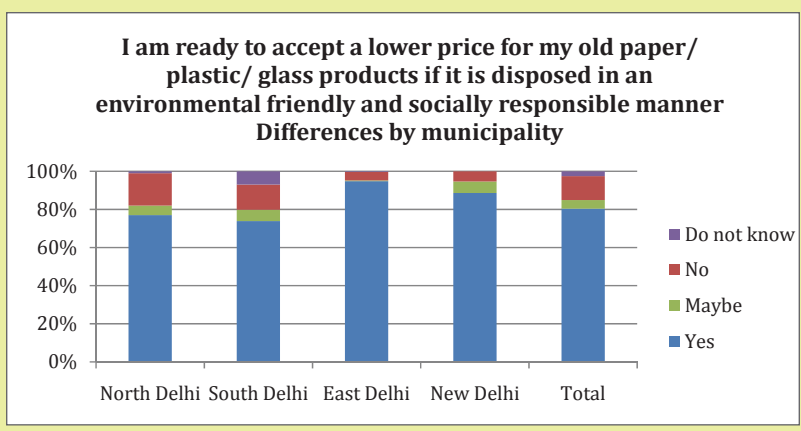


**Graph18:** Percentage of people who think recycling is a priority – responses by socioeconomic category

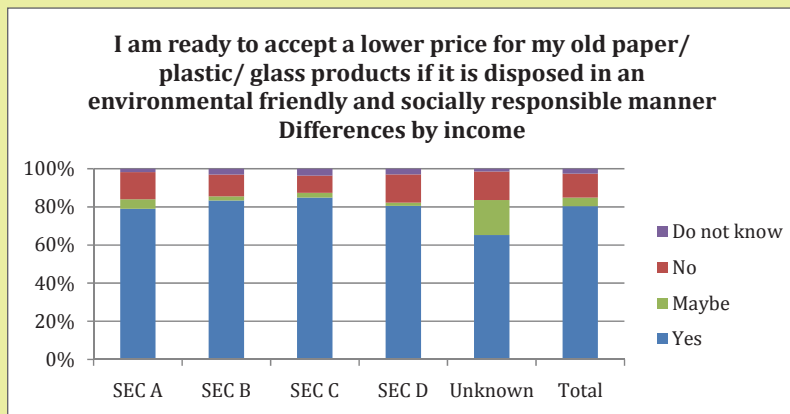
The lack of awareness amongst residents about the importance of segregation and recycling, is still a major gap Delhi needs to address (see chapter 9). The lack of awareness about the importance of separating the handling of toxic and hazardous waste is another critical area (see chapter 2).

Yet, our study shows that, given a chance, Delhi residents will actively support a different and more effective system. A clear example is given by our analysis on the willingness to pay

or pay more for waste services in areas where waste management is the poorest (see the example of north Delhi Municipal Corporation in other chapters) and the willingness to segregate to make waste processing more efficient and less hazardous for waste workers. Delhi residents are also largely in favor (over 80%) of accepting a lower price for the material they traditionally segregate and sell to itinerant recyclers, in exchange of more environmentally friendly and more socially sustainable handling.

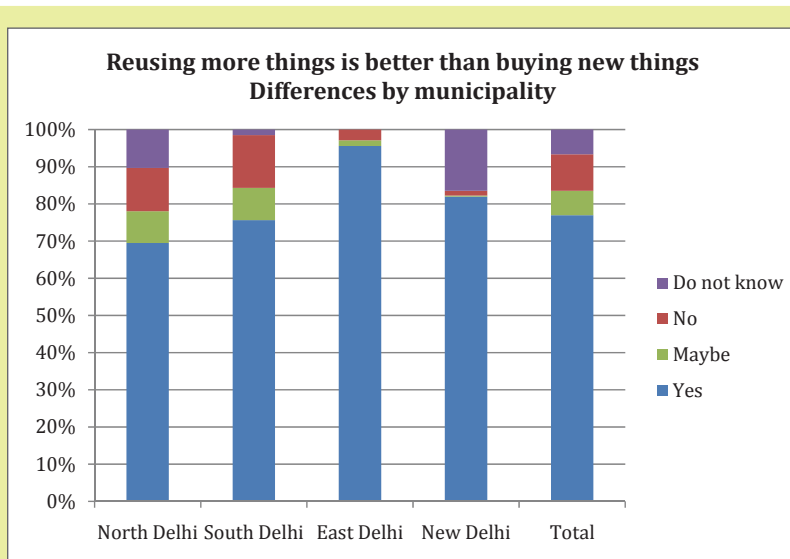


**Graph19:** Willingness to earn less from sale of recyclable items – responses by municipality

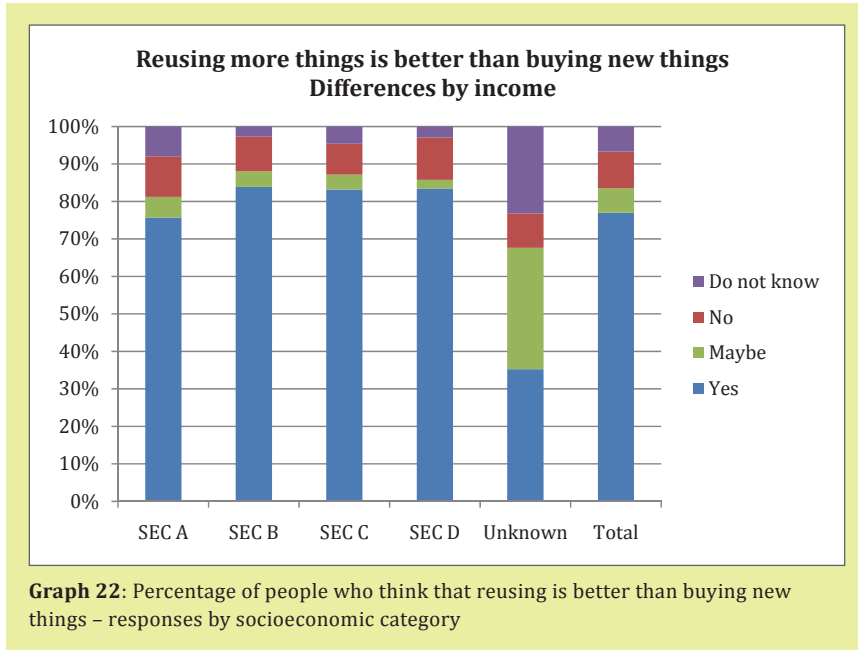


**Graph20:** Willingness to earn less from sale of recyclable items – responses by socioeconomic category

Again, across municipalities and socio-economic categories, Delhiites agree in principle that reusing is better than buying new things.



**Graph 21:** Percentage of people who think that reusing is better than buying new things – responses by municipality



**Graph 22:** Percentage of people who think that reusing is better than buying new things – responses by socioeconomic category

Residents are eager to change, pay more or make an effort if they understand the impact their actions will have. Their attitudes towards waste makes them an asset that deserves to be leveraged in new and flexible urban alliances.

### Measures that can be taken by the Government of NCT of Delhi?

Delhi residents are aware that waste poses a large problem, though they are still largely unaware of the scale of this problem, and have only a partial notion of their individual role

and responsibilities in the current waste crisis. Most of our respondents nevertheless believe they can and should make a contribution to improve the existing situation. People’s limited knowledge about basic waste facts still hampers residents’ understanding of their options. To address this, broad information campaigns can be conducted to sensitize Delhiites about the different ways of dealing with waste in their daily life. It can be concluded from the research that residents are willing to support decentralized and inclusive waste management.

*Residents are eager to change, pay more or make an effort if they understand the impact their actions will have. Their attitudes towards waste makes them an asset that deserves to be leveraged in new and flexible urban alliances.*



## Belief no. 2

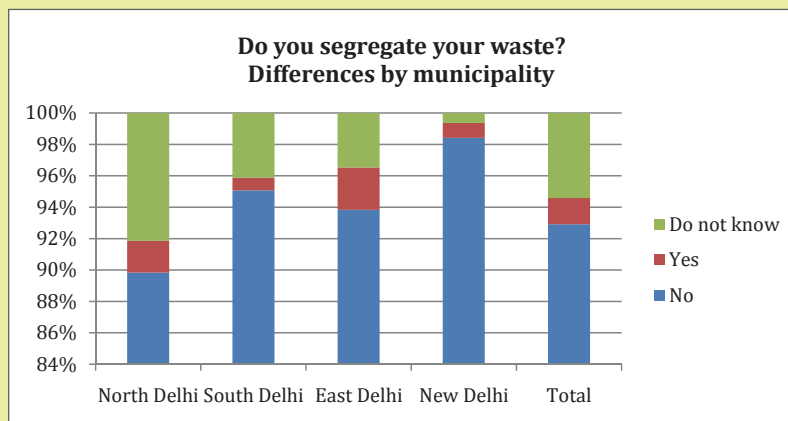
### People in Delhi do not source segregate because of attitudinal habits

The notion that Delhi residents don't care about their waste is entrenched. The fact that very few people segregate waste at home is often used to prove the fundamental difference between environmental sensibilities in India and in countries like Japan, Germany or Sweden. It is believed that Delhi residents don't see waste as their responsibility, they expect

the government to take on the full responsibility of managing it.

#### What are the research findings?

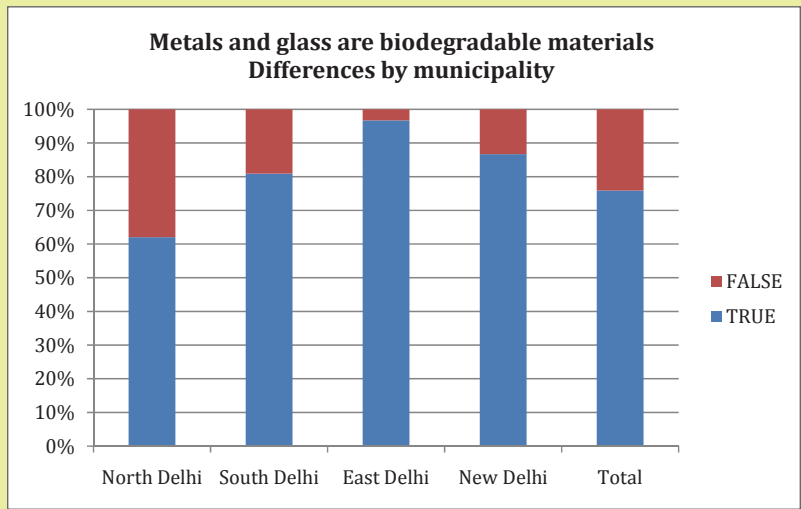
Less than 2% of Delhi residents segregate household waste at source, placing waste in different bins or bags according to its type. Very few (5%) don't know, but the vast majority (93%) admits to not segregating. This is true across all municipalities.



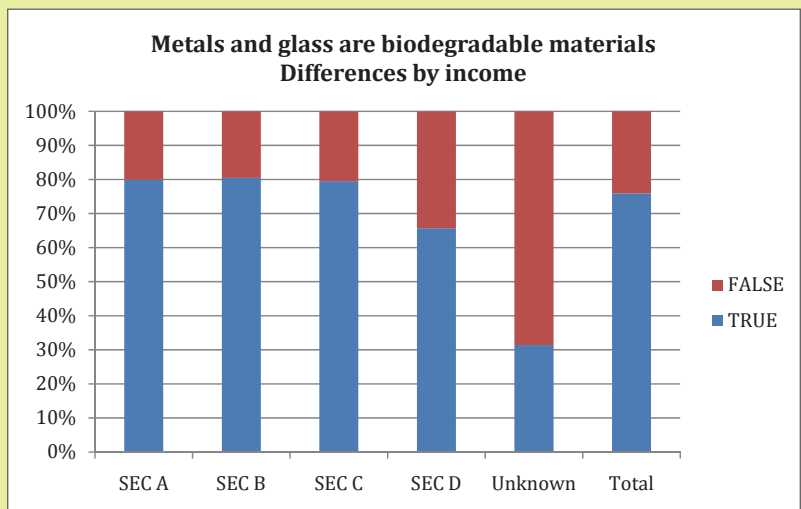
**Graph 23:** Percentage of respondents who segregate waste – responses by municipality

It is important here to consider the gaps in knowledge and the inadequacies that exist in the system that may have a role to play. Looking at the data for knowledge three out of four residents (76%) believe that glass and metal are *biodegradable*, with a peak of 97% in

East Delhi Municipal Corporation. Knowledge is not simply an issue of access to education – across socio-economic categories, the most disenfranchised group (SEC category D) is 15% more likely to know that metal and glass are not biodegradable.



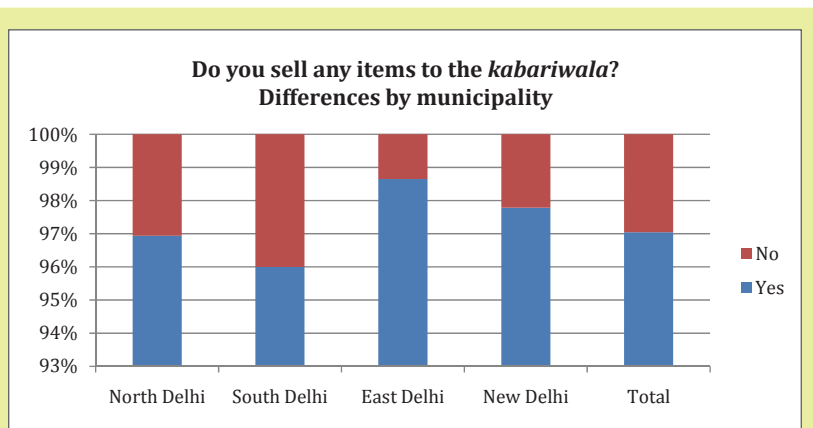
**Graph 24:** Percentage of people who believe metals and glass are biodegradable – responses by municipality



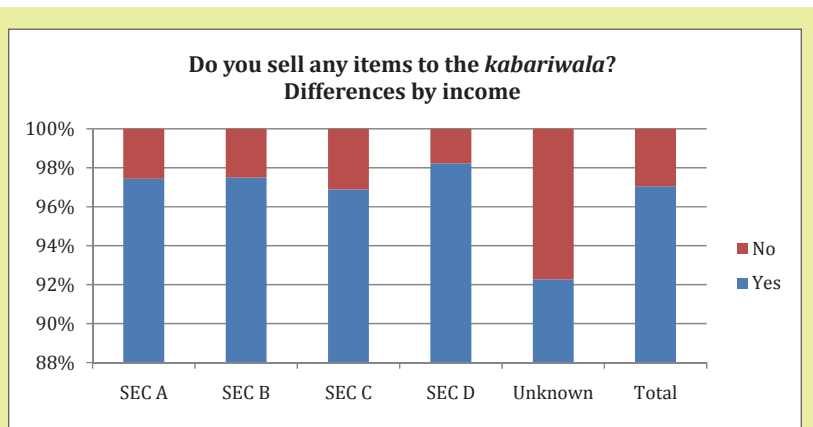
**Graph 25:** Percentage of people who believe metals and glass are biodegradable – responses by socioeconomic category

Segregation is a relatively misunderstood concept in Delhi. Delhiites do segregate, but they don't relate to segregation as a distinct practice. 96% of respondents indeed declared selling a number of items to *kabariwalas*: 88% sell newspapers, 37% glass bottles, and between 6% and 10% segregate magazines, cardboard and tins. Segregation of these items is automatic in most households of the capital. The overwhelming majority sells items to

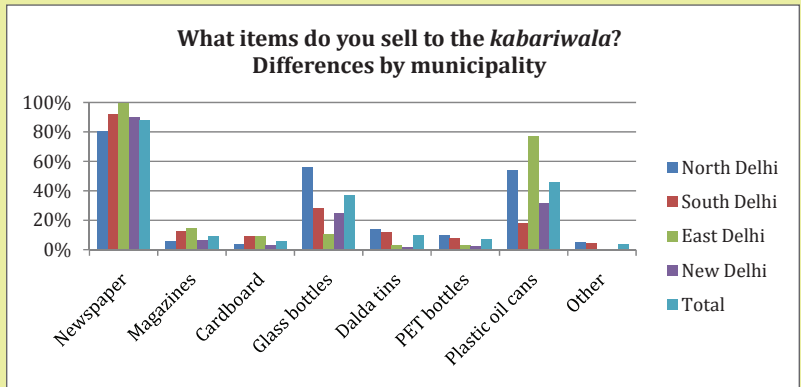
*kabariwalas* because of the money they can earn from it, but over half of respondents cite environmental gains amongst its side effects. In light of this data, entrenched habits cannot be held as the reason 98 in 100 Delhiites do not systematically segregate. Data suggests that there is rather a lack of knowledge amongst residents of Delhi 60% of respondents admit not to knowing the difference.



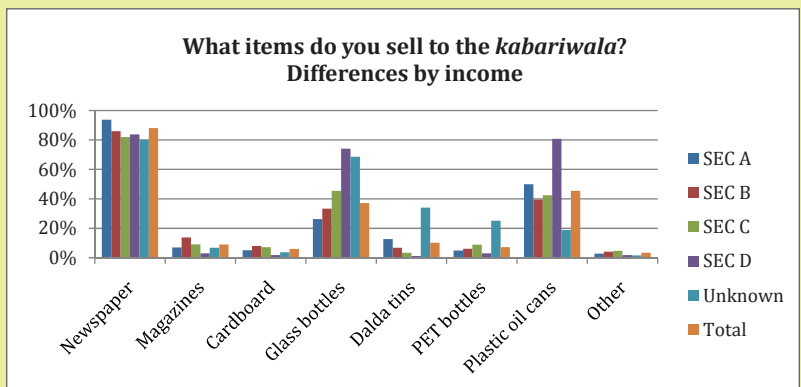
**Graph 26:** Percentage of people who sell any items to the *kabariwala* – responses by municipality



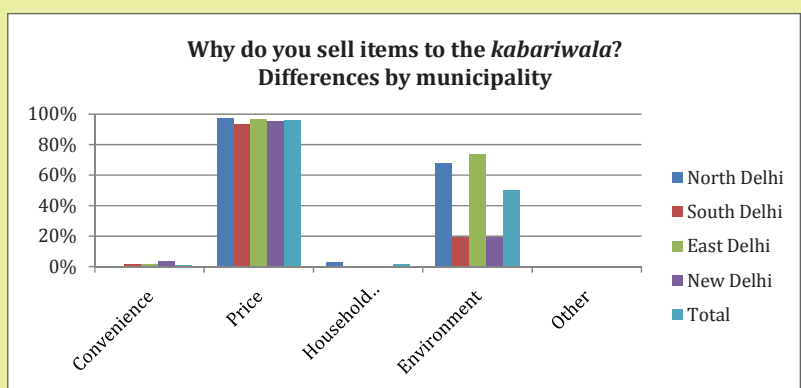
**Graph 27:** Percentage of people who sell any items to the *kabariwala* – responses by socioeconomic category



**Graph 28:** Items sold to the *kabariwala* – responses by municipality



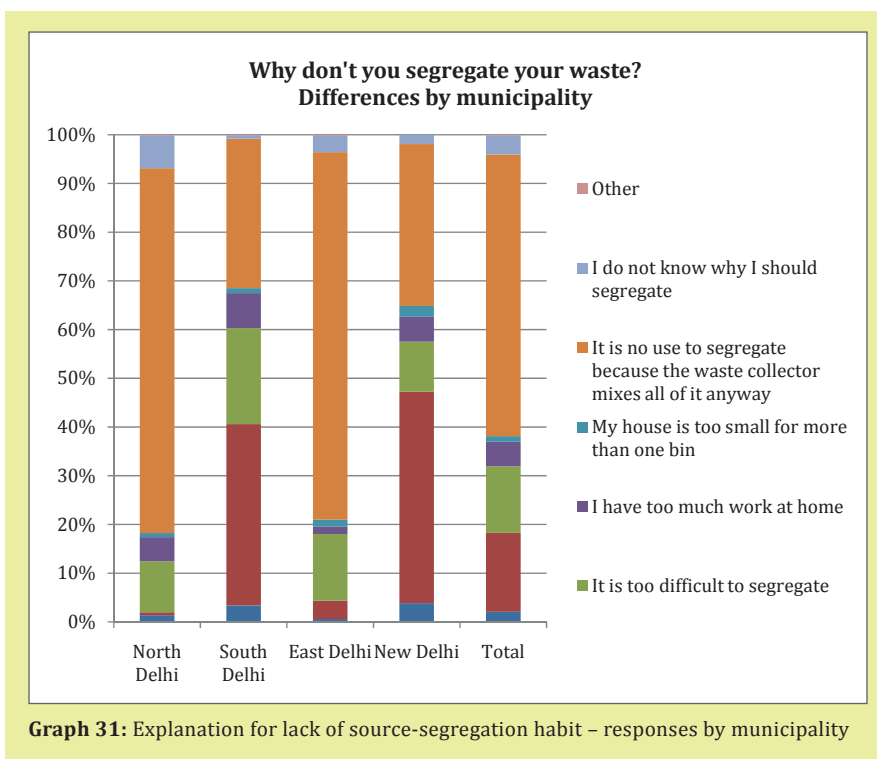
**Graph 29:** Items sold to the *kabariwala* – responses by socioeconomic category

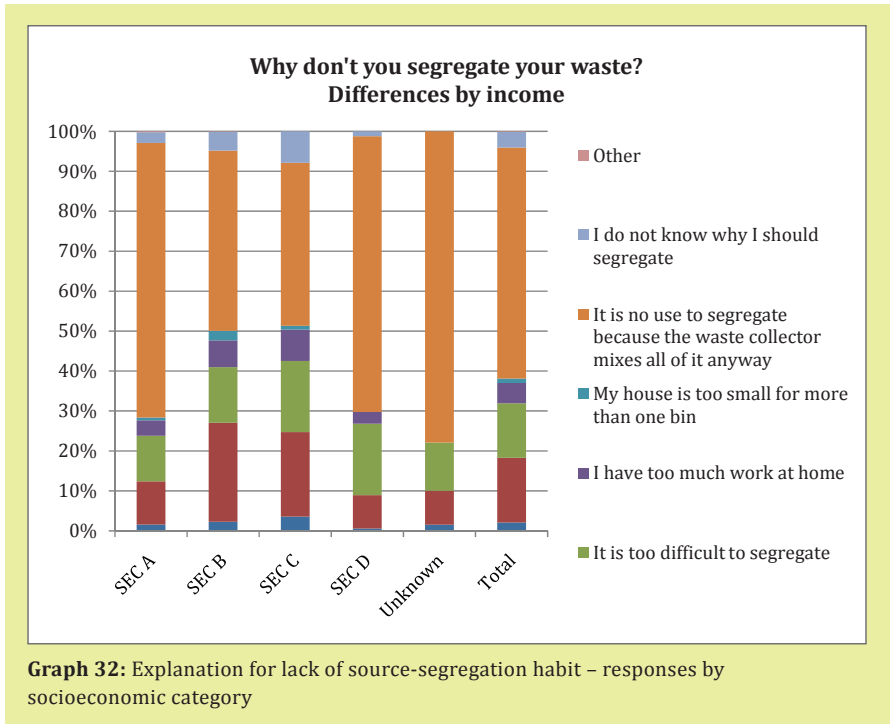


**Graph 30:** Motivation for sale of items to the *kabariwala* – responses by municipality

Participants were asked why no further segregation is done at home. From the data it can be seen that most believe that door-to-door waste collectors mix the waste anyway: only 16% of respondents blame family members who do not listen, 14% find it difficult, 5% do not find the time and a few (2%) feel that cooperation from the domestic help is lacking. When looking at the data municipality wise 60% of respondents in New and North Delhi Municipal Corporation thought their efforts would be nullified due

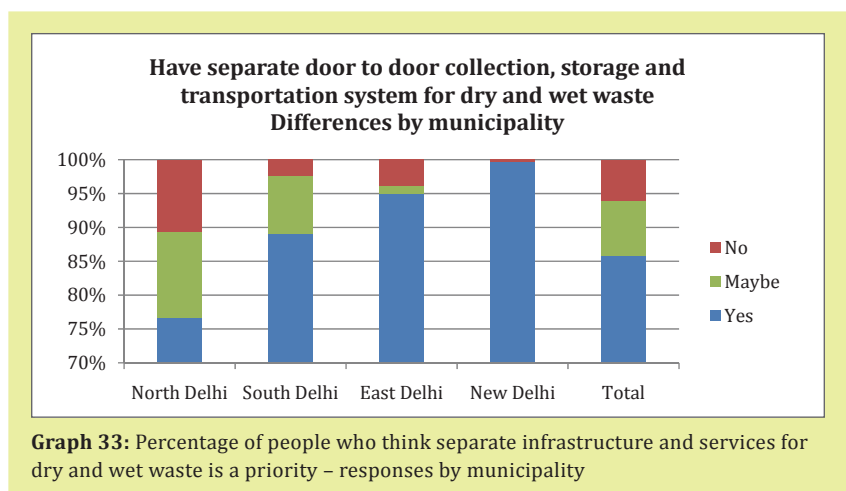
to inadequate collection systems in place. Only South Delhi Municipal Corporation registered less than 20% people blaming waste collectors. The conclusion drawn from the focus group discussions and interviews was that awareness campaigns, agreements with waste workers, incentive mechanisms (including penalties for non-compliance) and a separate collection system are effective solutions and should be given priority over distribution of bins through the city, in future policies.

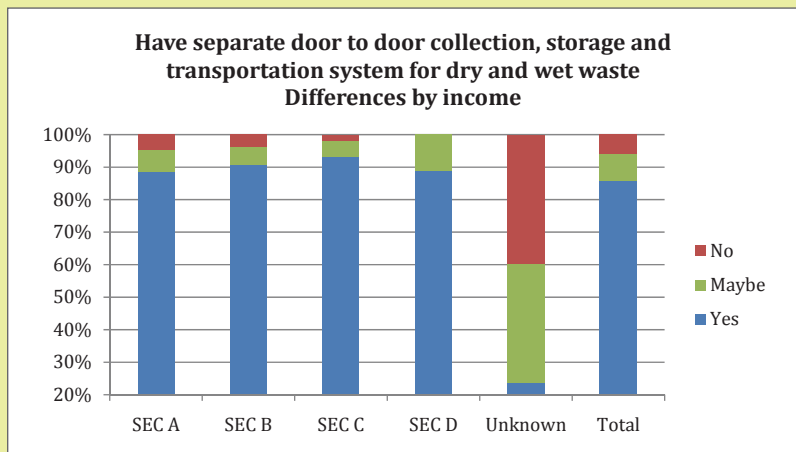




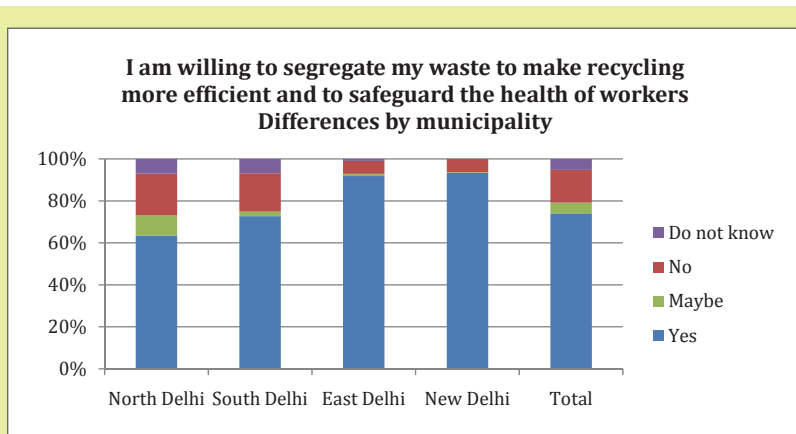
The survey confirmed that there is a real scope to improve the current system: 86% of residents (and as many as 99% in New Delhi and 95% in East Delhi Municipal Corporation) would welcome separate storage and collection systems for dry and wet waste in the

capital, and 74% (over 90% in East and New Delhi Municipal Council) are ready to start segregating to contribute to a more efficient system and safer working conditions for waste professionals.

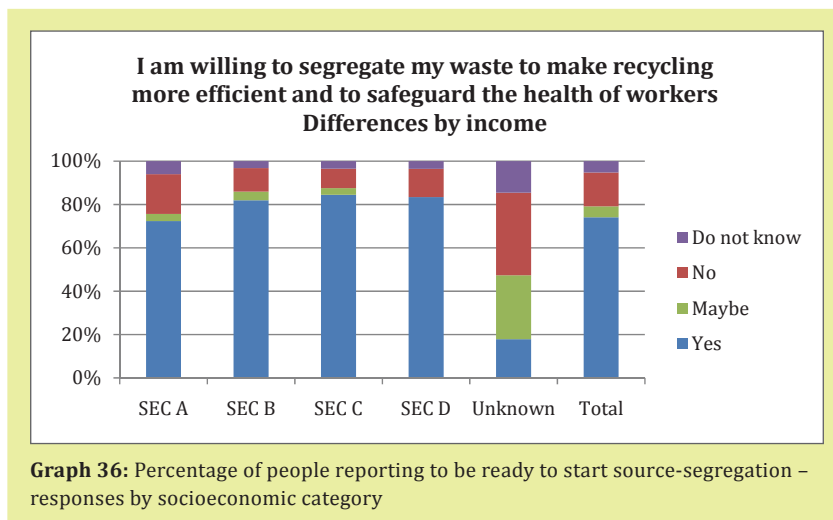




**Graph 34:** Percentage of people who think separate infrastructure and services for dry and wet waste is a priority – responses by socioeconomic category



**Graph 35:** Percentage of people reporting to be ready to start source-segregation – responses by municipality



**Graph 36:** Percentage of people reporting to be ready to start source-segregation – responses by socioeconomic category

In sum, **lack of awareness about the difference between dry and wet, biodegradable and non-biodegradable wastes**, the lack of formal systems and the lack of economic incentives (unlike the case of recycling through *kabariwalas*) turn kitchen and household items that could be segregated into undistinguished waste. Segregation relies on the capacity of users to recognize different categories of waste, and this is vastly missing in Delhi today: only a tiny minority knows that the dry/wet distinction is the most important waste categorization. Yet, according to our current knowledge about waste processing technology, segregation at source is the single largest contribution individual residents can make towards waste management as a whole.

### Case study - Introducing segregation in Bangalore

Experiments in Bhopal, Bangalore, Chennai and Coimbatore have shown that enforcing

compulsory segregation at source is not always easy. In many of these cities, successful pilots met considerable limitations when scaled up to the whole city. Bangalore was the first city in India where source segregation was made compulsory, through a series of directives issued by the Karnataka High Court in response to a Public Interest Litigation in 2012.<sup>22</sup> Two years on, segregation at household level is only partial and the municipality is planning new awareness-raising campaigns. The problem in Bangalore is not only one of residents' attitudes. Residents have complained that segregated waste is mixed back and dumped in the city's landfills; the government has recognized important shortcomings on its side too.<sup>23</sup> The severity of sanctions set by the recent Goa Non-biodegradable Garbage (control) (third amendment) Bill, 2014 are also self-explanatory about the urgency and difficulty of enforcing compliance: the law sets fines to up to 5,000 (for individuals) and 25,000 rupees

<sup>22</sup> Environmental Support Group - Trust, 'Karnataka High Court Directs Bangalore To Be The First City In India To Segregate Waste At Source [Press Release]', 24 November 2014, <http://www.esgindia.org/education/teaching-resources/press/karnataka-high-court-directs-bangalore-b.html>.

<sup>23</sup> "Waste Segregation Not Done at Source" - The Times of India', accessed 15 September 2014, <http://timesofindia.indiatimes.com/city/bangalore/Waste-segregation-not-done-at-source/articleshow/36075725.cms>.



(for businesses) or jail terms of up to six months for those who fail to comply.<sup>24</sup>

A number of successful small-scale examples, however, show that source segregation is indeed possible. The small town of Pammal in Tamil Nadu, Kanchipuram district, has since the mid-1990s witnessed the activism of a group of middle-class women turn into an NGO (Exnora Green Pammal) that now implements a model of source segregation and collection in a number of towns of Haryana, Andhra Pradesh and West Bengal.<sup>25</sup> Half of the operations' costs are covered by sales of compost on-site and recyclable items collected, and the rest is covered by CSR funding and through residents' collection fees. A similar resident-driven initiative has recently started in Pondicherry.<sup>26</sup> What these smaller initiatives show is that resident mobilization and the integration of segregation with improved collection and decentralized processing is critical to ensure an effective service provision.

## Measures that can be taken by the Government of NCT of Delhi

Although the concept of segregation as part of SWM operations is relatively new in Delhi, it is believed that is the largest contribution Delhi residents can make towards a cleaner and less polluted city. This of course implies involving communities from the individual and household level upwards. This study provides evidence that a majority of Delhi residents are ready to change the way they handle waste within their homes once they understand the benefits source segregation has not only for them but also for those who handle their waste and the environment in general.

Learning from the experiments and experiences of introducing source segregation in other cities, Delhi should approach this critical task by:

- Investing in outreach: Delhi needs imaginative, creative and engaging public awareness and information campaigns that spell out the impact that segregation (into dry and wet waste) has on environmental pollution, city finances and the health of waste workers; the *Swachh* Delhi and *Swachh* Bharat mobilization is a good opportunity to advocate for this.
- Monitoring: The impact of these campaigns must be measured and results shared widely;
- Defining standards: Engaging RWAs to define agreements and standards for collecting trash to implement separate collection of wet and dry waste with the support of informal sector workers, running dry waste collection centers, supporting their formalization and organization into associations and cooperatives whenever possible;
- Incentivization: Defining a system of incentives and penalties at the household, neighborhood and RWA levels, to ensure buy-in and compliance.
- Segregating across the waste flow: Providing separate storage systems at intermediate points such as *dhalaos* and training waste collectors to transport and deposit biodegradable and non-biodegradable waste into the separate storage points.

24 'Fine, Jail for Failure to Segregate Waste - The Times of India', accessed 15 September 2014, <http://timesofindia.indiatimes.com/city/goa/Fine-jail-for-failure-to-segregate-waste/articleshow/40382680.cms>.

25 Ahluwalia, *Transforming Our Cities: Postcards of Change*.

26 'Residents Show the Way to Source Segregation in Pondy - The Times of India', accessed 15 September 2014, <http://timesofindia.indiatimes.com/city/puducherry/Residents-show-the-way-to-source-segregation-in-Pondy/articleshow/38162495.cms>.

## Belief no. 3

# People either do not pay or are unwilling to pay for waste management services

Managing urban solid waste is extremely costly, but only few waste generators, especially among residents are aware of it. There is a widespread belief that Delhi residents do not pay or are not willing to pay for their waste to be disposed of in the right manner. An interviewee's response provides support to that belief: "***we [Delhiites] don't want to pay for the services, this is the culture.***"<sup>27</sup>

### What are the research findings?

As discussed in chapter 8, doorstep collection remains the most effective tool for engaging residents in waste management in the capital. Accordingly, *doorstep collection fees* often represent all Delhiites know about SWM

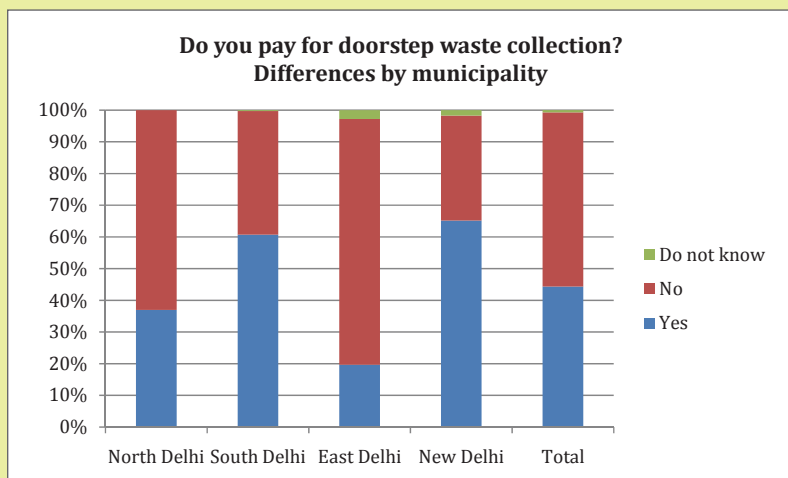
financing. This research looked into residents' experience of paying for doorstep collection as an entry point to understand their willingness to pay, or pay more, for a different or better service, and their ideas about whose responsibility waste ultimately is.

Overall, only 44% of respondents said they *pay for waste collection*, but the figure varies significantly across municipalities reflecting the different systems in place across the city (see also chapter 8): over 60% of respondents in South Delhi Municipal Corporation and in New Delhi Municipal Council pay for doorstep collection, while 63% and 77% respectively in North and East Municipal Corporation do not pay. Interestingly, middle socio-economic categories (B and C) are slightly (10%) more likely to pay for doorstep collection than the top and bottom categories.

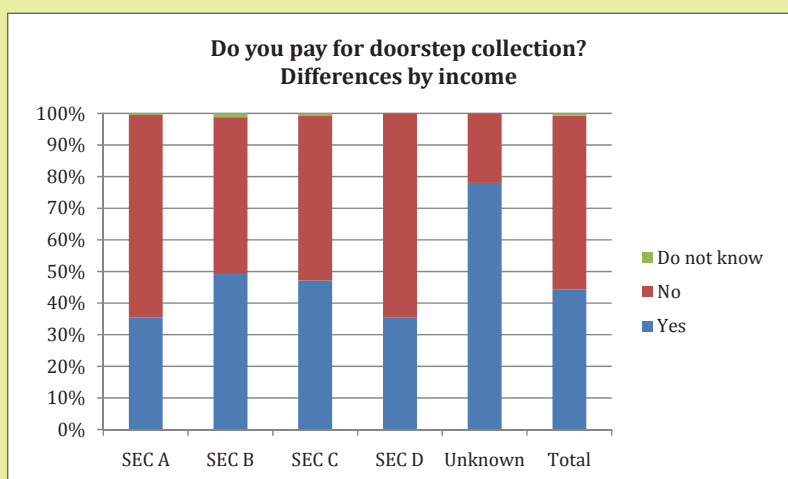
*doorstep collection remains the most effective tool for engaging residents in waste management in the capital.*

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Chintan, Environmental Research and Action Group, Interview with Pradeep Dadlani, Sycom, 2014.



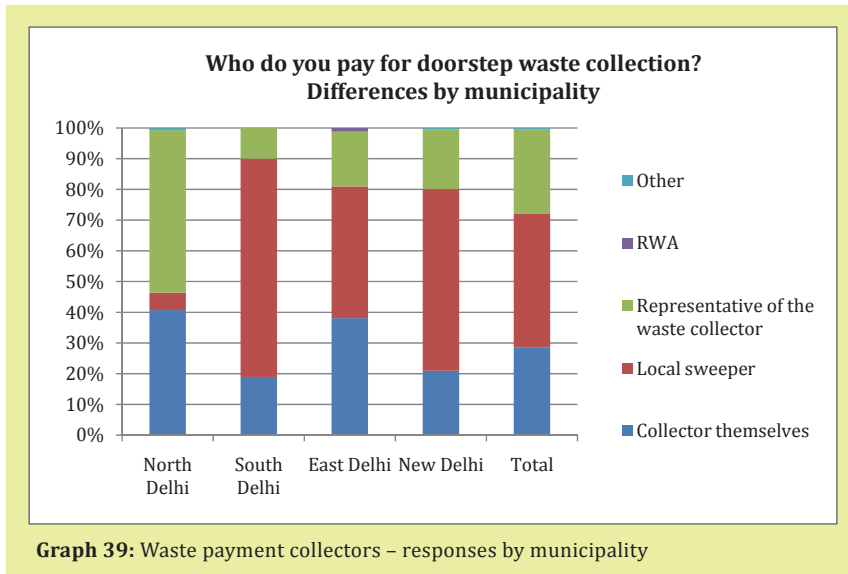
**Graph 37:** Incidence of payment for waste services – responses by municipality



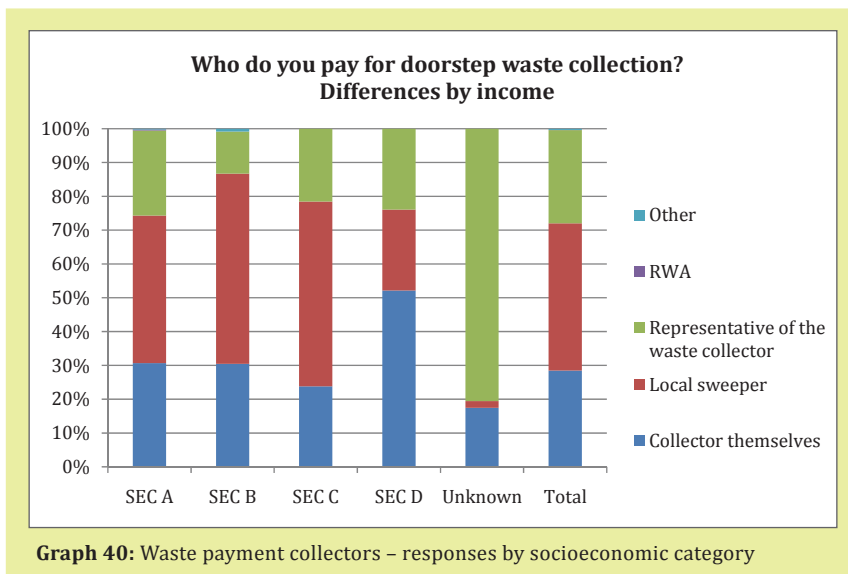
**Graph 38:** Incidence of payment for waste services – responses by socioeconomic category

Payments are usually made *to the local sweeper* (43%), the *collector* (28%) or *a representative of the collector* (28%). In SDMC and in New Delhi Municipal Council, over two thirds of respondents pay the local sweeper, and residents of North and New Delhi Municipal Councils are 20%

more likely to pay directly to the collector. Respondent from the bottom socio-economic category (D) are also 20% to 30% more likely to interact directly with the collector (specifically for payments) than everybody else. Overall, payment arrangements are highly diversified.



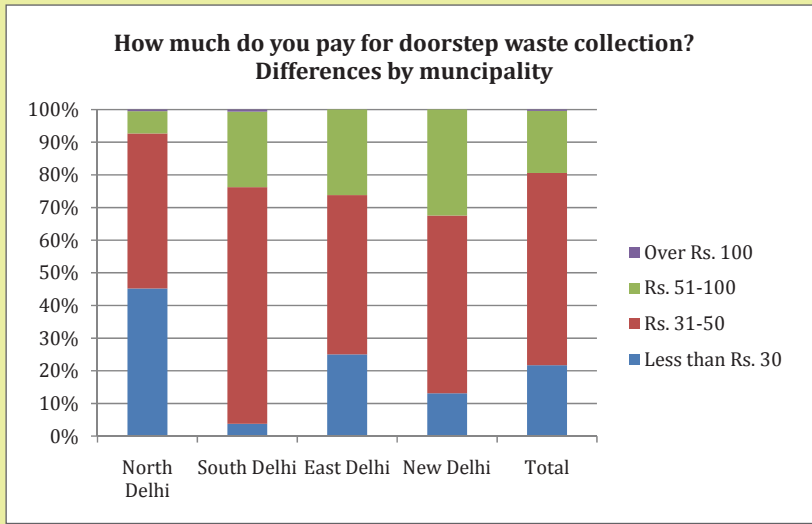
**Graph 39:** Waste payment collectors – responses by municipality



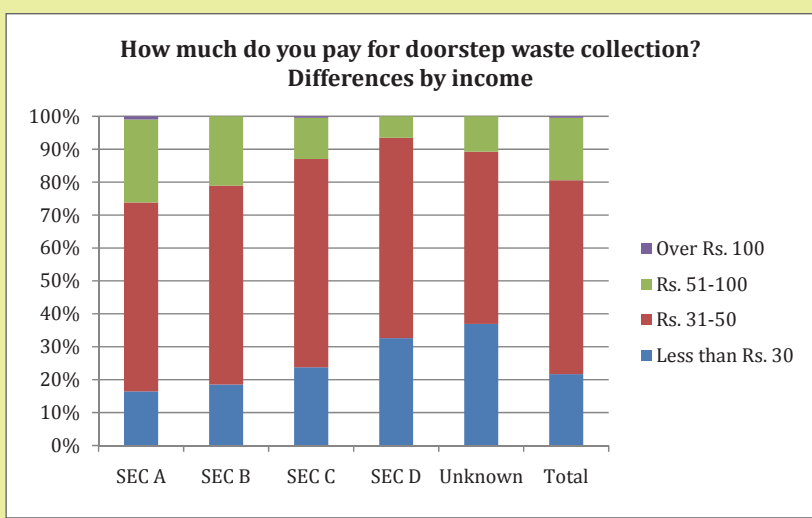
**Graph 40:** Waste payment collectors – responses by socioeconomic category

A majority of respondents (59%) pay monthly between Rs. 31 and Rs. 50 for doorstep waste collection. 22% (but around half in North Delhi Municipal Corporations) pay less than

Rs. 30 and 19% pay between Rs. 51 and Rs. 100. These figures are consistent across socio-economic categories.



**Graph 41:** Doorstep collection fee levels – responses by municipality



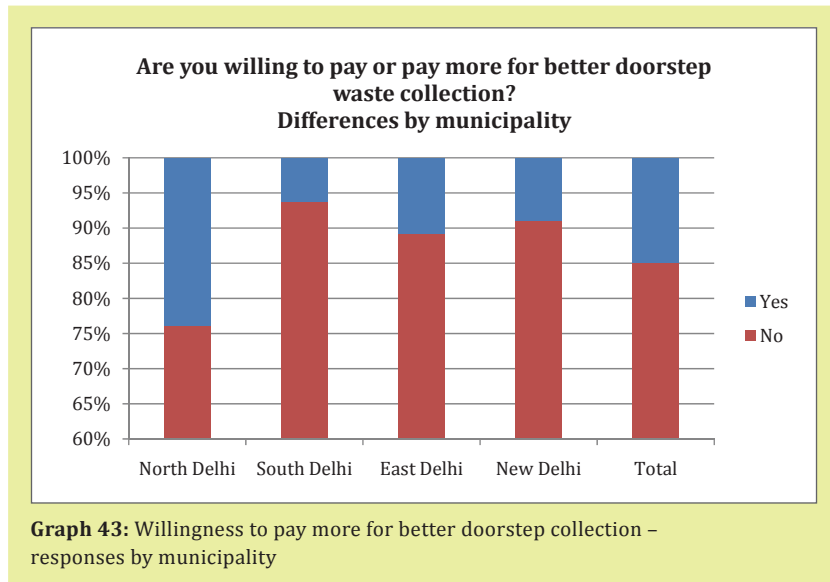
**Graph 42:** Doorstep collection fee levels – responses by socioeconomic category

Only 15% are willing to pay (or pay more) for a better collection service, with the figure going up to 90% or more in South and East Delhi Municipal Corporation and New Delhi Municipal Council. Among those who are willing to pay for better collection

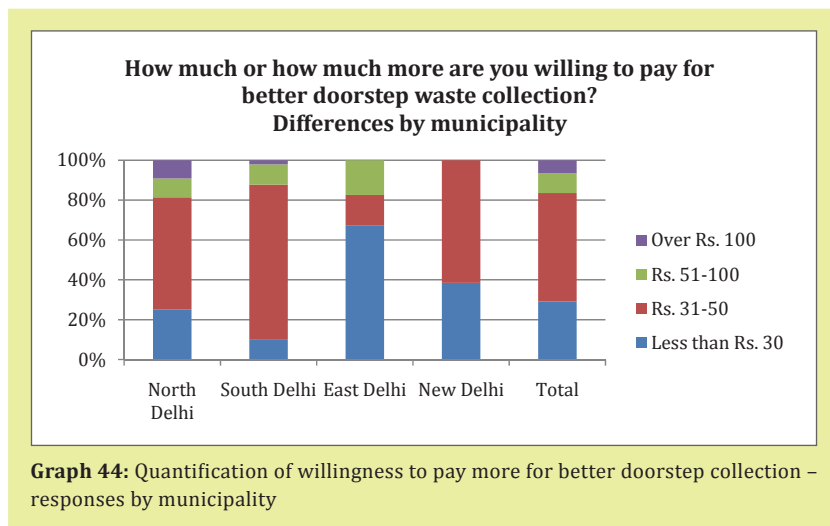
services, 70% respondents live in North Delhi Municipal Corporation, and 54% are willing to pay between 31 and 50 rupees, 29% less than 31 and a lesser but significant 17% (overwhelmingly in North Delhi) are ready to pay up to 100 rupees for a better

service, including 7% willing to pay more than Rs. 100 per month. The top and bottom socio-economic categories (A and D) are

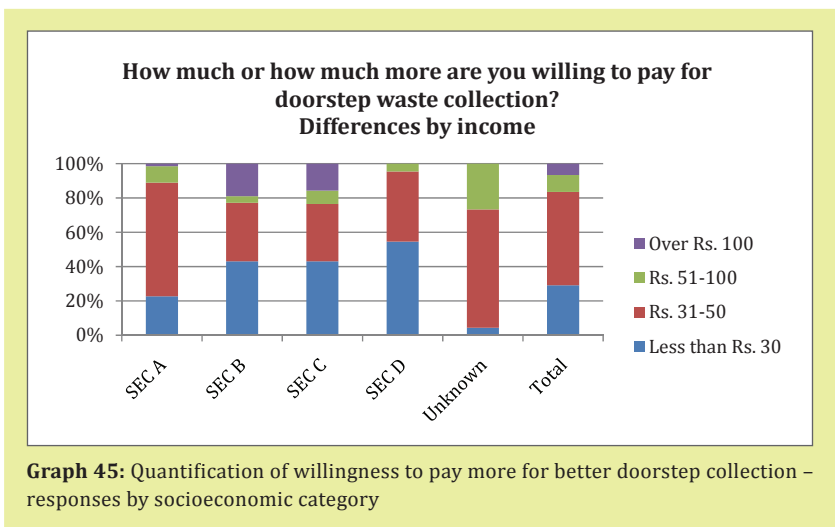
slightly (7%) more likely to be willing to pay more than the middle categories (B and C).



**Graph 43:** Willingness to pay more for better doorstep collection – responses by municipality



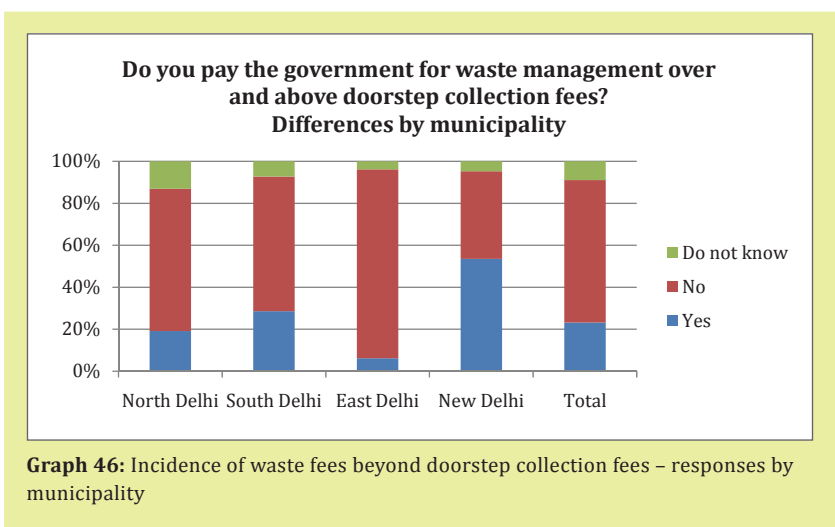
**Graph 44:** Quantification of willingness to pay more for better doorstep collection – responses by municipality



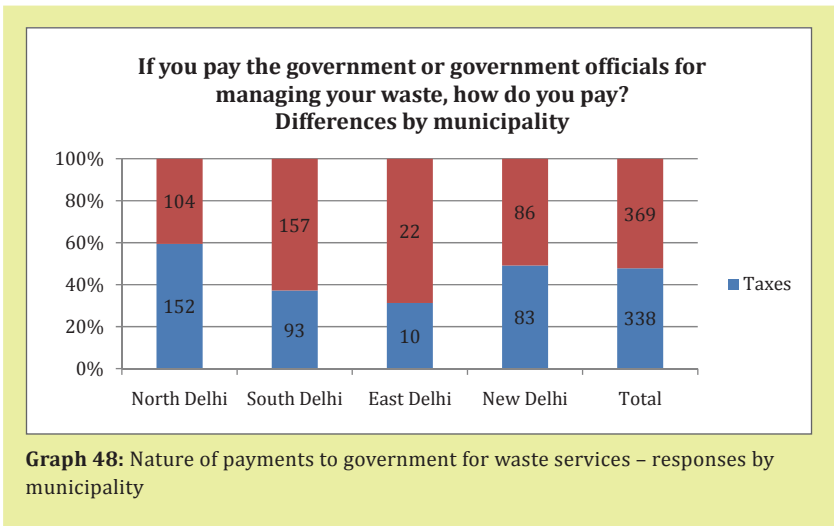
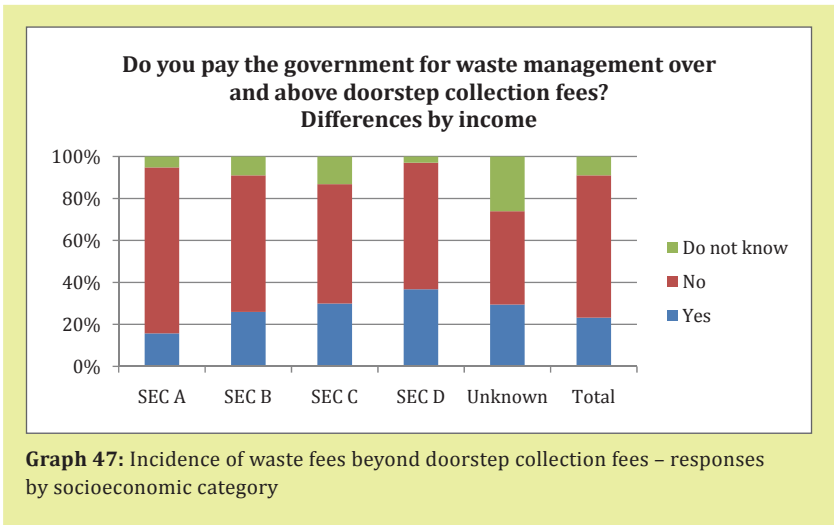
**Graph 45:** Quantification of willingness to pay more for better doorstep collection – responses by socioeconomic category

A large majority of residents are oblivious to the fact that waste management represents a major share of Delhi’s city budget, above and irrespective of doorstep collection fees. 68% respondents (but 90% in North Delhi Municipal Corporation) think that their payment of collection fees is their only financial contribution towards government spending of waste management. Only a

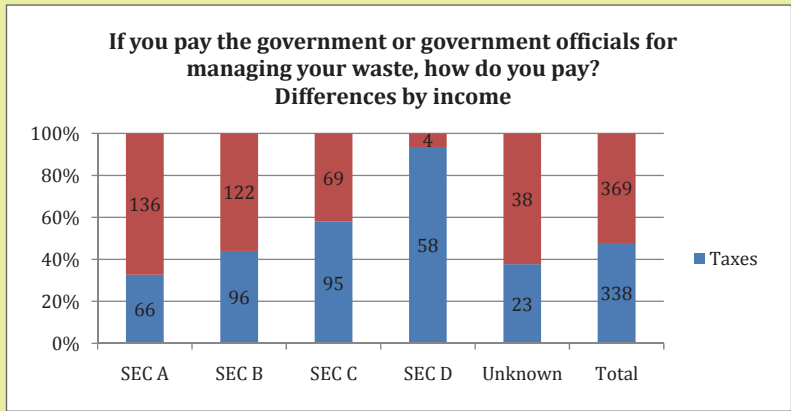
quarter of respondents (and up to half in New Delhi Municipal Council) believe that they contribute to government spending on waste over and above what they pay as a doorstep collection fee. Better-off SEC categories (67% among group A) understood this additional contribution in terms of non-taxation ‘incentives’, but worse-off residents (94% among group D) pointed to taxes alone.



**Graph 46:** Incidence of waste fees beyond doorstep collection fees – responses by municipality



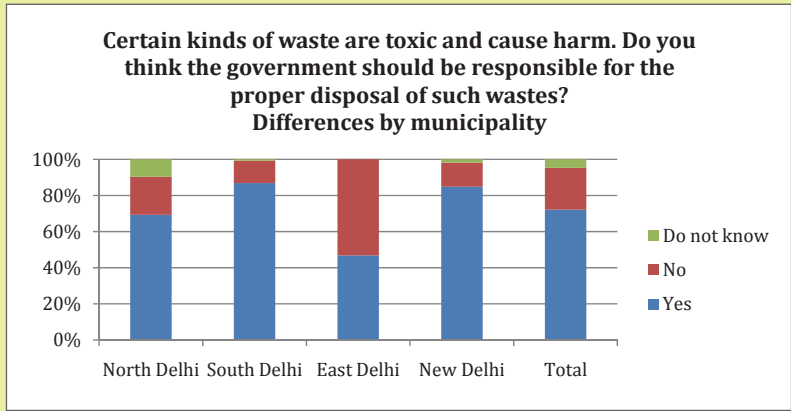




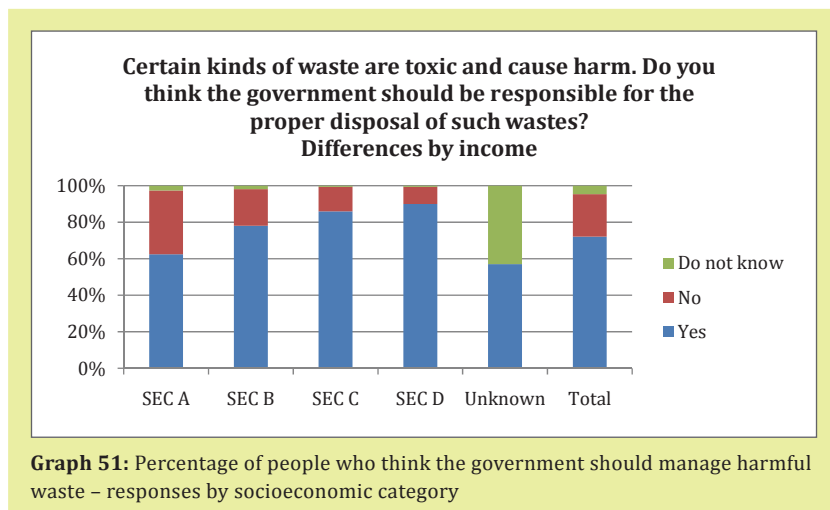
**Graph 49:** Nature of payments to government for waste services – responses by socioeconomic category

Despite low willingness to contribute financially towards waste management, respondents hold that the government has a primary responsibility to handle waste. For example, more than 70 % of respondents (consistently across socio-economic

categories), think that public authorities have a primary responsibility to handle toxic or hazardous waste, with businesses and individuals sharing this responsibility with government according to only 50% and 24% of respondents respectively.



**Graph 50:** Percentage of people who think the government should manage harmful waste – responses by municipality



Respondents were asked about alternative ways of setting fees for waste management, but their responses reflect an overall low engagement with the issue of waste management and its financing. Less than half of the respondents supported an alternative system where waste generators pay according to the type of waste they generate (46%) or its quantity (44%). In both cases, levels of support are also clearly split by municipality: 70% or more support in New Delhi Municipal Council and South Delhi Municipal Corporation, and only between 20% and 30% in East and North Municipal Corporations. In North Delhi Municipal Corporation, as many as 46% (up to 30% more than in other municipalities) did not have an opinion on the matter. These variations reflect both the varying experience residents have of collection, waste infrastructure and payments, and also different levels in basic knowledge about waste. Overall, the issue of payments reflects the high fragmentation of SWM management across the capital.

Municipalities can rely on a number of alternative mechanisms to finance SWM.

If the largest share is usually taken on by urban local bodies' budgets, approaches like 'Extended Producer Responsibility' partly shift the burden onto manufacturers – logistically, technologically and financially. Source segregation and waste minimization also reduce significantly the total expenditure by informing waste generators' basic behaviours to reduce the volumes of waste that need end-of-pipe handling. Privatization of waste management services is more complex (see belief 4). The most expensive part of SWM remains however very close to residents' own reach: collection and transportation of waste from households onwards.

### Case study - Pune and its informal sector

Pune has set the example by identifying as the most expensive part of urban solid waste management the link between collection and segregation on one hand, and transportation and disposal on the other: source segregation and front-end recycling reduce drastically the volume of waste needing handling, and leveraging this window of opportunity for

Pune has meant integrating end-of-pipe scientific waste processing with collection and segregation done by the informal sector and residents themselves.

In particular, in 2009 Pune Municipal Corporation (PMC) contracted SWaCH (Solid Waste Collection and Handling or, officially, the SWaCH Seva Sahakari Sanstha Maryadit, Pune), a cooperative of 2300 self-employed waste-pickers, to carry out doorstep collection. SWaCH members collect waste from households, where it has already been segregated in wet and dry bins. They transport wet waste to closed containers for processing in PMC facilities, but sort and recycle most of the dry waste locally, reducing significantly the need for transportation and disposal.

What is relevant in the Pune model is the way its widespread and efficient front-end waste management solution is financed. SWaCH receives Rs. 10 monthly for the collection from households, but waste collectors also supplement their income from the bulk sale of recyclable material recovered from dry waste (to which they have virtually exclusive access), and receive additional direct payments for their public service from PMC of about 8 crores INR per year. The Municipality integrated user-fees with value-extraction from waste in the informal recycling market and public investment in SWM, guaranteeing minimum standards of efficiency and sustainability. PMC also provides SWaCH members medical insurance, ID cards, uniforms, and gear, making SWM a more inclusive and just public service. Although the municipality has not renewed the contract with SWaCH after a multi-year contract ended, citing several reasons, the collection has continued on the basis of user fees and the sale of recyclable material, although supervision has drastically declined.

## Measures that can be taken by the Government of NCT of Delhi?

Alleviating the financial liability of SWM for Delhi municipalities is as necessary as reorganizing SWM on new foundations. These two dimensions are intimately linked, and tackling them together is critical, particularly in light of Delhi's fast urbanization and the growing proportions of Delhi's waste crisis.

Delhi residents who are currently not paying for their waste to be collected either because the mechanism is not in place or the one that exists is weak, are willing to pay for a proper collection system to be setup. Delhi can leverage this opportunity and integrate locally relevant solution with the need for minimum standards across the city, in terms of safe handling, total reach and efficient management of solid waste.

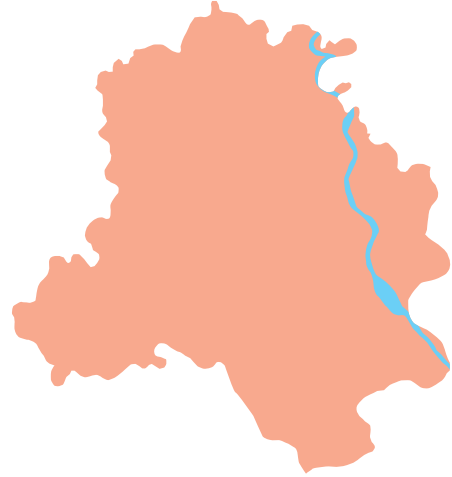
To do so, the Delhi government can focus on the following priorities:

- Front end doorstep collection. Delhi should consider following the example of Pune, moving away from a “collect and dispose approach,” and putting doorstep collection and front-end sorting and recycling on a higher footing than disposal, according to the international waste hierarchy and the Municipal Solid Waste (Management) Rules 2000; such a system should not be contracted to the lowest bidder, but be based on experience, inclusion of the informal sector and capacity to train the informal sector.
- Explore decentralized financing mechanism. Delhi needs to evaluate the economic and management potential of integrating the informal waste collection and recycling sector in its SWM. For this segment, it should also explore a decentralized waste financing and

management system that combines user-fees, exclusive access to waste and public contributions.

- Devolve responsibilities. Municipalities should support the organization (through collectives, associations and cooperatives) of doorstep collection and household user fees where it is currently not available, and empower RWAs to manage the city's relationship to waste collectors.

- Everyone pays. Delhi should permit the collection of user fees from households by waste collectors and their organizations; this should not be linked to how the service is organized.



*Alleviating the financial liability of SWM for Delhi municipalities is as necessary as reorganizing SWM on new foundations. These two dimensions are intimately linked, and tackling them together is critical, particularly in light of Delhi's fast urbanization and the growing proportions of Delhi's waste crisis.*

## Belief no. 4

# Reducing consumption, and therefore waste, is not an option for India at the moment, because it is on a fast track towards economic progress

### Can Delhi adopt a Refuse, reduce and reuse measure?

Rapid economic growth comes with high costs and benefits, and large cities like Delhi typically have a disproportionate share of both. Solid waste has an immediate impact on people's quality of life and health, and people's growing aspiration for consumerist lifestyles is inevitably to blame for the growing volume of waste per person the capital generates. Rigorous studies have shown that in consumerist societies *personal expenditure* has the closest correlation to municipal solid waste generation – more than GDP, wages or population.<sup>28</sup>

Many cities across the world have started targeting consumption as a way to limit the need for 'end-of-pipe' waste management (whether it is recycling, composting, incineration and disposal in landfills).<sup>29</sup> Reducing the opportunities residents have to generate waste is an intuitive and effective way to reduce the burden of waste on a city. For this reason, minimizing is at the base of the waste management hierarchy. If in

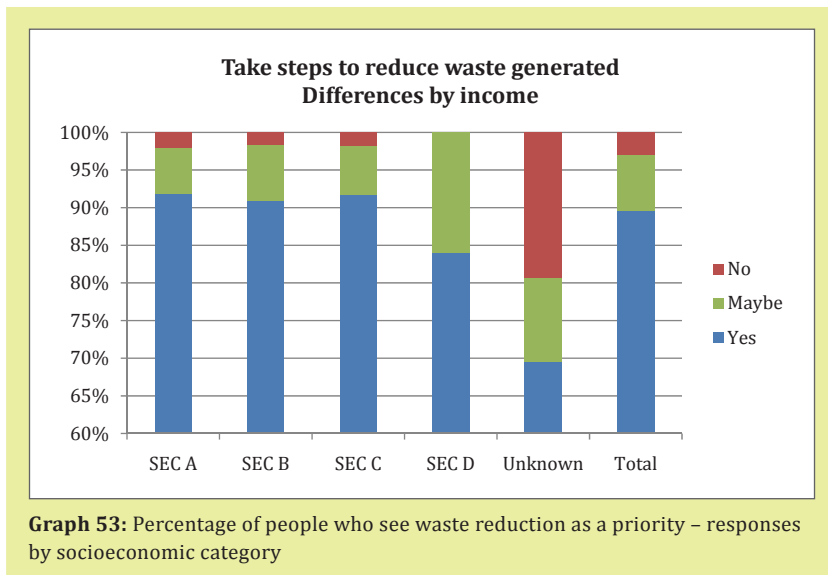
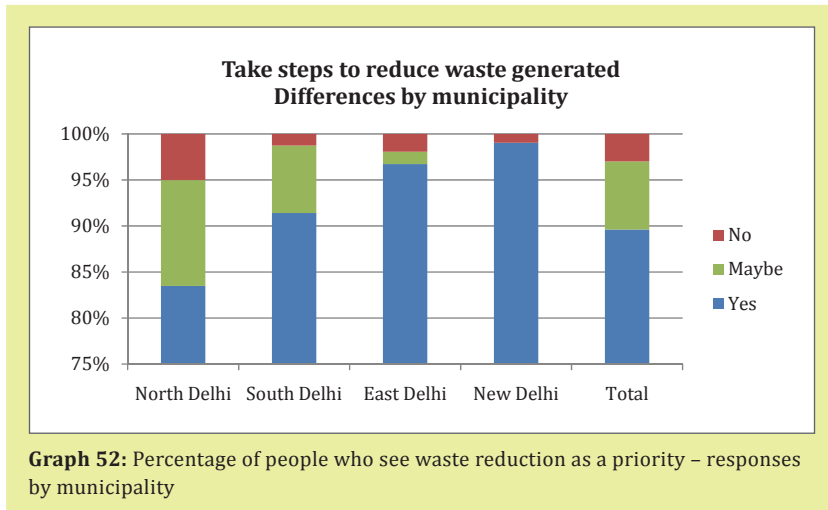
Western countries the mantra of *responsible consumption* is on the rise, in developing nations the concept is still highly contentious. The question of having to choose between freedom of consumption vs. future health arises. The nexus between consumption, economic development and environmental degradation is undeniable: the knowledge we now have on the disruptive environmental implications of 20th century's growth in the West ought to be an omen for India today.

### What are the research findings?

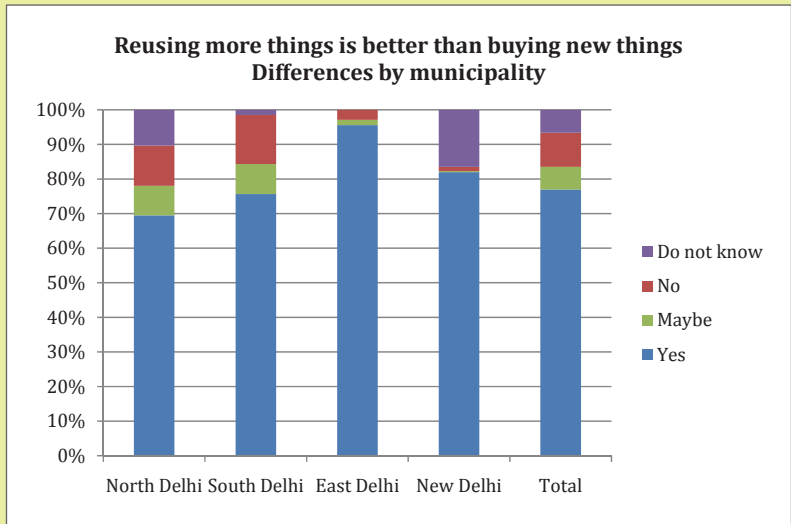
In the survey, 90% of respondents agreed that Delhi should urgently reduce the amount of waste it generates. The support for this statement varied from 84% in North Delhi Municipal Corporation to 91% (where an additional 12% responded 'maybe'), and 96% respectively in South and East Delhi Municipal Corporations. In New Delhi Municipal Council, 99% supported waste reduction. Over 90% of respondent from SEC categories A, B and C supported minimization, whereas in the bottom SEC category (D) no one expressed any opposition.

28 Chris Coggins, 'Waste Prevention — an Issue of Shared Responsibility for UK Producers and Consumers: Policy Options and Measurement', *Resources, Conservation and Recycling* 32, no. 3-4 (July 2001): 181-90, doi:10.1016/S0921-3449(01)00060-X.

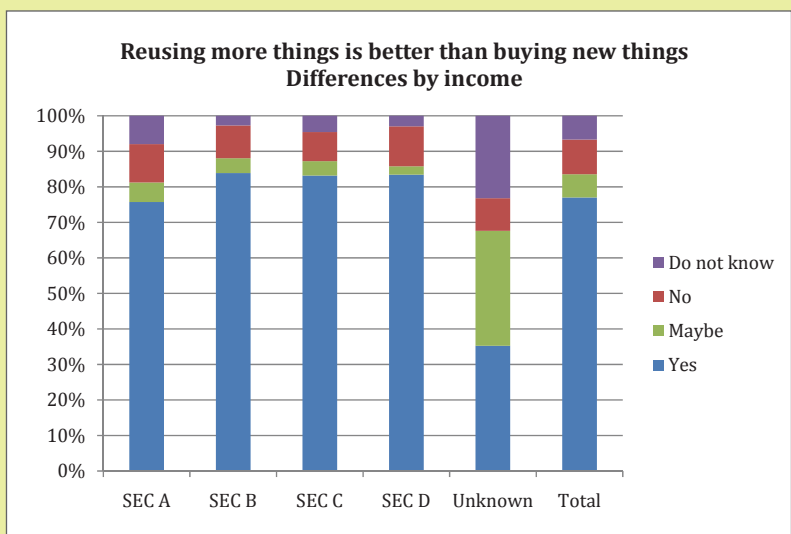
29 David Ferry, 'The Urban Quest for "Zero" Waste', *Wall Street Journal*, 12 September 2011, sec. Business, <http://online.wsj.com/news/articles/SB10001424053111904583204576542233226922972>.



Furthermore, over 70% (and over 95% in East Delhi Municipal Corporations) stated that reusing is better than buying, with minimal deviation across SEC categories.



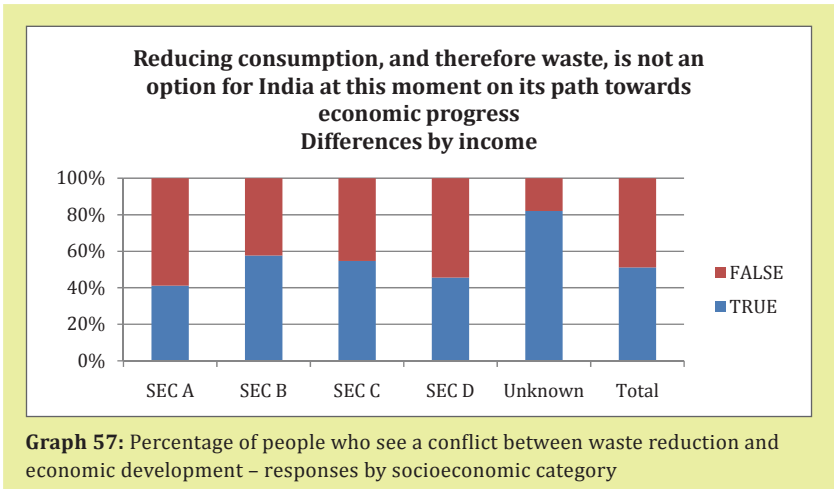
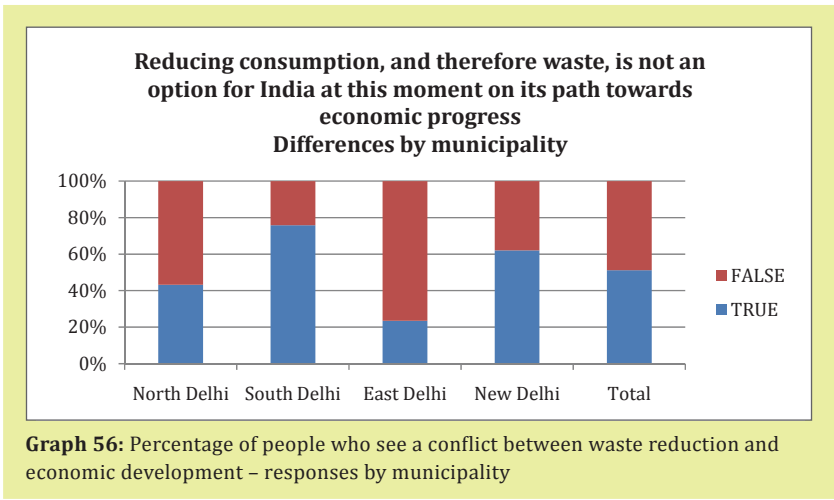
**Graph 54:** Percentage of people who think that reusing is better than buying new things – responses by municipality



**Graph 55:** Percentage of people who think that reusing is better than buying new things – responses by socioeconomic category

India's prerogative to thrive economically, regardless of high environmental costs, is a stance easily associated with India's right to develop economically, including in international environmental negotiations. Only about half of respondents however thought that at this moment of its economic development reducing consumption is 'not an option for India'. The issue is contentious and capable of splitting opinions across municipalities: South Delhi Municipal Corporation recorded the highest number of people in agreement with this predicament

(close to 80%), but in East Delhi Municipal Corporations just above 20% thought reducing consumption is not an option right now. Significantly, respondents from the top and the bottom SEC categories are up to 15% more likely to support reduction in consumption than the two middle categories: the diverse experience people have of India's recent development should be kept in mind when assessing the potential Delhi residents to create progressive alliances for reducing the waste the city generates.





Irrespective of their socio-economic category, wealth is not the only thing Delhiites care about: the desire for more comfortable lives is already clashing with ever-louder claims for safe and clean urban spaces where present and future generations can live. The mobilization around the construction of incinerators nearby residential areas is only one example (see chapter 2). The current waste emergency is also a glaring reminder that everyday goods have a cost for both society and the environment, and that such cost is rarely reflected in market prices. Consumer behaviours currently do not take broader costs into account, but they could in the future if adequately sensitized.

The burden of managing the waste implications of growing consumption does not fall exclusively on consumers: it is shared between producers (who produce and package goods), resellers (who pack them for customers, adding potential waste in the form of bags and wrapping), consumers (who buy them, carry/store them and dispose them off) and governments (which decide what limits apply to manufacturers' and consumers' freedom). Under certain conditions, consumers can use their power to strategically influence and change both production and consumption standards. Polythene bags (typically the plastic bags used to carry goods between shops and home), offer a compelling example of how consumption and waste are intimately linked, in the good and in the bad: though widely used virtually for every purchase made by a resident of a city like Delhi, carry bags are most often non-biodegradable and their disposal after a single use poses an unknown cost for society and the environment.

## Case study - Plastic bags

A 2013 report by the Central Pollution Control Board states that India generates 5.6 million tons of plastic waste annually, of which 40% is not collected or recycled.<sup>30</sup> At this rate of generation, 2.24 million tons of uncollected and unrecyclable plastics are added to our environment each year,<sup>31</sup> and plastic bags represent a large part of that pile. Plastic carrier bags are today a pressing concern for most administrations around the globe. The European Commission explains the issue in terms of a glaring market failure:

*The use of plastic carrier bags entails negative environmental externalities (littering, greenhouse gas emissions, contamination of air, soil and water, and impacts on ecosystems and human health) that are not reflected in the prices paid by the end users, which normally receive these bags for free. Customers are not encouraged to limit their use of plastic carrier bags precisely because they receive them for free or for a very low charge, while retailers are not encouraged to limit the hand-out of plastic bags because they are inexpensive to provide. Free distribution prevents consumers from being aware of the value of plastic carrier bags and the associated impacts and costs of their use, and creates the perception that they represent an unlimited resource.<sup>32</sup>*

The Australian government highlights how severely misplaced they are, if one were to think of them as the non-renewable resource they are: 'Plastic bags are produced from polymers derived from petroleum. The amount of petroleum used to make a plastic bag would drive a car about 11 metres'.<sup>33</sup>

30 Central Pollution Control Board, *Website Material on Plastic Waste Management* (New Delhi, June 2013), [http://www.cpcb.nic.in/divisionsofheadoffice/pcp/management\\_plasticwaste.pdf](http://www.cpcb.nic.in/divisionsofheadoffice/pcp/management_plasticwaste.pdf).

31 Bharati Chaturvedi and Aman Luthra, 'Still Profiting from Pollution: What the Plastic and Polymer Industry Is up to A Guide for Everyone', unpublished 2013.

32 European Commission, *Impact Assessment for a Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL Amending Directive 94/62/EC on Packaging and Packaging Waste to Reduce the Consumption of Lightweight Plastic Carrier Bags*, 2013, 17.

33 Department of the Environment Government of Australia Environment, 'Plastic Bags', Text, (23 June 2005), <http://www.environment.gov.au/node/21324>.

In light of these high hidden costs, many administrations have experimented with a range of measures to curtail their use and availability: Switzerland, China, South Africa, Kenya, Rwanda, Congo, Bangladesh, Washington DC and San Francisco in the United States and several states of Australia, have banned them completely; in Mexico and Hong Kong, their sale is compulsory, South Korea taxes them, and New Zealand, Japan, Sao Paulo state in Brazil have signed voluntary agreements with retailers to curtail their use.<sup>34</sup>

In Delhi, despite a High Court order in 2009, a notification in 2012 and the issuance of Plastic Waste (Management and Handling) Rules in July 2011 by the Ministry of Environment, Forests and Climate Change, the municipal authorities have yet to enforce the legal 'blanket ban' on plastic bags. The reasons for this failure include the lack of means to tackle centrally the scale of the problem in Delhi (unlike successful bans and requisitions by municipal authorities

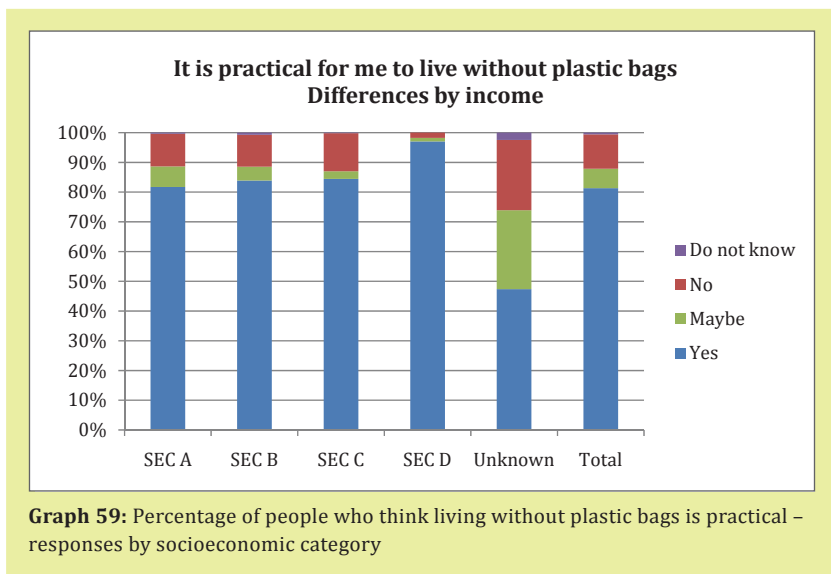
in Srinagar, for example), entrenched habits among shopkeepers and shoppers, and the direct impact a ban would have on the national plastic industry, a point of national pride for the industrial sector even in spite of the fact that other categories of bags would offer much higher margins to producers.<sup>35</sup>

If the administration, corporates and shopkeepers haven't enforced the ban, the potential contribution of Delhi's residents, the primary users of plastic bags, remains critically untapped. Both this survey and TERI's 2014 Environments Survey show that residents of the capital are overwhelmingly in favour of reducing the use of plastic bags in Delhi: respectively 81% of the respondents (and above 90% for worse-off residents) think their life would be practical without plastic bags; 97% of TERI's respondents are in favour of banning them altogether. 77% of our respondents also agree that reusing is always a better option, a very relevant attitude to this issue.



34 Kit Strange, *Plastic Bags: National Policies & Practices* (ARC+, 2011).

35 European Commission, *Impact Assessment for a Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL Amending Directive 94/62/EC on Packaging and Packaging Waste to Reduce the Consumption of Lightweight Plastic Carrier Bags.*



**Graph 59:** Percentage of people who think living without plastic bags is practical – responses by socioeconomic category

This data shows that consumers alone could contribute *drastically* to reduce the use of plastic bags. This requires organizing, sensitizing and offering practical alternatives that catalyze people’s willingness to tackle the problem. A fundamental step is to show the cost plastic bags impose on society and the environment, in line with international practices. These campaigns should be run at the neighbourhood level and in schools, with urban bodies and environmental groups at the forefront. Campaigns could easily focus on the advantages of refusing, reducing and reusing plastic bags: this research proves that Delhiites are ready for it.

### Measures that can be taken by the Government of NCT of Delhi

What was for long taken for granted by countries like the USA and Western Europe, the high capacity of the environment to absorb – safely and easily – higher levels of pollution and more waste generated by changing lifestyles, has turned out to be false. India, including for large urban centres like Delhi, still has comparatively lower rate of waste

generation per capita despite its sustained economic growth. Rather than preparing to deal with an inevitable environmental catastrophe, Delhi has a chance to act, particularly by targeting middle-income SEC categories. At current waste generation rates, the scope to control the impact of consumption on waste generation in Delhi is still very large.

Citizens have a comparatively larger role to play in reducing waste than urban local bodies as they become more powerful consumers and more aware citizens in a booming domestic market of goods and services. Environmental awareness among the general public is essential to orient consumption, and accordingly production, towards more ecological and sustainable models of urban life. A successful model of development for Delhi will necessarily rely on an alternative model of reduced consumption.

- **Regulate.** The Delhi government should coordinate its waste management approach with regulation of the industrial sector to reflect the economic and ecological

reality of Delhi as a space where goods are produced, imported, packaged, retailed, consumed and turned into waste in the same limited geographical and administrative area. Embracing the minimization of waste (according to the waste hierarchy) by both posing restrictions on producers and influencing consumer behaviours should be a first step. Focusing on those materials in the waste stream that pose particular problems for disposal such as non-recyclable packaging material could be a starting point.

- Public outreach on sustainable shopping. The experience of other countries proves that consumers have a large potential to influence market practices. In order to do so, however, they need to organize. The Delhi government should explore the incentives the city offers for consumers' association and NGOs to play an active role as facilitators. Environmental awareness at the scale required for a sensible consumers' mobilization in a city like Delhi can be achieved only through broad urban alliances and collaboration of local government's agencies with corporate and civil society actors. The city needs to send a strong message about the unprecedented scope Delhi residents have to control waste now specifically that they can consume more.

- Tame the plastic bag. The case of plastic bags applies to many other goods that are bought or distributed with little awareness about their real social and environmental costs. The Delhi administration should identify and regularly update its knowledge about the waste burden associated with everyday consumables. This will help mobilize the public, induce behaviour change in consumption and influence manufacturers too wherever the Extended Producer Responsibility approach is not enforced by law.
- Extended Producer Responsibility. Many toxic and sanitary wastes, such as batteries, used sanitary napkins, diapers, e-waste, CFLs, etc. should be brought into the ambit of EPR by the Delhi government in its own jurisdiction so that waste collectors and consumers are able to be safeguarded against the hazardous and other impacts of such wastes.



*Citizens have a comparatively larger role to play in reducing waste than urban local bodies as they become more powerful consumers and more aware citizens in a booming domestic market of goods and services.*

## Belief no. 5

# Waste cannot be managed within city limits - it is extremely messy and dirty

Across the country's 4378 municipalities, 10 to 50% of the municipal budget is allocated for solid waste management.<sup>36</sup> 60-70% of this share is spent on collection, 20-30% on transportation and less than 5% on final disposal.<sup>37</sup> Yet, up to a third of the waste generated is never collected, piling up in the streets, in front of residencies and markets.<sup>38</sup> The situation in Delhi is among the worse in the country, aggravated by the city's rapid growth and urbanization rates. In 2007, the Federation of Indian Chambers of Commerce and Industry (FICCI) reported that Delhi spends Rs. 431 per person on solid waste management, the highest per capita expenditure in India. Despite such high-levels of funding, the situation is still far from ideal. The possibility

of another approach to manage waste within the city boundaries must be considered.

### What are the research findings?

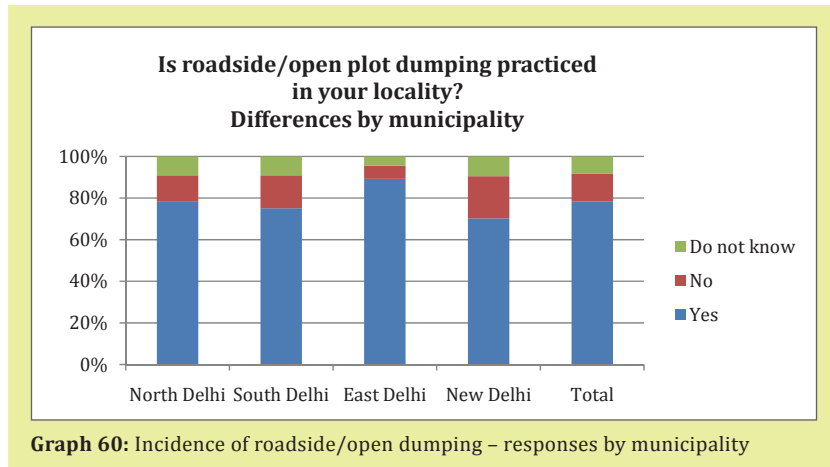
Delhi residents' daily experience with waste typically happens within their immediate neighbourhood, in front of their residences and around their markets. For example, 78% of respondents noted that roadside or open plot dumping of waste is common in their neighbourhood, with a peak of 90% in East Delhi. Along these lines, an Asian Development Bank specialist who was interviewed stated that *"we could [instead] have solid waste management at a regional level, instead of having 1-2 landfills for every town, we could have 4-5 big treatment, storage and disposal facilities spread across the state, travelling distance of vehicle will increase, but if segregated then volume can be reduced"*.<sup>39</sup>

36 Chintan, Environmental Research and Action Group, 'Waste Tales Fact Sheet', 2010.

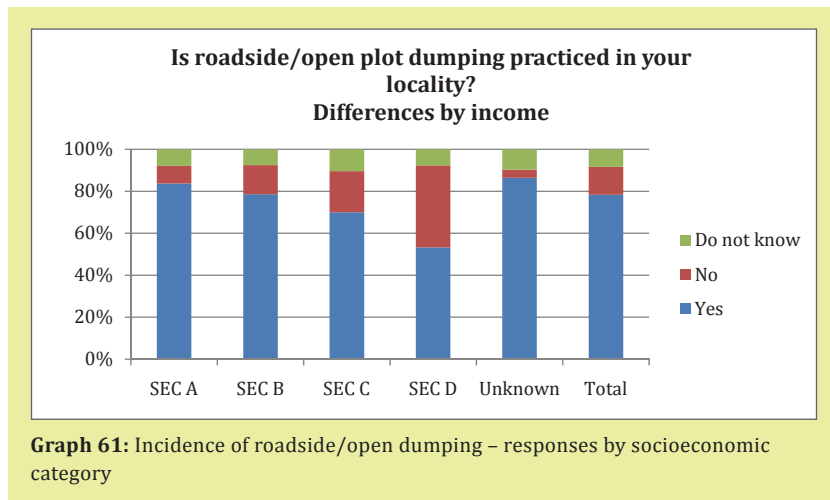
37 Toxics Links, 'Facts on Waste - Toxics Link - India Together', 2002, <http://indiatogether.org/environment/articles/wastefact.htm>.

38 Vikash Talyan, R. P. Dahiya, and T. R. Sreekrishnan, 'State of Municipal Solid Waste Management in Delhi, the Capital of India', *Waste Management* 28, no. 7 (2008): 1276-87, doi:10.1016/j.wasman.2007.05.017.

39 Interview with Pushkar Srivastava, Urban Specialist, Asian Development Bank, n.d.



**Graph 60:** Incidence of roadside/open dumping – responses by municipality

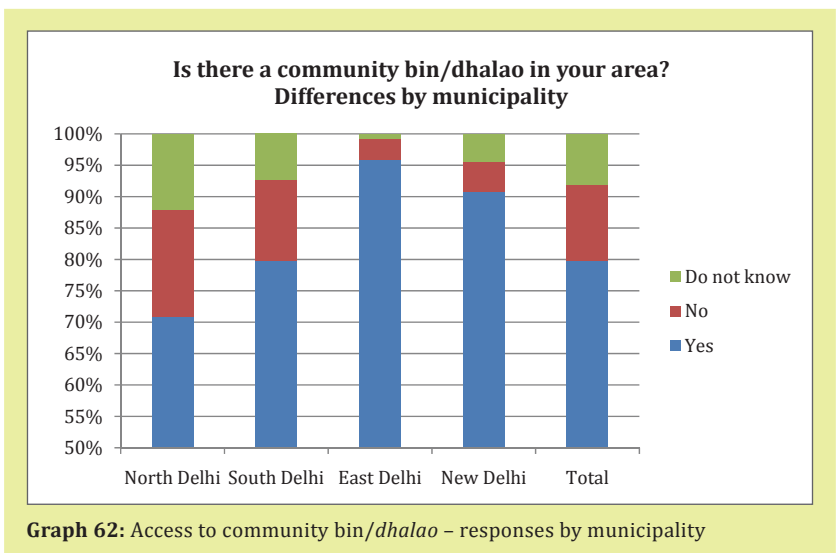


**Graph 61:** Incidence of roadside/open dumping – responses by socioeconomic category

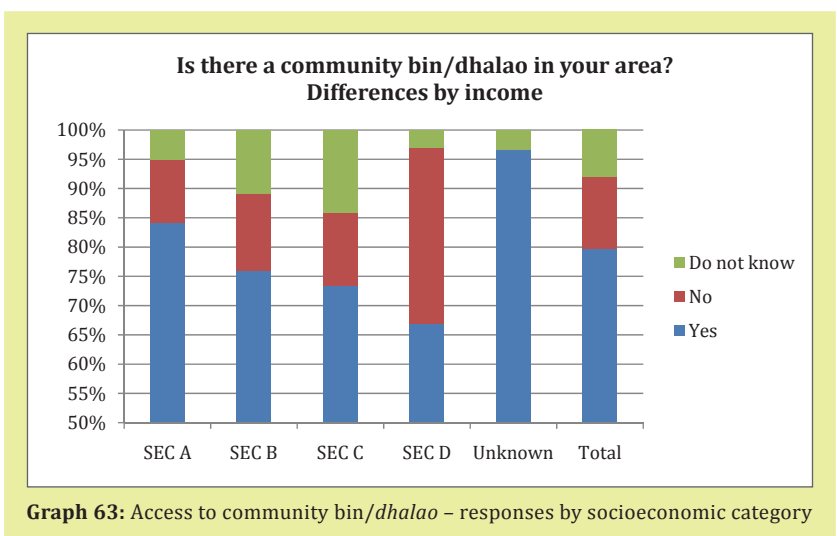
The survey highlighted important differences in people’s access to waste infrastructure, both across municipalities and socio-economic categories. A lot of work can still be done. Focus group discussions showed a range of perceptions on how waste can be handled at the neighbourhood-level – from upgrading *dhalao*s to decentralised composting.

80% of survey respondents said they had access to a community bin or a *dhalao*, a key feature of Delhi’s neighbourhoods, whose conditions is often associated with the

shortcomings of Delhi’s waste management system as a whole. Access to *dhalao*s was over 90% in East Municipal Corporation and New Delhi Municipal Council, but as many as 17% noted not having access to it in North Delhi Municipal Corporation. Across socio-economic categories, access decreases steadily from 84% to 67% from SEC category A (the better off among Delhi residents) to category D (the worse off), and residents falling under socio-economic category D were three times less likely to have access to a community bin than anybody else.



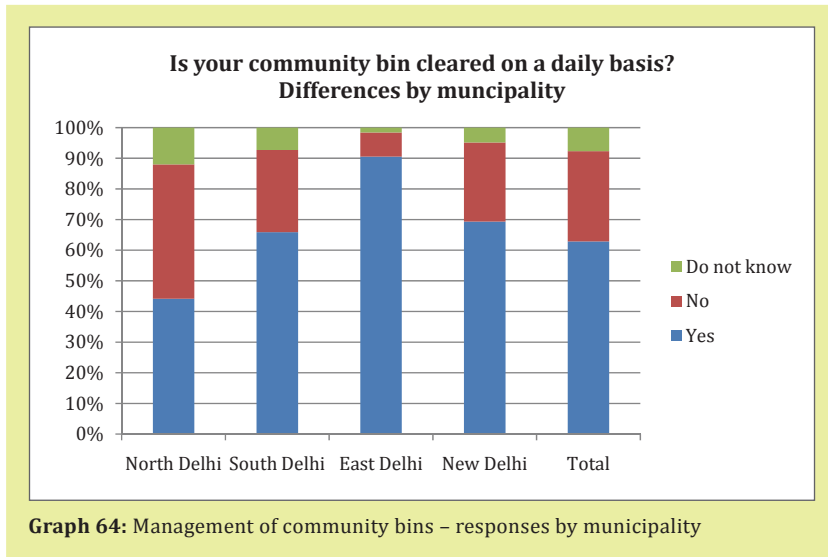
**Graph 62:** Access to community bin/dhalao – responses by municipality



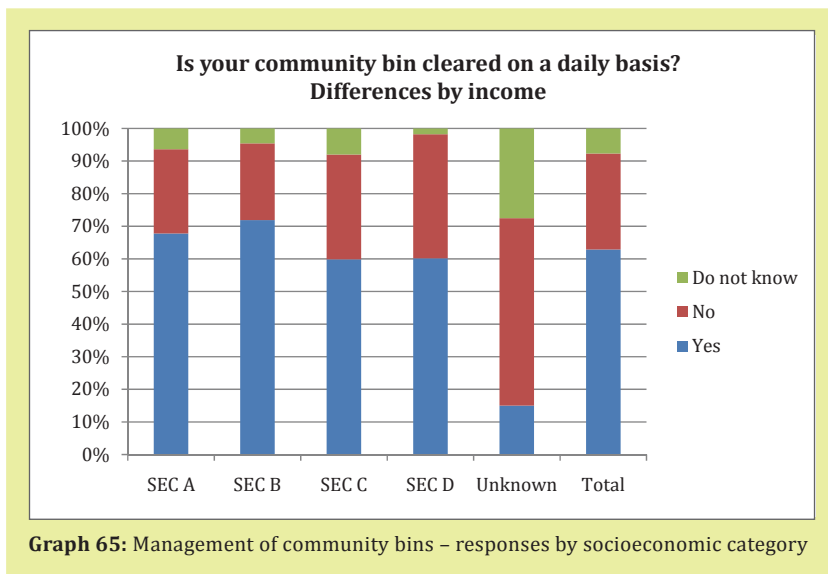
**Graph 63:** Access to community bin/dhalao – responses by socioeconomic category

Perceptions about the *state of dhalao*s confirm this fragmented picture: if more than half (63%) of residents say their neighbourhood *dhalao* is cleaned daily, this number goes up to 90% in East Delhi Municipal Corporation and down to 44% in North Delhi Municipal Corporation. Only 40% are *satisfied with their cleanliness* overall, but perceptions differ

again significantly by municipality, ranging from 79% in New Delhi Municipal Council to around 20% in North and East Delhi Municipal Corporations. These numbers reflect the diverse nature of waste management arrangements across the city, but also speak to residents' widespread frustration with present shortcomings.

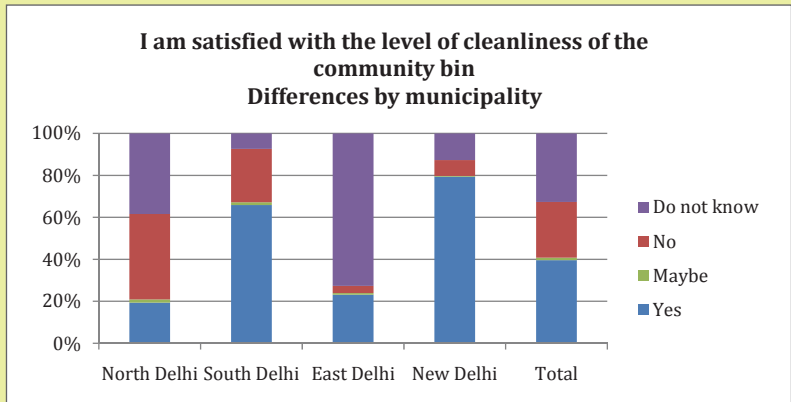


**Graph 64:** Management of community bins – responses by municipality

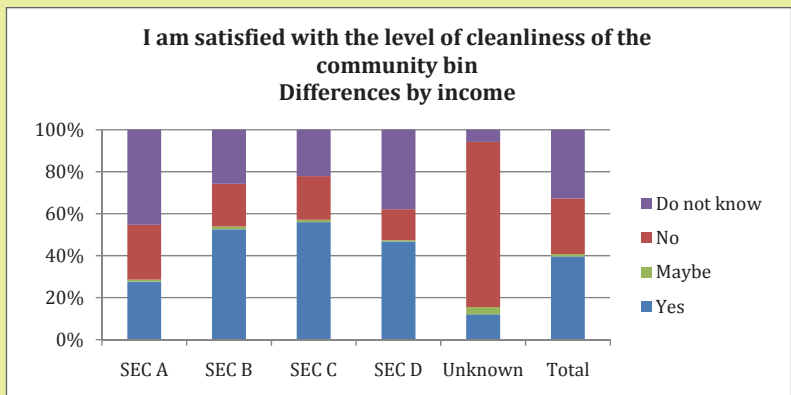


**Graph 65:** Management of community bins – responses by socioeconomic category





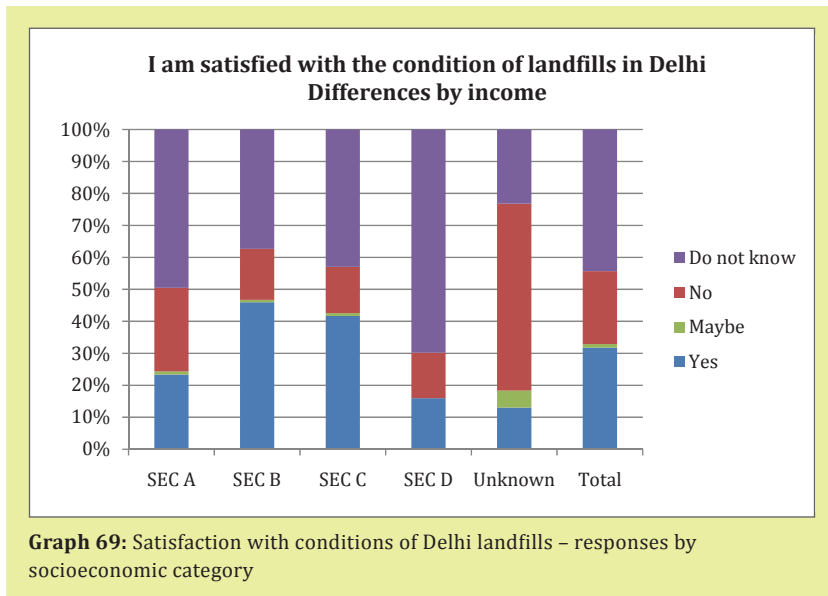
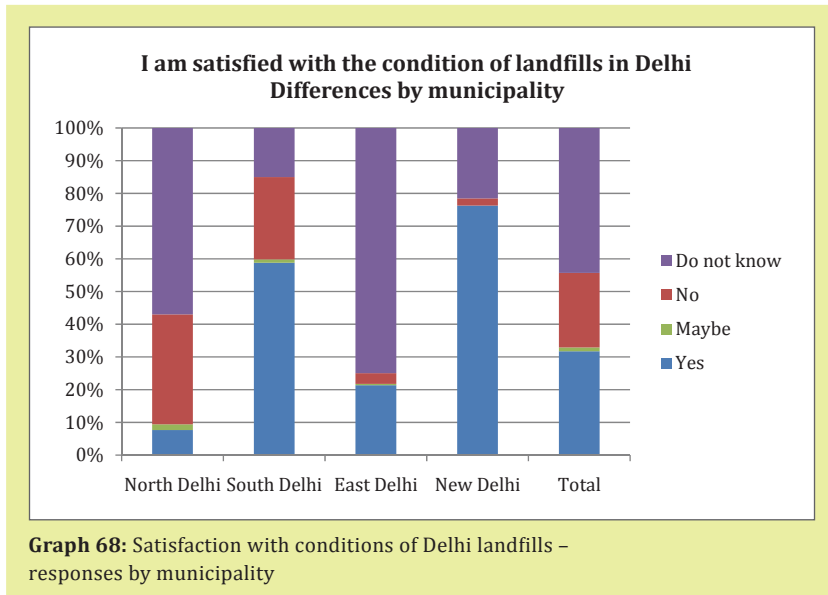
**Graph 66:** Satisfaction with cleanliness of community bins – responses by municipality



**Graph 67:** Satisfaction with cleanliness of community bins – responses by socioeconomic category

**The state of *dhalaos* is not only an indicator of people’s satisfaction with the cleanliness of their immediate surroundings, but the primary lens through which people relate to the place of waste (and its impact on communities) in the city.** When asked their satisfaction about the *state of Delhi’s landfills*, more than seven in every ten respondents

admitted not to know about it, with a peak of 80% in North Delhi and East Delhi Municipal Corporations. Hence it can be concluded that *dhalaos* matter to Delhi residents much more than landfills.



Focus group discussions and interviews also showed how these nearly ubiquitous infrastructures can be turned, not without challenges, into a resource for neighbourhoods. As a participant in one of

the discussions said: *“See the dhalao we have in Netaji Nagar, its walls have been covered with ceramic tiles. It also has 5 dustbins and we find it an extremely feasible provision for segregating waste because there are walls on*

three sides. The side of the *dhalao* which faces the road also has a wall so that the passer-bys are unable to see the waste.”<sup>40</sup>

*Dhalaos* can be relatively easily turned into material recovery facilities (MRF), a ward-level low-cost infrastructure where waste workers hired by the RWAs collect and segregate the waste after doorstep collection. Converting *dhalaos* into MRFs would ideally take waste away from the streets and divert it into the recycling chain, with potentially significant savings on transportation and secondary sorting at landfills for the administration. A focus group discussant pointed out that “in the city there should be certain points where you can visibly see that the material is getting recycled, that dry waste is getting recycled.”

There are many ways to turn *dhalaos* into MRFs to support a decentralized system: another participant argued that MRFs at *dhalaos* should be double storey, where you have wet waste on the ground floor and dry on the upper one. Segregation would take place on the upper floor. The segregation of the wet waste downstairs and segregated waste would be moved upstairs. This will allow more work in less space and will serve a twin purpose.”

Managing waste in a decentralized way emerged as an alternative to landfilling with wide support from focus group discussion participants and interviewees. A representative of plastic manufacturers declared in an interview that “our motto is zero waste to landfill, we want MSW be handled nearest to the place where it is generated. [...] If it is processed nearest to the place where it is generated, we save on transport costs. [...] trucks carrying waste are dirty, not covered, trash falls out, and they are smelly. Logistically, economically, aesthetically, it is not an acceptable situation.”<sup>41</sup>

Interactions with NGOs and residents however showed that important challenges remain, specifically with regard to financial sustainability, authorizations and the availability of land needed to set up neighbourhood waste processing stations. An NGO representative said for example: “When we tried to setup MRFs (Material Recovery Facilities) the RWAs have opposed us to not set it up there. They have told us to set it up somewhere else outside town. [...] We had to show them [how it worked], only then it happened. As per storage, that is an important issue. [...] initially there were a lot of problems because when we started separating green waste [...] they said it will leave a stench here, but it was not so.”

## Case study - Advanced Locality Management in Mumbai

Mumbai has led the way in the decentralization of municipal services in India since the mid-1990s, and its award-winning ‘Advanced Locality Management’ (ALM) scheme offers important lessons on decentralized waste management specifically. The ALM scheme has residents’ groups create street-level committees for planning, implementing and monitoring local services. In exchange, residents gain direct access (on waste and all other civic services) to the Municipal Corporation of Greater Mumbai (MCGM), through a dedicated officer in each ward.

ALM’s decentralized approach has households from each ALM segregate wet and dry waste at the household level, and local waste pickers collect it at their doorstep. Waste workers immediately compost wet waste in dedicated neighbourhood pits and sort dry

40 Chintan, Environmental Research and Action Group, ‘Focus Group Discussion on Waste Storage, Segregation and Recycling’. 2014

41 Chintan, Environmental Research and Action Group, Interview with Ravi Agarwal, President, All India Plastic Industries Association, 2014.

waste equally on the spot. The compost and recyclable material is sold by waste workers, who integrate their income with collection fees paid by residents, making the scheme financially sustainable. NGOs are also involved: they support waste pickers to organize, train them in composting and instruct them about safety standards. The MCGM, picks up the minimal quantity of leftover dry waste for further processing and final disposal.

Typically, residents give up a dedicated area of the communal garden to allow both the composting and the sorting. Recently, this diffuse waste infrastructure has also proved an asset to handle large amounts of waste during specific times of the year, like for the 'nirmalya' (fruit and flower puja waste) during the Ganpati festival, reducing drastically the transportation costs incurred by the MCGM through a collaboration with local NGOs, residents and waste pickers.<sup>42</sup>

A 2005 study calculated that the cost of waste management through ALMs in Mumbai is 15% lower through PPPs, and over 20% lower than if MCGMs did it alone.<sup>43</sup> Today, there are 658 ALMs in all 24 wards of Mumbai.<sup>44</sup> Central to ALMs (originally collaboration between the Government of India, the Municipal Corporation of Greater Mumbai and the United Nations Centre for Human Settlements) is the principle of mutual benefit and collaboration between a numbers of key actors: residents, the municipality, NGOs and waste collectors.

The example of Mumbai shows that 'waste management is not merely a service delivered by urban authorities but a cooperative

undertaking that requires the coordination of informal behaviours and conventional management approaches'.<sup>45</sup> The fact that Mumbai, despite its severe space crunch, can do this should inspire Delhi.

## Measures that can be taken by the Government of NCT of Delhi

India should be shifting from a model of waste management focused on collection, transportation and disposal, to one built around minimization, recycling and scientific treatment of waste. Decentralization is a promising option for a large and diverse city like Delhi as the city explores more effective and efficient solutions. Integrating collection, sorting, recycling and processing certain fractions of waste at the neighbourhood level could considerably reduce the city's expenditure on waste management, reduce drastically the volume of waste needing final disposal and stimulate awareness among Delhiites about their shared ownership of waste across the city, and waste's value. Developing neighbourhood infrastructure through upgraded *dhalaos* (built according to given standards) could also prove instrumental to addressing the unequal access to basic waste infrastructure across municipalities but even more so across socio-economic categories as this study found.

This shift requires policy change, broad alliances, innovative thinking on diffuse waste infrastructure, composite solutions for financial sustainability and, ultimately, a new partnership between RWAs and informal waste professionals.

42 The Times of India, 'ALM, NGO Make the Best of "worship" Waste', *The Times of India*, 9 September 2014, <http://timesofindia.indiatimes.com/city/mumbai/ALM-NGO-make-the-best-of-worship-waste/articleshow/42119648.cms>.

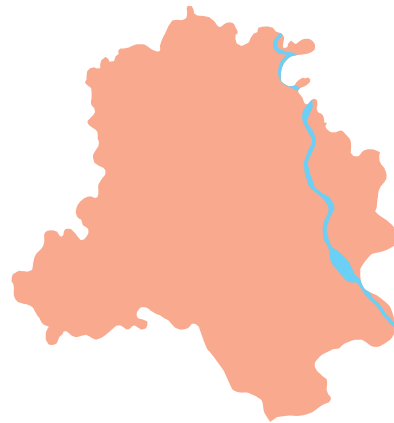
43 Sarika Rathi, 'Alternative Approaches for Better Municipal Solid Waste Management in Mumbai, India', *Waste Management* 26, no. 10 (2006): 1192-1200, doi:10.1016/j.wasman.2005.09.006.

44 Municipal Corporation of Greater Mumbai, 'Advanced Locality Management (ALM)', *The Municipal Corporation of Greater Mumbai*, 18 September 2014, <http://portal.mcg.gov.in/irj/portal/anonymous/qlvarprg#alm>.

45 Christian Zurbrugg, 'Urban Solid Waste Management in Low-Income Countries of Asia. How to Cope with the Garbage Crisis', November 2002, [http://www.eawag.ch/forschung/sandec/publikationen/swm/dl/Zurbruegg\\_2003\\_Crisis.pdf](http://www.eawag.ch/forschung/sandec/publikationen/swm/dl/Zurbruegg_2003_Crisis.pdf).

The Delhi government needs to:

- Explore micro-infrastructure. Delhi surely has options for low-cost, neighbourhood level infrastructure. Incentivizing an open competition for ideas among Delhi residents will provide innovative solutions and increase public support for such endeavours.
  - Fund pilots. To build confidence, it is important to test feasibility of several pilots, and to learn from the pilots to spread the model geographically.
  - Create Material Recovery Facilities (MRFs). Create policies that facilitate the creation of MRFs in neighbourhood spaces, including but not limited to the reconversion of *dhalaos*, and define waste pickers' groups and RWAs' powers and responsibilities to administer them.
  - Implement new forms of integrated waste management. Facilitate the contracting of organized local wastepicker to carry out waste processing from the household level to the neighbourhood MRF, and integrate it with the city collection system.
- Incentivize citizens. Create incentives for residents to organize at the neighbourhood level, such as charging them a lower property tax, buying back the compost they produce and provide grants under existing schemes to upgrade shared neighbourhood spaces. Appropriate monitoring mechanisms need to be in place to prevent misuse of the incentives.
  - Be flexible. Slums may not have the available space to set up material recovery facilities. Identifying synergies between neighboring areas should be a priority.
  - Develop MRF standards. Standards for local MRFs should be developed and managers from the informal sector be trained to run them in a professional and accountable way once they are set up.



*India should be shifting from a model of waste management focused on collection, transportation and disposal, to one built around minimization, recycling and scientific treatment of waste.*

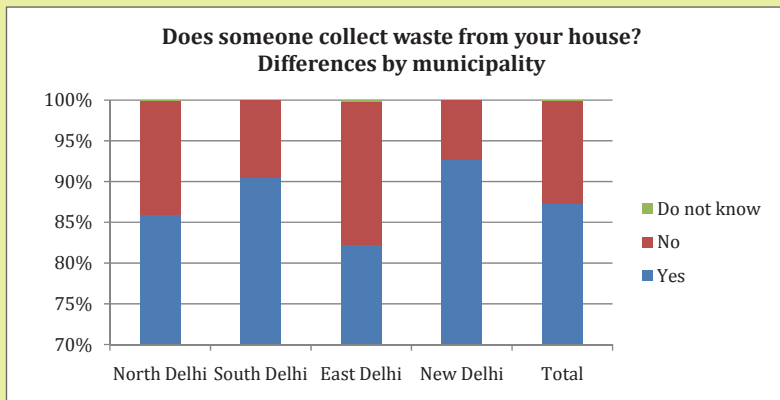
## Belief no. 6

# 100% Doorstep collection is a distant possibility for Delhi

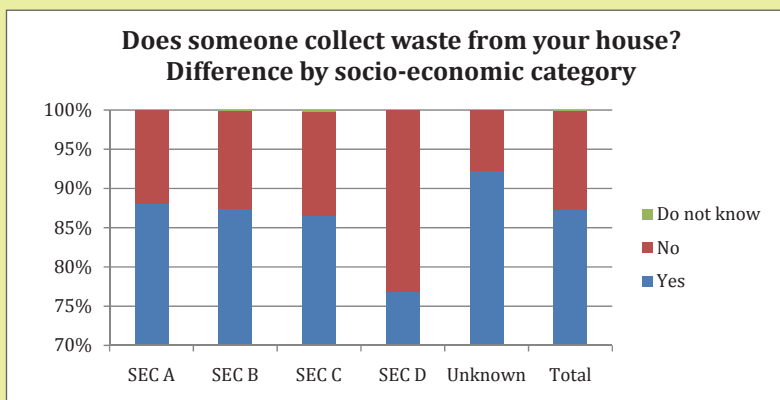
If the handling of municipal solid waste starts at the household level, waste management starts with doorstep collection. Doorstep collection has shown itself as the most effective way to limit the quantity of trash dispersed in and around neighbourhoods. It keeps trash away from stray animals and from drains. It is above all an extremely convenient service for residents, and the most effective way to mainstream compliance with segregation at source in cities that make it compulsory. Fast urbanization and population growth in the capital however suggest that reaching 100% of households in Delhi might remain an uphill task. Is this really the case, and how far is Delhi from the 100% mark?

### What are the research findings?

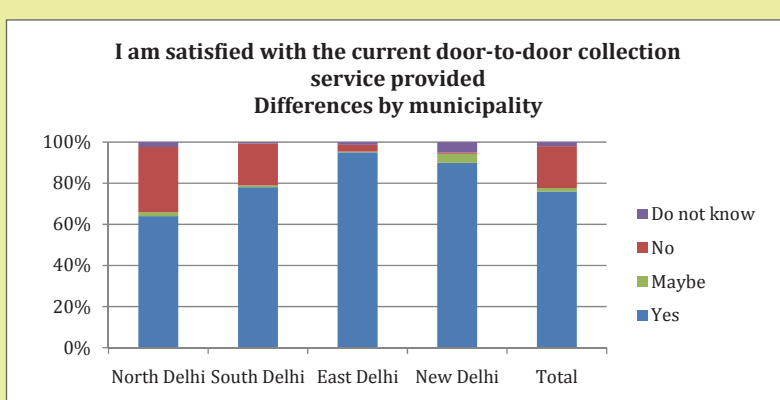
The survey shows that the situation in the capital is less critical than what is the popular belief. 87% of the sample declared that *someone already collects their waste* from their house, with minimal deviation across municipalities and with only the lowest socio-economic category (D) being 10% less likely than everybody else to benefit from doorstep collection. 76% declared also to be *satisfied with the service* available, with just 10% of respondents (from socio-economic category A) showing to be less satisfied than everybody else.



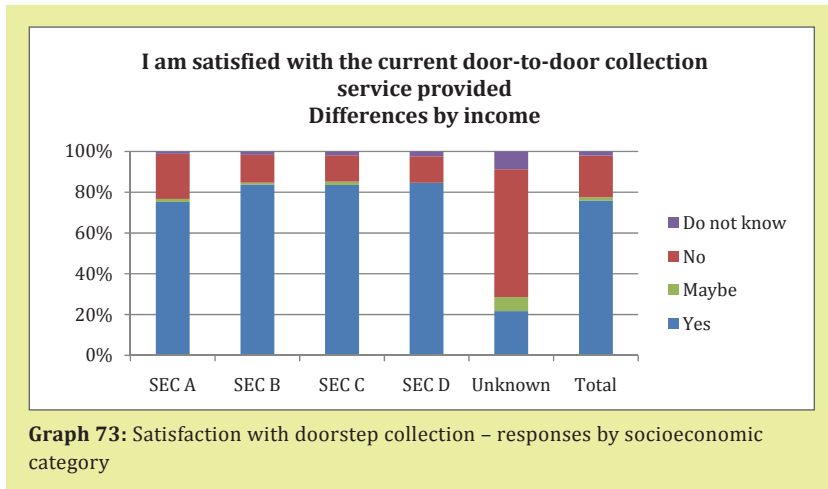
**Graph 70:** Incidence of doorstep collection – responses by municipality



**Graph 71:** Incidence of doorstep collection – responses by socioeconomic category

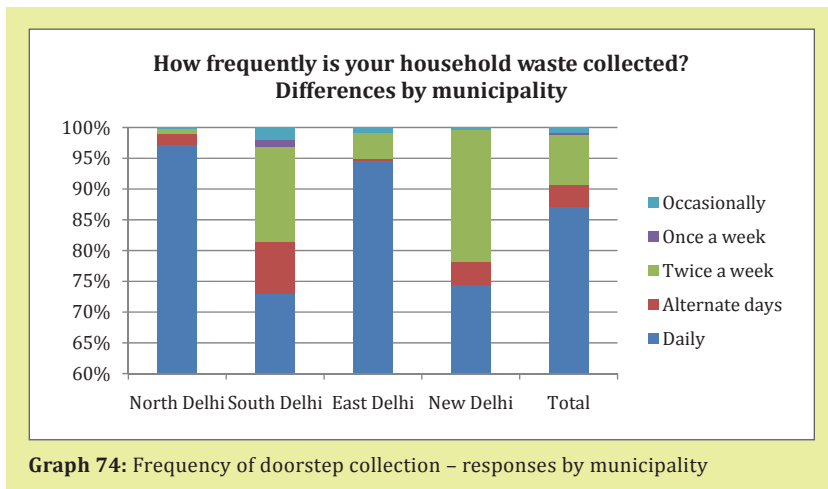


**Graph 72:** Satisfaction with doorstep collection – responses by municipality

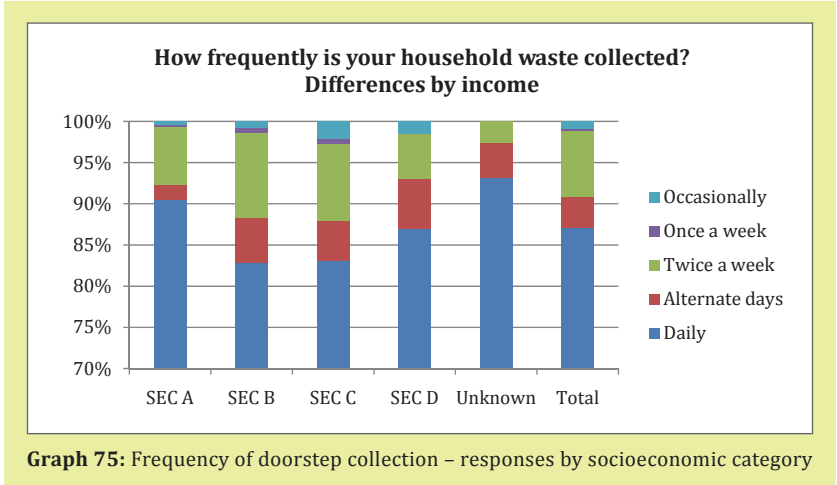


Doorstep collection also appeared to be reasonably timely. For virtually every household (99%), waste is collected *at least twice weekly*. Waste is instead collected *daily* in North and East Delhi Municipal Corporations for over 94% of households, and for over 73% of households in New Delhi Municipal Council and South Delhi Municipal Corporation – and

for 87% households on average across the city. North Delhi and South Delhi Municipal Corporations registered a peak of households with access to doorstep collection services only twice a week, 15% and 22% respectively. No significant deviation was recorded across socio-economic categories.



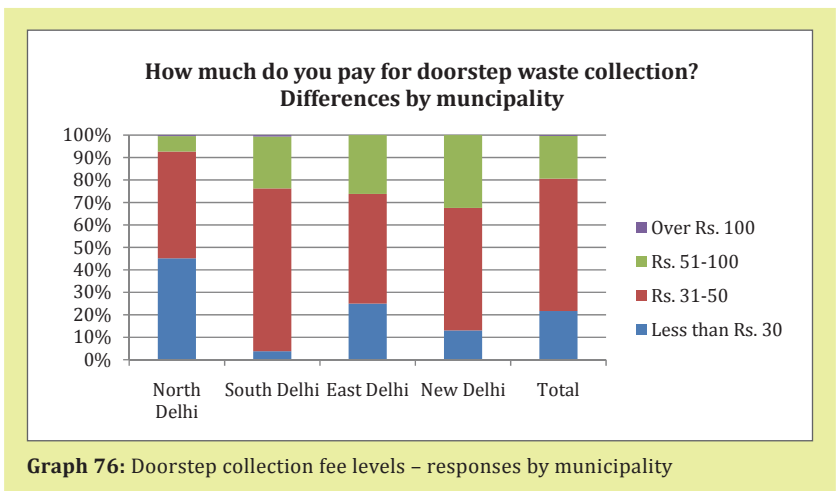




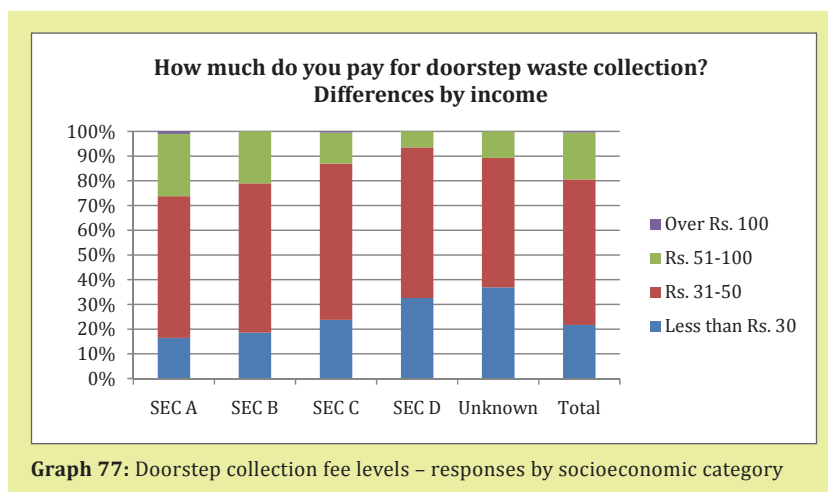
**Graph 75:** Frequency of doorstep collection – responses by socioeconomic category

The money Delhi residents pay out-of-pocket for doorstep collection varies across municipality. Two thirds of respondents (with no variation across socio-economic

categories) pay between 31 and 50 rupees per month for doorstep collection, but about half of respondents from North Delhi Municipal Corporation pay less.



**Graph 76:** Doorstep collection fee levels – responses by municipality



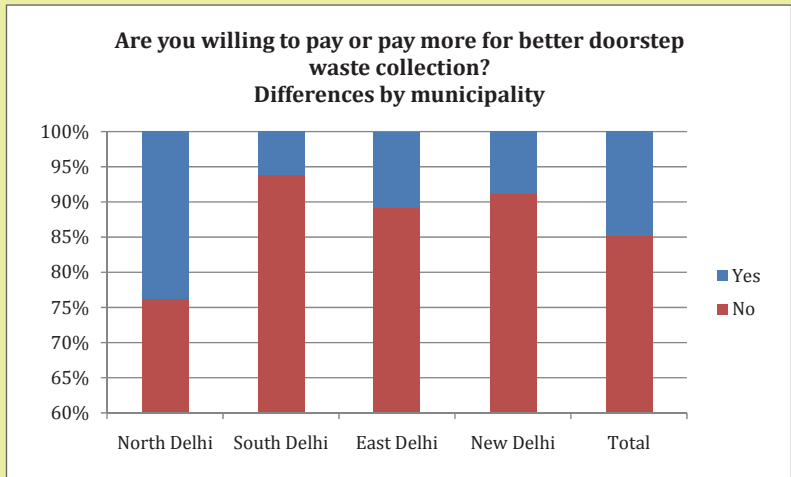
Graph 77: Doorstep collection fee levels – responses by socioeconomic category

North Delhi is an outlier with regard to residents' willingness to *pay more for a better doorstep service*, with almost a quarter of residents from this area willing to pay more to improve the service, of which more than half are willing to spend Rs. 31-50 and 10% up to Rs. 51-100. A significantly high number of respondents (two thirds, which is 30% to 50% more than in other areas) also declared to be willing to pay to start a doorstep collection service wherever one is not available. This figure is possibly linked to the fact that North Delhi Municipal Corporation has the highest

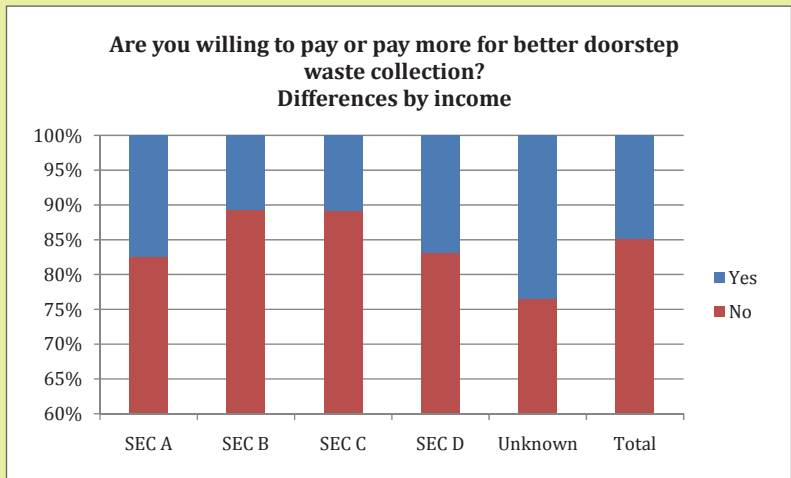
number of residents, representing 13% of the total sample, who say they have no access to a *dhalao* (17% within the municipality) or no knowledge of one in their immediate neighbourhood (12% within the municipality). (See graphs in chapter 6)

In line with these figures, a focus group discussion participant argued that “[there are] no problems at a citizen level. Every citizen wants service and wants to pay for them. Every house gives 50-60 rupees. From my house when they take garbage, she used to take 50 rupees but now it is 70 rupees, 50 is nothing”<sup>46</sup>

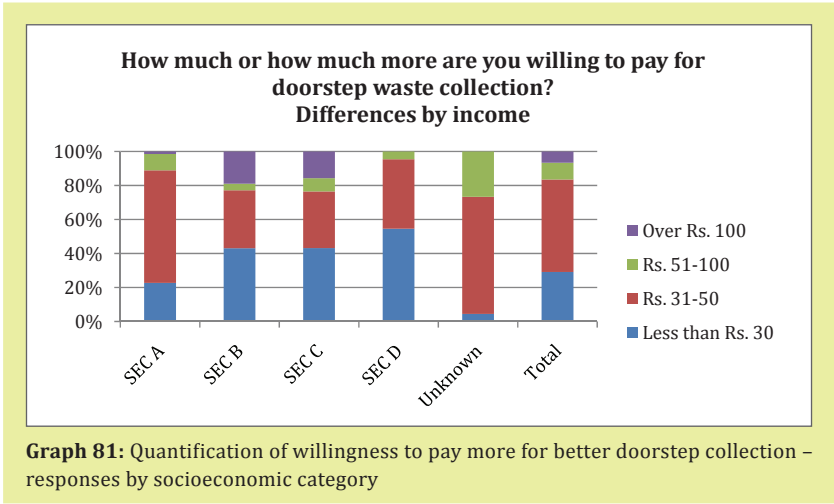
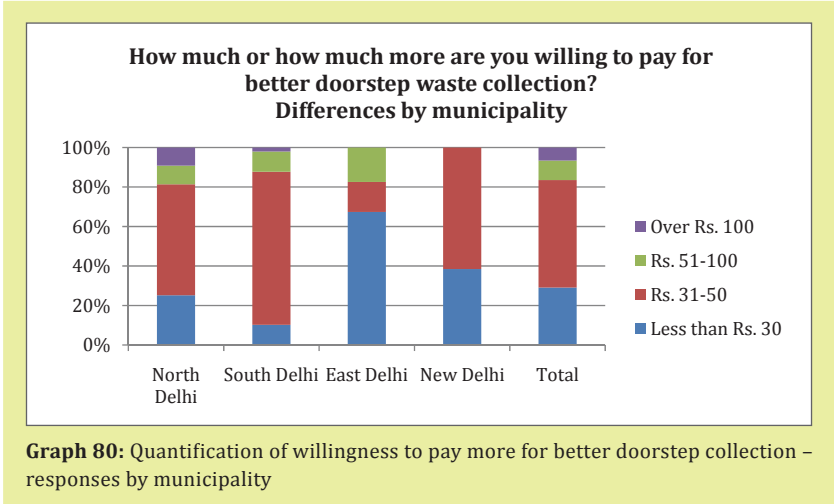
46 Chintan, Environmental Research and Action Group, ‘Focus Group Discussion on Waste Collection and Transportation’. 2014

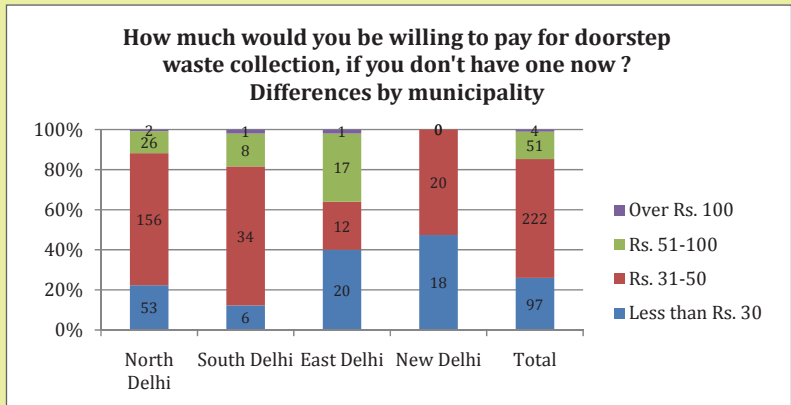


**Graph 78:** Willingness to pay more for better doorstep collection – responses by municipality

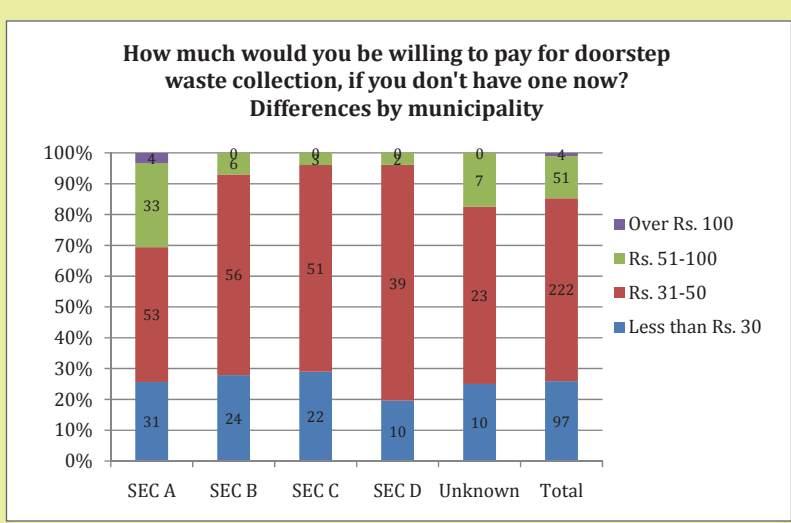


**Graph 79:** Willingness to pay more for better doorstep collection – responses by socioeconomic category





**Graph 82:** Quantification of willingness to pay for introducing doorstep collection – responses by municipality



**Graph 83:** Quantification of willingness to pay for introducing doorstep collection – responses by socioeconomic categories

90% or more of New Delhi Municipal Council and East and South Delhi Municipal Corporation, however, are not willing to *pay more* for neighbourhood waste services – a fact that reflects varying satisfaction levels but possibly also indicates little faith in existing systems, the availability of services for free (for example for government employees)

or lack of knowledge about the outlook of alternative systems.

Respondents agree overwhelmingly on the need to strengthen existing systems on a priority basis, by providing timely, regular and professional collection and removal of waste (92%, across socio-economic categories), and sharing information about

waste collection timings and other information (96%). Significantly, including waste pickers in the collection and segregation of waste is a priority for as many as 88% respondents. (Go to chapter 5 and 11 for relevant graphs)

## Case study - NGO facilitation, the experience of Chintan in Delhi

Cities across the country are working towards the goal of 100% doorstep collection in authorized colonies by reorganizing and streamlining the collection system as an integral part of an inclusive waste management strategy. This approach would ideally combine state-of-the-art disposal technology with the efficiency of the city's informal sector. Chintan's own direct experience of doorstep collection in Delhi suggests that the capital should be doing the same: include different actors for different phases of waste management, and the informal sector specifically for doorstep collection, recycling and sorting.

Through its partnership with SafaiSena, an association of over 12,000 among waste pickers and small waste traders and recyclers, Chintan has provided doorstep collection to close to 30,000 households and several bulk producers, across New Delhi Municipal Council, East and South Delhi Municipal Corporation. Each location, however, has offered different challenges. In all cases, the collaboration of different actors (local authorities, Chintan and waste collectors) translated into a very strong asset for the neighborhoods. This is however not the case across all of Delhi.

Starting in 2005, when the North Delhi Municipal Corporation decided to tender waste collection, it progressively excluded independent waste pickers from local doorstep collection (serving as many as 110 households daily, per worker). A private company took their place, moving through neighbourhoods

with small vans that alert residents of their presence with a ringtone. However, the size of the collection van, despite being the smallest in the market, does not allow the private contractor to enter narrow alleys in the most congested neighbourhood. According to the contractor, since manual doorstep collection was discontinued, residents living on upper floors have started throwing bags of waste directly towards the vans from balconies (rather than disposing them in communal bins on the street), worsening significantly the cleanliness of the neighbourhood. Along with the interruption of doorstep collection, the payments of private contractors based on volume of waste collected and transported brought to a stop segregation and recycling. To tackle both problems (the disposal of recyclable material in landfills is in potential violation with the Municipal Solid Waste (Management) rules, 2000), the private contractor and Chintan are now exploring the opportunity of to resume doorstep collection (along with the on-the-spot sorting and recycling of dry waste) by the waste pickers who were originally displaced.

In East Delhi, instead, private sweepers (who typically clean stairs, toilets, etc.) have started offering waste collection and disposal services. They are the ones to contact, manage and pay personally informal waste collectors working in the neighbourhood for their services. Different approaches among cleaners however cause regular clashes, disrupting the collection. By engaging with cleaners, councilors and waste collectors, Chintan supported the formalization of this relationship while keeping unchanged the central role of the cleaner in each household: it monitors the quality and reliability of the service, provides uniforms and IDs, and enforces uniform pay of waste collectors across households. Waste collectors segregate and recycle dry waste, and deliver wet waste to the municipality.

Finally, in Kotla Mubarakpur, a congested urban village in South Delhi Municipal Corporation with a lively market, Chintan facilitated the introduction of doorstep collection by linking an independent waste collector and the neighbourhood representative. Having developed a personal relationship with residents and the neighbourhood association, the waste collector (who wears a uniform and ID) is now a welcome presence for residents who benefit from doorstep collection, and cleaner alleys, for the first time in decades.

These are three examples of 'last mile' efforts to bring (or resume) effective and reliable doorstep collection across Delhi, where the collaboration of diverse actors has been critical and strategic. In all three cases, informal workers (organized with the support of Chintan) proved to have a comparatively superior capacity to handle doorstep collection as the first step of effective waste management, both in terms of efficiency, integration of collection with segregation and recycling, and reach across neighbourhoods of all types and incomes. In each of these cases, however, management costs are hard to recover, and are often co-funded from external sources. Good collection systems require handling data, helplines to remedy complaints and suggestions, an accounting system, excellent supervision and steady management. These costs should be ideally paid through a combination of service fees and financial support from the relevant municipality.

## Measures that can be taken by the Government of NCT of Delhi

In light of the findings of this study, 100% doorstep collection is not necessarily an illusion for a megacity like Delhi, even though bridging the 'last mile' might prove the biggest challenge. It will also go a long way in making the city look visibly cleaner.

The Delhi government can:

- Decentralize doorstep collection as the research supports this mechanism to be more effective, than an integrated and centralized solid waste management system. Instead, doorstep collection must be farmed out to smaller actors, ideally waste pickers' organizations. Management costs must be covered in order to guarantee quality service delivery, adequate supervision and accountability.
- Wastepickers for doorstep collection. Identify and recognize waste collectors' potential to organize and manage doorstep collection, guaranteeing them access to solid waste, space for segregation, access to health security, etc. in exchange for adequate, measurable doorstep collection services.
- Identify ways to integrate collection by organized waste workers with transportation of wet waste and unrecyclable solid waste by private contractors.
- Universalize doorstep collection. Extend the service to areas where it is not available, leveraging households' willingness to pay for this basic service and bridging the financial gap;
- Define subsidies. These must cover all areas, including slums where waste collection from recycling is not rentable for lack of large quantities of solid waste, by introducing whenever necessary subsidies and agreements with waste pickers' organizations.

## Belief no. 7

# The integration of the informal sector in the waste collection system is not desirable

As part of its 2021 vision, the Delhi Master plan includes the informal sector in the category of small and medium enterprises (SMEs), but there are a few challenges before this objective is achieved. The conditions under which informal (waste and recycling) sector professionals work and live do not comply with the status of Delhi being a world class city. The question then arises about upgrading the entire sector before moving towards the beautification of the city.

Delhi residents have well-defined but contradictory views about the place of the informal waste sector in the city: they recognize that waste pickers and recyclers have been providing an essential service to the city for a very long time, some at a high cost to their own health and quality of life, but they also know that these workers occupy a marginal role in society and urgently need organizing and new ways of operating – for everybody’s benefit. There search shows that upgrading and formalizing the informal waste sector, rather than dismantling it, is the solution the majority of Delhiites are keen to see implemented as

Delhi aspires to become a world-class city.

### What are the research findings?

The interviews and focus group discussions hosted unveiled complex views on the informal sector and its contribution towards waste management. The notion that informal waste workers operate illegally, that they are responsible for anti-social behaviours and exploiting minors is commonplace common belief. A representative from a large corporate declared for example that *“in the informal sector, minors are involved, full wages are not being paid, labour laws are not being followed, it comes in the way of our waste management, no company will want to get into that.”*<sup>47</sup>

However, others were in support of the informal sector, they argued that informal waste workers are the *‘backbone of the [SWM] system [that] we don’t talk about’*<sup>48</sup>, an underworld that deserves public recognition, basic economic and social benefits, and institutional support. A plastic manufacturer underlined the need for broad attitudinal change, including inside city institutions: *“The police should treat the kabariwalas with respect; they should not abuse the kabariwalas as they are doing an important work”* An

47 Interview with Neelima Khetan, GM, CSR, Coca Cola, 2014.

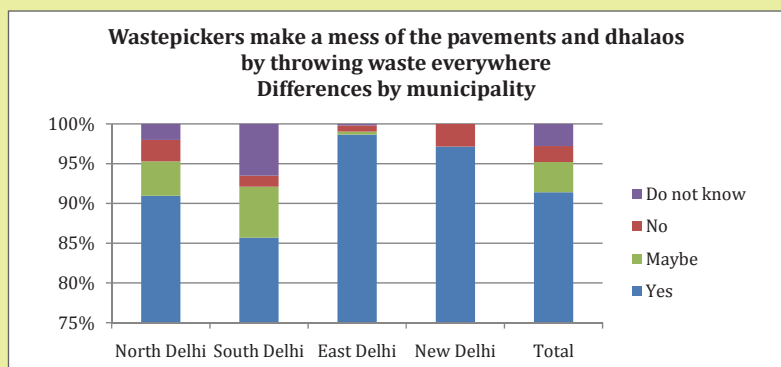
48 Chintan, Environmental Research and Action Group, ‘Focus Group Discussion on Waste Collection and Transportation’, 2014.



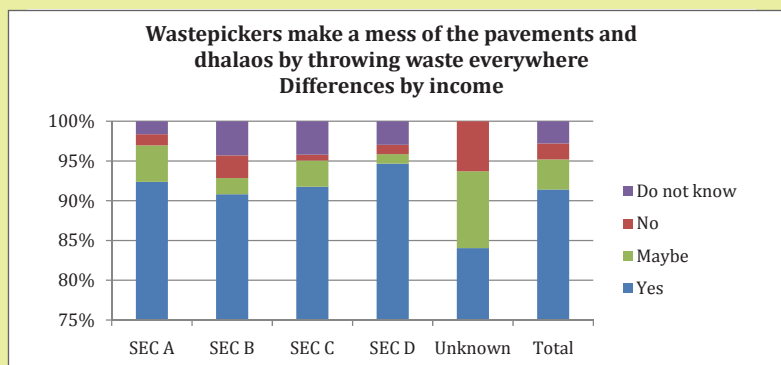
RWA member made it a point to describe her neighbourhood’s reliance on waste collectors: *“in CR Park we have a very strong RWA. In our area, we have appointed [...] under the RWAs payroll [...] four garbage collectors who come every day. They ring the bell [...] we take the garbage out and they take it and segregate it, you know the plastic from the glass and the wet waste and everything. And the wet waste goes to the garbage dump. The plastic and whatever they can sell off goes with them. [...] I think it is a very good system so far. I don’t feel that the municipality should touch that.”*

The survey confirmed these trends. 91.4% of respondents (and over 97% of respondents

in East Delhi Municipal Corporation and New Delhi Municipal Council) believe that waste pickers make a mess of the pavements and dhalaos by throwing waste everywhere. Across all socioeconomic categories, 84% of respondents thought that waste pickers and kabariwalas are thieves, with the only exception of the lowest category (cat. D) whose respondents were 7% less likely to associate waste professions with criminal activities. The opinion of a focus group discussant that *“it is very difficult to handle waste pickers sometimes, they drink a lot and create nuisance in the colonies”*<sup>49</sup> is an entrenched prejudice.

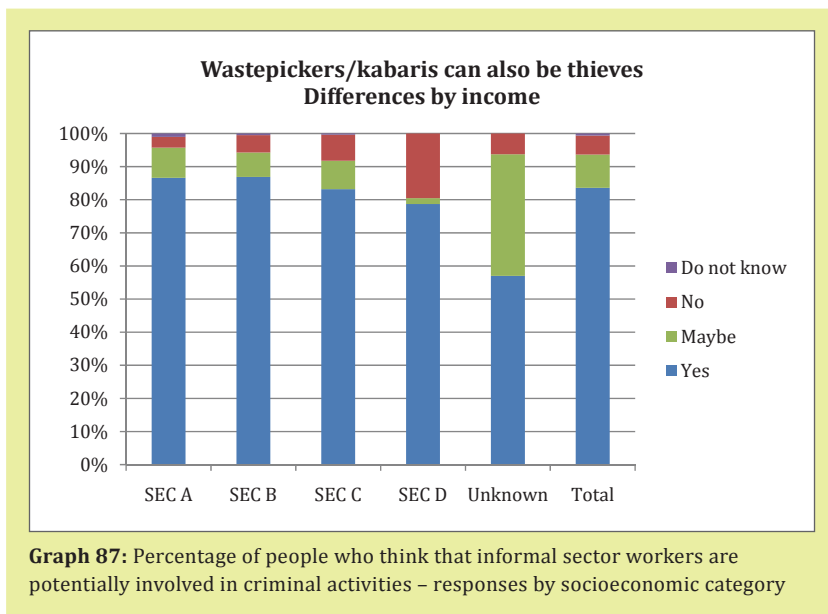
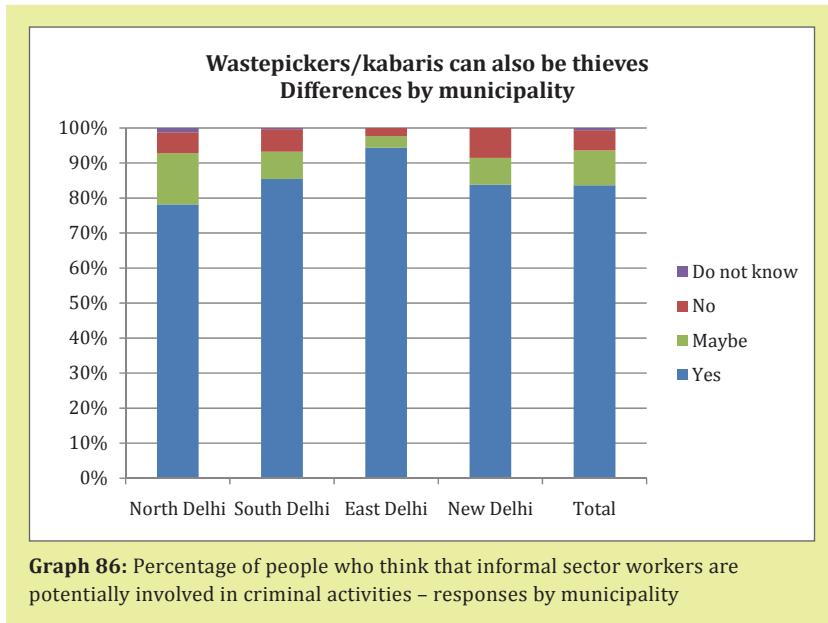


**Graph 84:** Percentage of people who think wastepickers dirty public spaces – responses by municipality



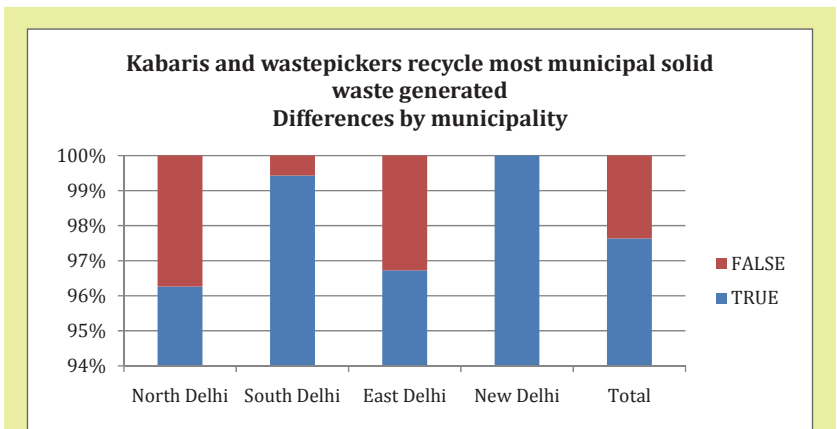
**Graph 85:** Percentage of people who think wastepickers dirty public spaces – responses by socioeconomic category

49 Chintan, Environmental Research and Action Group, ‘Focus Group Discussion on Waste Storage, Segregation and Recycling’, 2014.

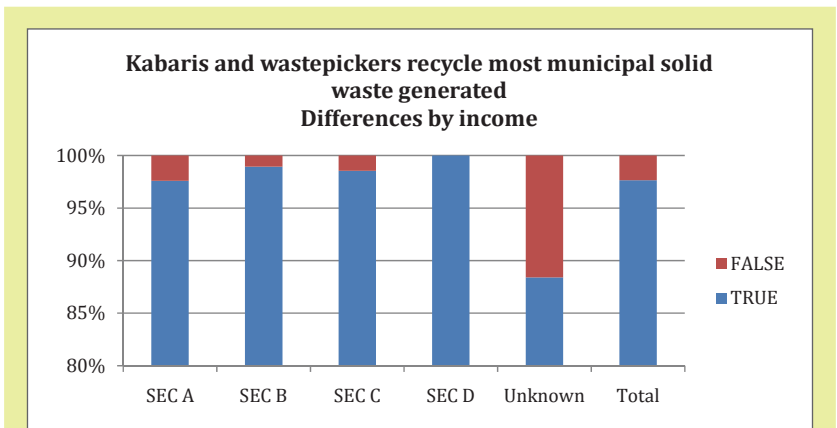


On the other hand, 98% of respondents think that waste pickers and *kabariwalas* recycle *most* of the municipal solid waste generated in the capital. 78% of respondents from across the city (and over 96% percent in New Delhi Municipal Council and East Delhi Municipal Corporations) recognize that they have *always*

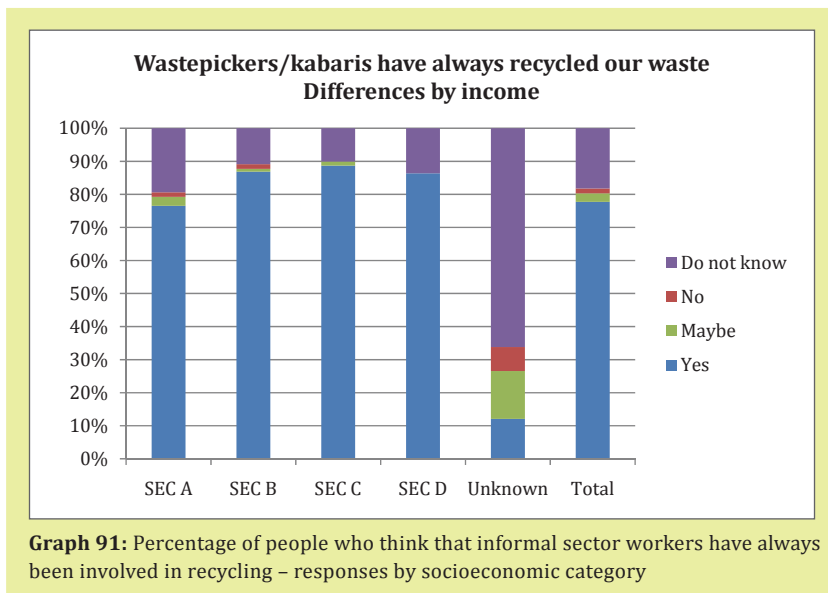
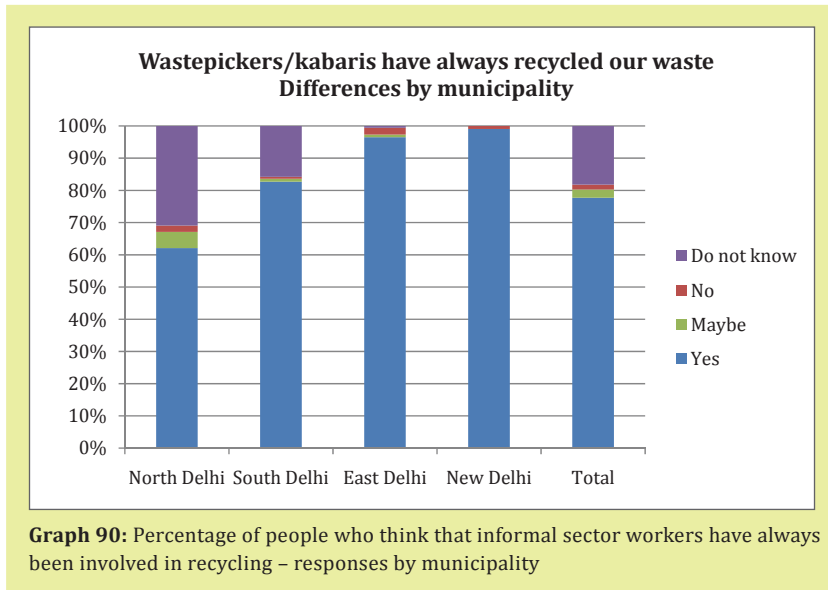
been involved in recycling the city’s waste. Virtually *everybody* (98.7%) recognizes that waste handlers get injured from dealing with un-segregated waste from the capital’s households, an undeserved risk two thirds of respondents are ready to alleviate by starting source segregation in their household.

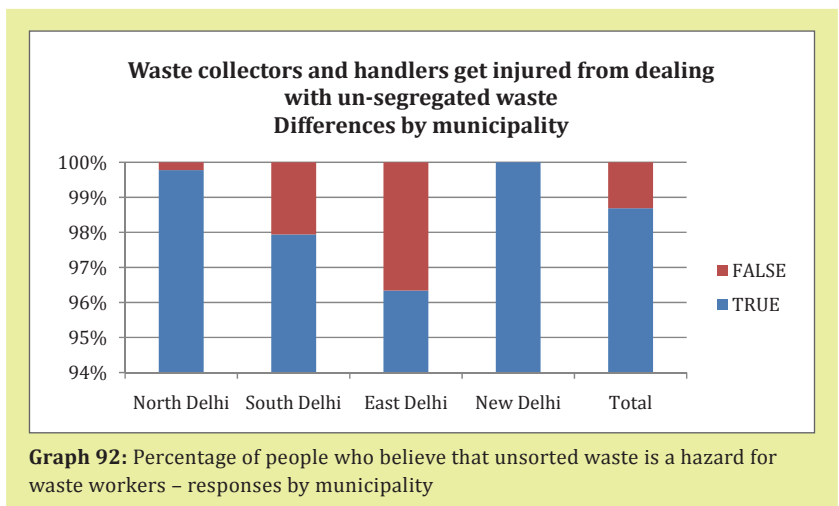


**Graph 88:** Percentage of people who think that informal sector workers recycle most solid waste – responses by municipality



**Graph 89:** Percentage of people who think that informal sector workers recycle most solid waste – responses by socioeconomic category



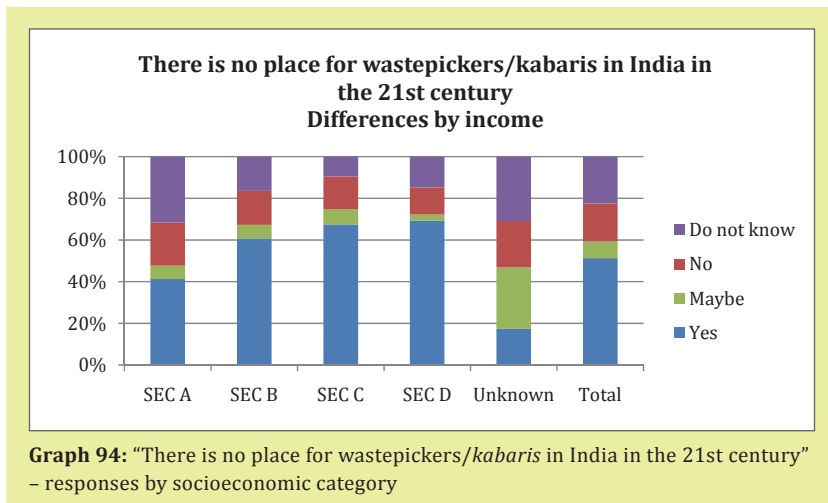
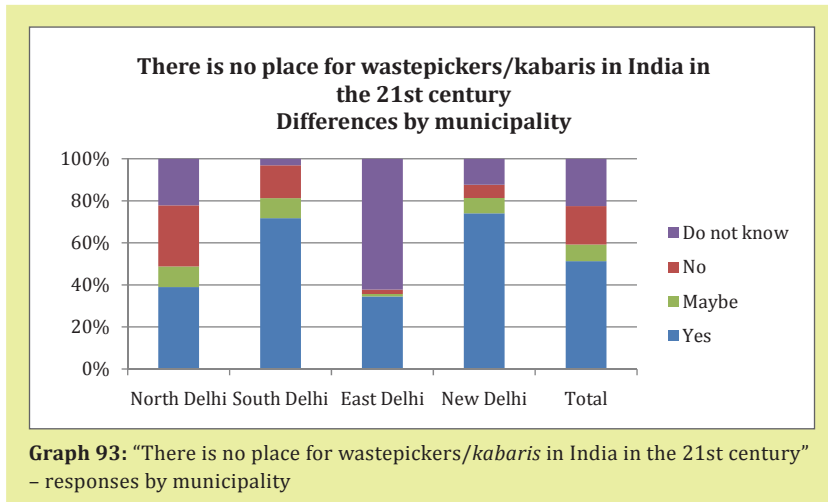


**Graph 92:** Percentage of people who believe that unsorted waste is a hazard for waste workers – responses by municipality

Overall, Delhi residents understand the role of the informal sector in waste management, with only half (51%) of the population thinking that waste pickers and *kabariwalas* do *not* have a place in India in the 21st century, a glaring recognition of their work – particularly in light of the entrenched social stigma against them. Responses are however split between East and North Delhi Municipal corporations (with less than 40% of support for this statement, with as many as 29% in North Delhi Municipal Corporation positively stating that the informal waste sector *does* have a place today in Delhi) and New Delhi Municipal Council and South Delhi Municipal

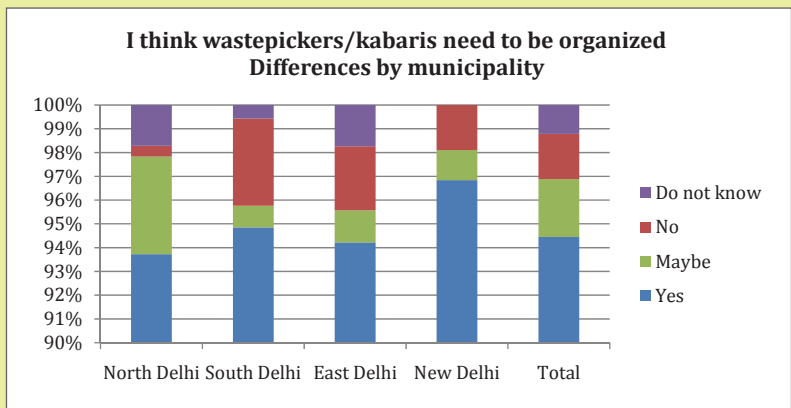
Corporations (where over 72% believe that waste pickers and *kabariwalas* do not have a place in today’s India). These positions are likely to reflect the different incidence of doorstep waste collection by informal sector workers across the city, and the fact that many would want them to play a role, but only through organizing and formalizing. Socioeconomic status has an impact on this point too, with the support for the statement that the informal sector has no place in Delhi’s future waste management increasing progressively from Delhi’s better-off (around 40%) to Delhi’s worse-off residents (70%).

*... doorstep waste collection by informal sector workers across the city, and the fact that many would want them to play a role, but only through organizing and formalizing.*

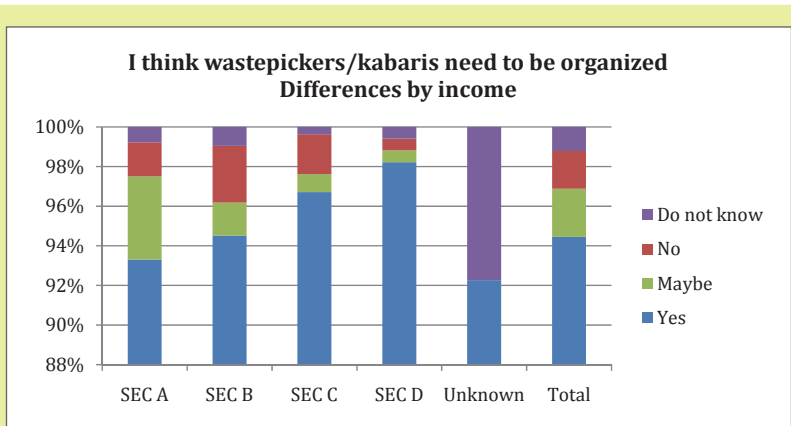


Despite mixed stances on the informal sector, overall, there is an overwhelming agreement on the urgent need to structure and formalize its contribution. 94% of respondents, with minimal deviation across municipalities, support the organization of informal waste pickers. 88% of respondents (over 90% in

South, North and East Delhi) agreed that waste pickers and *kabariwalas* need to be included in the collection and recycling of waste as a priority for the capital. New Delhi Municipal Council was an exception with a relatively low minority (13%) of respondents openly against involving the informal sector.



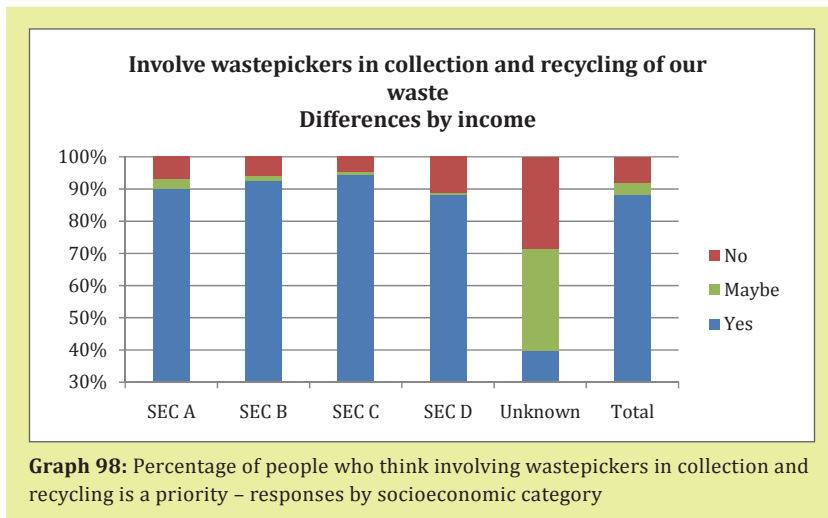
**Graph 95:** "I think wastepickers/kabaris need to be organized – responses by municipality



**Graph 96:** "I think wastepickers/kabaris need to be organized – responses by socioeconomic category



**Graph 97:** Percentage of people who think involving wastepickers in collection and recycling is a priority – responses by municipality



**Graph 98:** Percentage of people who think involving wastepickers in collection and recycling is a priority – responses by socioeconomic category

Interviews and focus group discussions strengthened this point by underlying the untapped potential RWAs have to include waste pickers in neighbourhood-level waste management initiatives. Waste pickers who participated in our focus group discussion argued that they are able to currently handle up to 90% of waste generated in the neighbourhoods where they work; many

experts argued that local bodies have a critical role to play in negotiating collaboration on fair terms and build waste professionals’ capacities to manage waste effectively and efficiently. A Come Clean India representative argued that *“It may also be a good idea to increase the fee for collection, involve ragpickers in a structured way, let them sort waste, take out recyclables, give them protection”*.



## Case Study - Legal and policy measures towards the informal waste sector in Brazil

Including the informal sector in the city's waste management is a priority, but how to do it is less clear. Delhi has many successful examples to draw from other developing countries like Brazil is one of these.

Starting in the 1990s, Brazil has pioneered efforts to mainstream the informal waste sector, substituting progressively repressive state policies against waste pickers with efforts towards inclusion, recognition and institutional support. The experience of Brazil was driven by a mix of political engagement at all levels of the Brazilian federal structure, successful experimentation by municipalities and states, and strategic mobilization of waste pickers themselves.<sup>50</sup> The range of legal initiatives alone taken by Brazilian institutions is indicative of many options a city like Delhi has to choose from.

- In 1990, the cities of Porto Alegre and Belo Horizonte ruled that recyclable waste should be handled by cooperatives of waste pickers. A dedicated department in the city administration was instituted to provide technical support and oversight to a growing number of waste pickers who successfully organized in cooperatives and associations.
- In 2003, in an explicit recognition of waste pickers' socio-economic rights, the state of Minas Gerais accepted the principle that waste pickers are entitled to alternative income and work opportunities when local authorities deny them access to landfills and dump sites.

- In 2004, the Federal District of Brasilia identified organized waste pickers as exclusive beneficiaries of the waste produced within the premises of all public buildings, guaranteeing them access to all recyclable waste.
- At the federal level, the Brazilian government passed laws, in 2001 and 2007 respectively, that recognize waste picking as an employment category in its own right, and allowed contracting wastepickers cooperatives outside of standard bidding processes.

In Brazil, waste pickers have been included in a number of policy fora and committees, participating actively in policy debates and the drafting of innovative legislation. Today, they have opportunities to influence their stake in Brazilian society and in the national economy, and they keep running an essential share of the country's recycling industry.

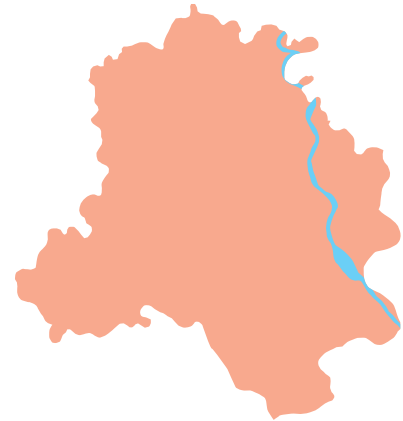
## Measures that can be taken by the Government of NCT of Delhi

The dire work and living conditions of waste professionals in Delhi's informal sector is at odds with the aspiration of the capital to become a world-class city. This contradiction only worsens in light of the fact that this sector contributes disproportionately to the capital's waste collection and recycling systems, and therefore contributes disproportionately to reducing pollution and guaranteeing a higher life quality for all. Their progressive recognition as part of Delhi's mainstream is a necessity, particularly if Delhi aspires to become greener and more inclusive.

<sup>50</sup> Sonia Diaz, 'Overview of Legal Framework for Social Inclusion in Solid Waste Management in Brazil' (WIEGO, 2010), [http://wiego.org/sites/wiego.org/files/publications/files/Dias\\_Brazil\\_Legal\\_framework\\_social\\_inclusion\\_waste\\_0.pdf](http://wiego.org/sites/wiego.org/files/publications/files/Dias_Brazil_Legal_framework_social_inclusion_waste_0.pdf).

The Delhi government can speed up this process by taking the following steps:

- Consult the informal sector. Identify wastepicker associations and representatives to be included in policy discussions about the future of waste management in Delhi;
  - Multiple stakeholders can help out. Identify the role of RWA and trade/market associations in negotiating agreements locally, including the provision of the appropriate gear designed in consultation with waste pickers, financial mechanisms and monitoring of labor standards.
  - Help organize via policy. Identify key legal and policy measures to impact the working and living conditions of informal waste professionals, including supporting the creation of association and cooperatives, publicly recognizing their work and supporting the source segregation of waste at household level.
- Prioritized access for doorstep collection. Allow wastepicker associations to collect doorstep waste collection fees from households.
  - Level the playing field. Treat waste pickers associations at par with, if not above, private waste collection service provider firms in terms of their ability to deliver waste management services. Hence, enable them to compete with large corporate firms on grounds of efficiency and effectiveness of services, as well as compliance with rules and contracts, for collection and sorting.
  - Develop standards. Develop standards and protocols for professionalizing their work and provide the necessary financial and technical support required for making those changes.



*The experience of Brazil was driven by a mix of political engagement at all levels of the Brazilian federal structure, successful experimentation by municipalities and states, and strategic mobilization of waste pickers themselves. The range of legal initiatives alone taken by Brazilian institutions is indicative of many options a city like Delhi has to choose from.*

## Belief no. 8

# Composting should be carried out away from residential areas owing to the odour it produces

A 2004 study commissioned by the Municipal Corporation of Delhi showed that 74% of the municipal solid waste reaching Delhi landfills is biodegradable, and mostly made up of food waste.<sup>51</sup> If composted, this waste can become a precious resource for the capital's private gardens, parks and lawns, while reducing very significantly the volume of waste piling up in Delhi's space constrained landfills. Compost increases soil quality and reduces the amount of water needed by plants; it minimizes the quantity of synthetic fertilizers dispersed in the atmosphere, soil and water, and reduces the quantity of waste needing disposal by municipal authorities. Decentralized composting is also one of the most accessible waste management technologies available today. It minimizes

transportation and processing costs and reduces the volume of waste that needs to be managed by the city.

Yet, composting still suffers from a bad reputation, particularly through the association of wet waste with the odors coming out of the city's *dhalaos* and rotting food. The perception of composting as a nuisance can pose a large obstacle for a city like Delhi, where composting is still marginal and struggles to take root as daily practice. To work, composting requires strong community buy-in. Segregation at the household level and awareness about the difference between wet and dry waste, are both essential. Residents have a major role to play. It also requires a market.

Some questions then arise from the study. Are residents' attitudes a real obstacle to decentralized composting in a city like Delhi? Is it realistic to plan a decentralized, integrated and sustainable composting system in the capital?

51 Municipal Corporation of Delhi and Kadam Environmental Consultants, *Feasibility Study and Master Plan for Optimal Waste Treatment and Disposal for the Entire State of Delhi Based on Public Private Partnership Solutions*, Volume 6: *Municipal Solid Waste Characterisation Report*, April 2004.

## What are the research findings?

Focus group discussions confirmed that residents' resistance to compost is often strong: for one, waste pickers argued that they are not allowed to compost wet waste in neighbourhood parks, particularly during the monsoon, for fear of odours and the dispersal of waste taking over common areas. In light of existing composting techniques, however, this fear turns out to be unwarranted. Following simple segregation and processing rules excludes completely the risk of odours, and appropriately designed spaces can keep composting units away from rain and flooding.

Delhi has set up a number of high-capacity composting plants in the vicinity of landfills, where part of Delhi's wet waste is treated. Between the Okhla, Bhalaswa and Tikri plants, Delhi's centralized composting capacity will soon reach 900 MT/day.<sup>52</sup> The volume of waste produced in Delhi is however already ten times the plant's capacity, and the largest part of wet waste is inevitably dumped or landfilled, at a significant direct and indirect cost for the city and its residents. In addition, lack of source segregation affects the quality of compost produced at these centralized facilities.

Instead, decentralized composting offers a greater opportunity to take pressure off Delhi's overflowing landfills by diverting wet waste at source (from households, vegetable markets and the capital's food industry). Initial (but marginal) measures have already

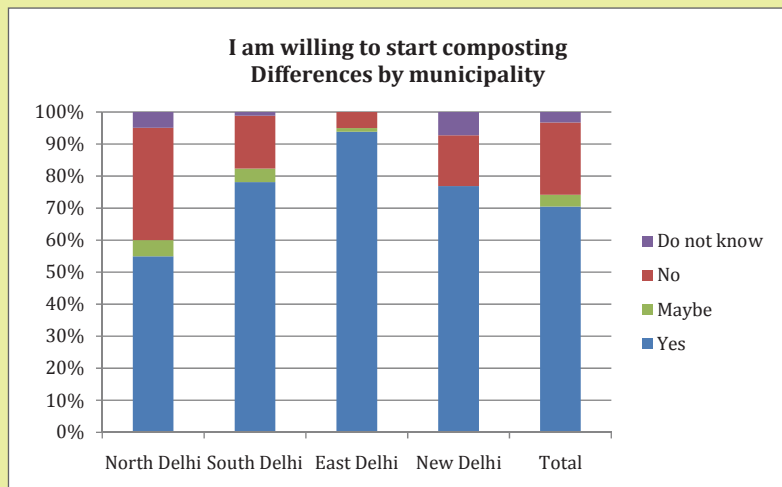
been put in place, such as the requirement that the capital's five-star hotels segregate their waste and compost it.<sup>53</sup>

The challenge for Delhi remains integrating households and bulk generators in the city's management system for wet waste. This requires awareness about waste and residents' willingness to segregate. The survey findings show that the awareness about different types of waste in Delhi is very low (for example, only 24% of respondents know that glass and metal are not biodegradable). As many as 93% of respondents do not segregate their household waste.

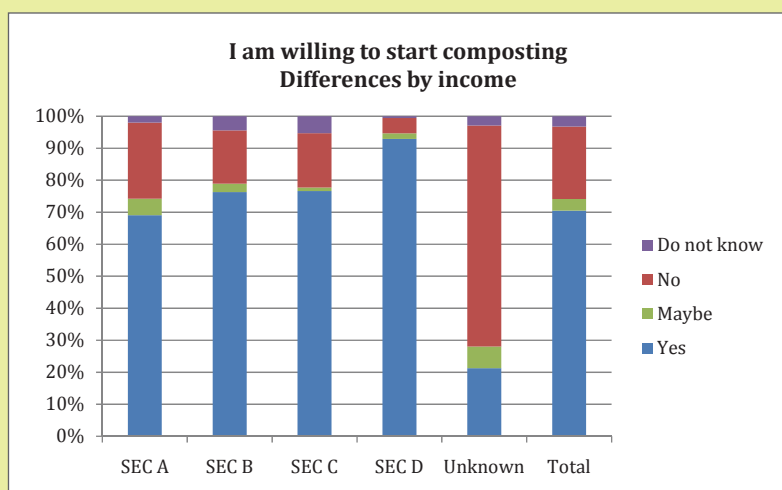
Knowledge, habits and systems are intimately linked, and unless Delhi residents become aware of the direct linkages between waste and their quality of life, a sustainable approach to waste will remain an implausible aspiration. Low expectations regarding the possibility of implementing integrated waste services are very common: having a separate wet and dry waste collection system ranked as one of the lowest priorities for the respondents of our survey, and 58% don't segregate their waste because they believe that waste collectors mix it back. Yet, as many as 70% of respondents are willing to start composting at home, with a peak of over 90% in East Delhi Municipal Corporation, and a low of 55% in North Delhi Municipal Corporation. Worse-off residents (SEC category D) showed more willingness than others to start composting (up to a fifth more people answered yes).

<sup>52</sup> Gov. of NCT of Delhi, 'Department of Environment - Waste Management'.

<sup>53</sup> The Economic Times, '5-Star Hotels in Delhi to Take Environment-Friendly Steps by September - Economic Times', *The Economic Times*, 3 June 2013, [http://articles.economicstimes.indiatimes.com/2013-06-03/news/39714736\\_1\\_five-star-hotels-waste-water-green-hotels](http://articles.economicstimes.indiatimes.com/2013-06-03/news/39714736_1_five-star-hotels-waste-water-green-hotels).



**Graph 99:** Willingness to start composting – responses by municipality



**Graph 100:** Willingness to start composting – responses by socioeconomic category

Except the need to build awareness about wet waste, another challenge that emerged from the research is the temporary lack of a national market for compost. High subsidies for synthetic fertilizers still distort the market against chemical-free agriculture, despite the former’s negative environmental impacts. The engagement of municipal administration should therefore be composite,

ambitious and strategic, with a twin focus on changing fertilizers’ subsidy policies and on targeting the city’s many green spaces as a potential output market for compost, starting from gardening at the household and neighbourhood level, in schools and institutions, to include the capital’s large parks and public gardens.

In sum, a new decentralized model requires a far-reaching, but arguably inevitable, restructuring of Delhi's approach to waste. One of our interviewees summed up the challenge in the following words: *'We need an immediate solution for the existing piles of garbage, [...] Buy back for all local compost, get local stakeholders to create Integrated Sustainable Waste Management plants.'* If decentralised composting in Delhi still seems a far-fetched idea, other major cities in India have already taken up the challenge. Bangalore and Pune are among those.

## Case Study - Bangalore's growing market for home composting services and products

Bangalore currently generates about half of Delhi's MSW, i.e. 3-4,000 MT/day, with a similar content of wet waste (72%).<sup>54</sup> Since the introduction of the Municipal Solid Waste (Management and Handling) Rules 2000, the Bangalore city council sought proactively the collaborations of NGOs to fulfill its responsibility to provide door-to-door collection and environmentally friendly waste management. The city was also an early testing ground for neighbourhood-level waste management initiatives, and a pilot for the Integrated Sustainable Waste Management (ISWM) by the Urban Waste Expertise Program (UWEP) since the mid-1990s. The relevance of Bangalore's experience is that local initiatives supported by the administration flourished, ultimately stimulating a sizeable market for

environmentally minded providers of small-scale waste management solutions.

Daily Dump is one of the actors, a company which markets and distributes products for household segregation and household/community composting. Through its products and customers, Daily Dump alone enables diversion of 14,272kg of wet waste from Bangalore's landfills monthly<sup>55</sup>. This waste is instead composted by households and used locally. The company also provides practical guides for decentralized composting at the neighbourhood level and has contributed to turning composting into a larger economic opportunity for a number of people, including potters and gardeners.

The existence of a growing market for home-based composting products in Bangalore shows that a decentralized composting model is a real opportunity for a number of actors, including a growing sector of for-profit service providers. Pune Municipal Corporation's collaboration with the chemical company BASF for the provision to residents of biodegradable bags for storing wet waste is another successful example.<sup>56</sup>

As residents organize, different models are emerging in Bangalore to integrate door-to-door collection by local waste pickers with waste services provided by urban local bodies for dry waste.

Ultimately, the on-going experience of Bangalore proves that 'community participation in waste management not only refers to households setting out garbage bins

54 T. V. Ramachandra, K. Shweta, and T. M. Dania, 'Carbon Footprint of the Solid Waste Sector in Greater Bangalore, India', in Assessment of Carbon Footprint in Different Industrial Sectors, Volume 1, ed. Subramanian Senthilkannan Muthu, EcoProduction (Springer Singapore, 2014), 265-92, [http://link.springer.com/gate2.library.lse.ac.uk/chapter/10.1007/978-981-4560-41-2\\_11](http://link.springer.com/gate2.library.lse.ac.uk/chapter/10.1007/978-981-4560-41-2_11).

55 'Home Page | Daily Dump', accessed 10 September 2014, <http://dailydump.org/>.

56 BS B2B Bureau, 'Pune Municipal Corporation Joins Hand with BASF for Waste Management', *Business Standard India*, accessed 11 September 2014, [http://www.business-standard.com/content/b2b-chemicals/pune-municipal-corporation-joins-hand-with-basf-for-waste-management-114090800654\\_1.html](http://www.business-standard.com/content/b2b-chemicals/pune-municipal-corporation-joins-hand-with-basf-for-waste-management-114090800654_1.html).

at fixed times and paying service charges regularly but also concerns the capacity of neighbourhood residents to manage and supervise waste collectors and maintain good public relations, to coordinate with similar groups and enterprises in the neighbourhood and to negotiate with the local authorities about the integration of services.<sup>57</sup>

## Measures that can be taken by the Government of NCT of Delhi

Legislation in India is increasingly embracing the waste management hierarchy and composting as a measure to treat organic waste. Few waste management approaches promise to have as many environmental benefits as decentralized composting. Additionally, a decentralized model has the potential of revamping community buy-in in the city, based on a practical sense of shared responsibility that permeates daily household rituals. This approach requires however widespread awareness about waste composition and basic household handling practices like segregation.

Composting offers a chance to divert up to three fourths of the capital's waste from landfills, forever.

The Delhi government can therefore:

- Tell citizens. Launch an awareness campaign on the contribution single households can make to the city welfare through composting, including in terms of quality of life and health.
- Encourage experimentation. Stimulate diverse neighbourhood-level experiments that encourage the use of compost in local gardens and green spaces through local, low-cost processing, managed by waste professionals and local gardeners and overseen by neighbourhood representatives.
- Study feasibility. Commission feasibility studies on the compost output potential of Delhi, and scope policy changes in the neighboring agricultural sector for chemical-free agriculture, benefitting the environment as well as the quality of food that reaches Delhi's tables.
- Financial support for compost. Pay a minimum support price for compost made of waste, with a priority for decentralized waste based composting, especially by those composting less than 10 tons a day in any given site. This must be procured by municipalities' horticulture department and all other government agencies.

57 Maria S. Muller et al., 'Differing Interpretations of Community Participation in Waste Management in Bamako and Bangalore: Some Methodological Considerations', *Environment and Urbanization* 14, no. 2 (10 January 2002): 241–58, doi:10.1177/095624780201400219.

## Belief no. 9

# The scale of Delhi's current waste crisis can only be managed effectively by government actors, and with a large use of public funds

There is no doubt that megacities like Delhi produce a large amount of waste. The Delhi Government's Department of Environment estimates that the city generates 8,000 tons per day of municipal solid waste (MSW).<sup>58</sup>

A 2012 World Bank report estimates MSW generation rates at 5,874 tons per day.<sup>59</sup> Even though these numbers may seem staggering, actual waste generation rates may even be higher and are set to increase as incomes and consumption levels continue to rise. Litter on the streets, overflowing community bins, open dump sites, trash floating in the river and drains, along with the city's massive landfills – all contribute to the general perception that waste is a massive problem that needs to be prioritized. Domestic and international news media reports sensationalize the problem of waste as an “impending disaster”<sup>60</sup> that

threatens to drown the city in its own waste<sup>61</sup>. Waste tarnishes Delhi's image as the capital city of an emerging global economic power.

Decentralization imperatives such as the implementation of the 74th Constitutional Amendment are driving the need for cities across the country to look for additional sources of funding to satisfy the increasing demand for infrastructure and services for their residents and businesses. Waste management is among the most critical and most expensive of civic services, and there is growing concern that the expanding scale of waste in the capital will turn into an unsustainable financial liability for municipalities. Delhi's specific waste composition and international experience, however, point to a number of viable alternatives.

58 <http://www.delhi.gov.in/wps/wcm/connect/environment/Environment/Home/Environmental+Issues/Waste+Management>  
59 Hoornweg, D. and Bhada-Tata, P. 2012. *What a Waste: A Global Review of Solid Waste Management*. Washington, DC: World Bank.

60 <http://www.dailymail.co.uk/indiahome/indianews/article-2571042/Delhi-drowns-waste-High-Court-panel-calls-aggressive-solution-solve-Capitals-alarming-litter-problem.html>

61 <http://www.hindustantimes.com/news-feed/chunk-ht-ui-indiasectionpage-htfordelhi/delhi-may-drown-in-its-own-waste/article1-1052381.aspx>



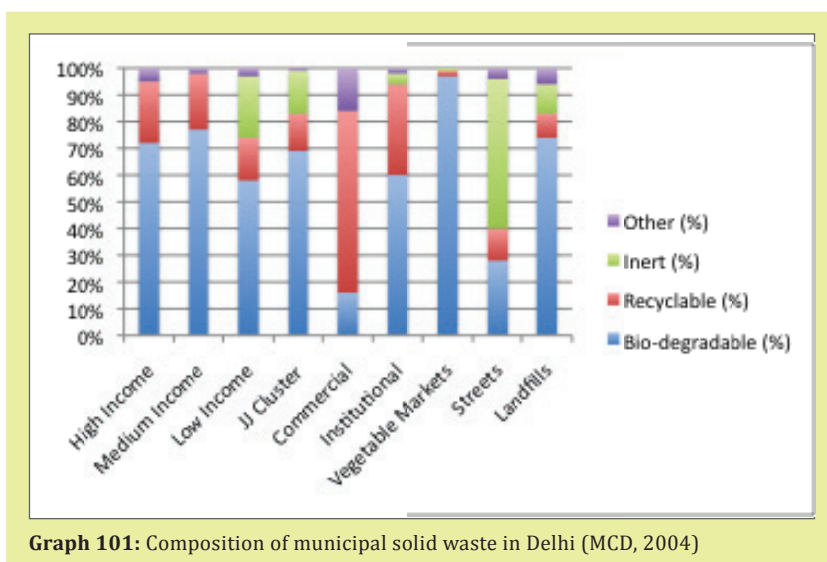
## What are the research findings?

Delhi has the highest per-capita income in the country. As incomes rise further, higher volumes of waste are likely to be generated. By some estimates, per capita generation of waste is expected to more than double by 2021<sup>62</sup>. This translates automatically in higher per capita expenditure by municipalities for waste management.

Although recent and accurate data on municipal expenditures on solid waste management are not available, the 2004 study commissioned by the MCD estimated per capita expenditures of INR 268 during the previous year. These are likely to have increased since 2004, due to higher waste generation rates but also due to massive capital expenditures in solid waste

management infrastructures such as waste-to-energy facilities and the rising costs of manpower. A 2010 report commissioned by the Ministry of Environment, Forests and Climate Change benchmarked per capita expenditures for large cities at approximately INR 170 per year.<sup>63</sup> A 2011 report by a High Powered Expert Committee estimates per capita solid waste management infrastructure investment costs at INR 391 and operations and maintenance costs at INR 155 per annum.<sup>64</sup> The need to economize on spending in solid waste management is clear.

Yet, waste is also a resource, and what is commonly perceived as a growing problem should instead be seen as a mix of new and old opportunities.



**Graph 101:** Composition of municipal solid waste in Delhi (MCD, 2004)

62 Sankhe, S. et al. 2010. *India's Urban Awakening: Building Inclusive Cities, Sustaining Economic Growth*. New Delhi: McKinsey Global Institute

63 IL&FS. 2010. *Technical EIA Guidance Manual for Common Municipal Solid Waste Management Facilities*. New Delhi: Ministry of Environment and Forests

64 High Powered Expert Committee. 2011. *Report on Indian Urban Infrastructure and Services*. New Delhi: Ministry of Urban Development

A 2004 study commissioned by the MCD<sup>65</sup> (above) shows that between 20 to 30 percent of waste in Delhi has value as recyclable material that can or is already reused or transformed into consumer goods. More than 50 percent of waste is instead currently biodegradable. If systems for processing biodegradable waste are put in place, only 10 to 15% of the total waste in Delhi will need to be managed through active government intervention. This could be through intense awareness along with incentives of buy back. Currently because of lack of source segregation and lack of infrastructure in markets, the potential of composting as an option for managing large quantities of waste is not being harnessed. This point is critical because a mix of technical, financial and innovative partnerships can minimize the percentage of waste that needs to be managed by the government in the first place, thus reducing costs drastically. The government is also not the only actor who is involved (and has potential to work differently) in waste today: the formal corporate sector and the traditional informal waste and recycling sector also play major roles.

### Case study: Waste Management in San Francisco, a successful public-private partnership

The city of San Francisco in California is often lauded for its cutting-edge waste management practices. In 2013, it won the City Climate Leadership Award in the waste management category for its zero waste program<sup>66</sup>. The

World Wildlife Fund also selected San Francisco as the Earth Hour Capital in 2013<sup>67</sup>. A 2011 research study conducted by the Economist Intelligence Unit (EIU) named San Francisco the greenest city in North America for its waste management practices<sup>68</sup>. In 2009 and 2010, studies commissioned by Nalgene, placed San Francisco in the number one slot as “America’s least wasteful city.”<sup>69</sup> In 2008, Forbes ranked San Francisco number six in its “America’s 10 Cleanest Cities”, and in the top five in waste-management spending. The reason for all these accolades is the city’s progress towards meeting its ambitious zero waste goals by 2020. From 1990 to 2010, San Francisco increased its landfill diversion rates from 35 percent to 80 percent. An ordinance regulating construction and demolition (C&D) debris has allowed for the recovery of a massive amount of C&D waste material. In addition, mandatory recycling and composting has increased organics collection by 50 percent to more than 600 tonnes per day, higher than any composting program in the United States<sup>70</sup>. While much of this success has to do with the foresight that city officials have exhibited over the years, active citizen participation, the willingness of businesses to reduce waste through product design and the ability of the city’s waste management firm in assuming and supporting the city’s waste management goals cannot be discounted.

San Francisco offers also a great example of active partnership between the city and a private waste management company – Recology – to achieve zero waste management

65 COWI and Kadam Environmental Consultants. 2004. *Feasibility Study and Master Plan for Optimal Waste Treatment and Disposal for the Entire State of Delhi based on Public Private Partnership Solutions*. Delhi: Municipal Corporation of Delhi

66 <http://cityclimateleadershipawards.com/category/winners/>

67 <http://wwf.panda.org/?204597/San-Francisco-zero-waste>

68 <http://www.siemens.com/entry/cc/en/greencityindex.htm>

69 <http://www.fastcompany.com/1618762/nalgene-ranks-most-and-least-wasteful-cities-america>

70 <http://cityclimateleadershipawards.com/san-francisco-zero-waste-program>

goals.<sup>71</sup> Yet, why has San Francisco been so successful in this partnership, when many Indian cities struggle with private contractors unable to honor their contracts?

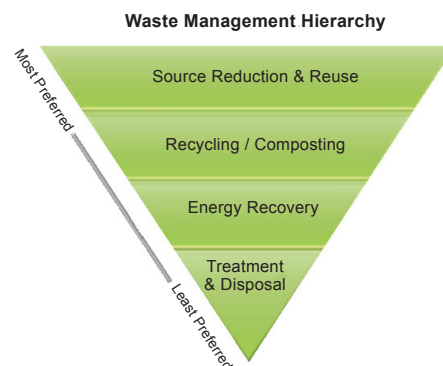
Part of the answer lies in the history of the firm and the city<sup>72</sup>. Prior to 1921, San Francisco's waste management landscape looked very similar to what Delhi looks like today. Poor Italian immigrants acted as independent waste collectors across the city, much like Delhi's waste pickers. Over time loose confederations of scavenger cooperatives began. In 1921, San Francisco passed an ordinance allowing the city to regulate waste collection fees and requiring permits for operating waste management businesses. Around the same time, formerly independent waste collectors organized into two major cooperatives offering services in territorially delineated neighborhoods. As the city grew in size, so did the two organizations until they finally merged into an employee-owned organization in 1987. San Francisco did not follow the path of other US cities in its waste management systems. While most other cities controlled and subsequently outsourced their municipal waste management systems, San Francisco allowed private waste management service providers to operate while providing a regulatory framework for those services. San Francisco's exceptional performance in waste management has much to do with this very specific history.

This history also offers lessons for Delhi as the city modernizes its waste management systems. Investing in existing resources and partnerships is bound to yield results, limiting at the same time the financial liability of waste management. Delhi should encourage organizing and formalizing its army of

informal sector waste collectors and recyclers in cooperatives and associations, instead of outsourcing those services to new firms who are bound to have less experience and expertise than those who have historically done this work to make a living.

## Measures that can be taken by the Government of NCT of Delhi

Bearing in mind the solid waste management hierarchy, there are feasible ways to develop strategies that address the seemingly insurmountable solid waste management problem in the city. The waste management hierarchy, as shown in the figure<sup>73</sup> below has been explicitly and implicitly accepted by governments at the national, state and local levels in India. Understanding the waste stream and the role that various actors and institutional arrangements can play in the optimization of waste management services is crucial for developing cost effective ways to deal with the problem. Following are some recommendations that will not only help the city manage its waste but also address the negative public opinion around the issue:



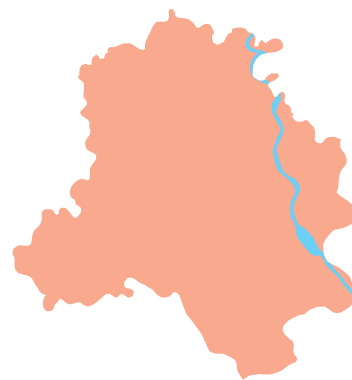
**Figure 2:** The internationally sanctioned waste hierarchy (US EPA)

71 For their support of the city's waste management objectives, between 2001 and 2010, Recology has consistently been the recipient of the Waste Reduction Awards Program (WRAP) from the California Department of Resources Recycling and Recovery (CalRecycle). See <http://www.sfrecycling.com/index.php/recology-employee-ownership/95-awards/129-waste-reduction-awards-program>

72 <http://www.sfrecycling.com/index.php/recology-history>

73 <http://www.epa.gov/solidwaste/nonhaz/municipal/hierarchy.htm>

- Recognize the informal sector as a key ally. Continue to recognize the important contribution made by the informal sector in recycling waste by formalizing and enabling it. The effectiveness of this sector will continue to alleviate significantly the burden of waste management on municipal budgets.
  - Build on existing doorstep collection systems. Waste collection is proportionally one of the costliest portions of the solid waste management lifecycle. For most city residents, this service is already provided by the informal sector, as shown in chapter 8 of this report. There's no reason to invest in expensive waste collection infrastructures when the existing one could easily be upgraded. With the goal of reducing overall waste management expenditures, the Government would do well by subsidizing and encouraging this informal system. Informal actors can also act as agents of change of waste management behaviours by encouraging waste generators to segregate their waste. It is much cheaper to collect waste from single collection points in a neighbourhood than all waste generators in that neighbourhood.
  - Invest in composting as a viable alternative to landfilling. Much of the current waste generated is organic. Segregation-at-source coupled with separate collection and transportation mechanisms can greatly improve the quality of compostable organic material.
- Leverage existing policy. This is relevant for the collection and use of currently non-recyclable materials, for instance multi-layered plastic packaging. Plastic Waste (Management and Handling) Rules 2011 clearly ask for the implementation of extended producer responsibility (EPR) by holding producers of those products accountable for the products' end-of-life. Plastic waste generation rates are high and will continue to rise with rising incomes. Their proportion in the overall waste stream is bound to increase. If waste collectors were paid for collecting such materials just as they are for collecting currently recyclable materials, there would be a separated stream of these materials for processing into several available options as identified by the Central Pollution Control Board (CPCB)<sup>74</sup>, thus reducing the total amount of waste that the city has to manage.



74 CPCB. 2013. *Website Material on Plastic Waste Management*. New Delhi: CPCB

## Belief no. 10

# Corporate providers of waste services can turn waste management into an efficient commercial venture, with benefits for all - from residents to municipalities

In 2009, Jairam Ramesh, former Environment Minister, declared publicly that Indian cities are the dirtiest on the planet: “If there is a Nobel Prize for dirt and filth, India will win it, no doubt.”<sup>75</sup> Municipal agencies across the nation have struggled to keep our cities safe and clean: inefficiency, lack of coordination, lack of resources, lack of accountability and insufficient, out-dated technology<sup>76</sup> are among the downsides critics cite most often, internally and externally. If not municipalities, however, who else can get ‘the job done’?

For over two decades, national and international agencies have argued that involving the private sector could flip the grim picture of Indian cities collapsing under the menace of trash. According to advocates

of privatization, turning municipal solid waste management into a commercially viable enterprise would benefit everybody. By stimulating open competition among providers of waste services, privatization promises to increase the efficiency, coverage and reliability of municipal services at reduced costs for public actors. Privatization also promises to be more equitable by expanding public services to historically underserved, poorer communities.<sup>77</sup> Embracing this mantra, the Ministry of Finance declared in 2009 that municipal authorities lack ‘in-house capability’ and resources, but that ‘the unbundling of services and technological innovations have opened up these areas to private sector participation’.<sup>78</sup>

Delhi, despite its ‘Green Delhi Clean Delhi’ slogan, is the epicenter of debates around waste management solutions. Managing the waste generated by businesses, institutions and residents of the capital city is set to

75 TNN, ‘India Can Win Nobel for Filth, Says Jairam Ramesh’, *The Times of India*, 21 November 2009, New Delhi edition, <http://timesofindia.indiatimes.com/india/India-can-win-Nobel-for-filth-says-Jairam-Ramesh/articleshow/5252991.cms>.

76 Ministry of Finance, Government of India Dpt. of Economic Affairs, *The Solid Waste Management Sector in India [Position Paper]*, November 2009, 6.

77 *Innovative Approaches to Solid Waste Management in India. Focus on Private Sector Participation*, Project Notes (Indo-US Financial Institutions Reform and Expansion Project - Debt Market Component FIRE(D), February 1999), 4.

78 Dpt. of Economic Affairs, *The Solid Waste Management Sector in India [Position Paper]*, 4.

become an even greater challenge in the future than it is today. How big a part of the solution is privatization?

## Where is the national debate headed?

The Indian Constitution attributes in its 12th Schedule exclusive authority to manage urban solid waste to municipalities. Health and environmental hazards make waste an issue of *public health*, justifying the government's exclusive prerogative over its management. The Municipal Solid Waste (Management and Handling) Rules, 2000 make it mandatory for urban local bodies to 'engage in daily collection, segregation, secondary storage in covered bins, transportation in covered vehicles, processing through composting or waste-to-energy technologies and disposal of rejects in engineered/sanitary landfills'.<sup>79</sup> Over a decade after its introduction, however, according to the Central Pollution Control Board 'hardly any city and town' is complying with existing regulations. The waste that remains dispersed across India's cities (often more than 30% of the waste generated) is a glaring indicator of present shortcomings.<sup>80</sup>

The potential contribution of the private sector to resolve waste management issues was first pushed by national and international proponents of infrastructure privatization. In a number of reports in the 1990s, many international organizations (from the World Bank to USAID) discussed the possibility of replicating in India the privatization of MSW management the USA had lived through the 1970s and 1980s.<sup>81</sup> Domestically, in 1993 the Rangarajan Committee recommended a large disinvestment of up to 49% in

sectors explicitly reserved by law to the public sector. The recommendations were not implemented, but over a decade later, advocates of privatization still argue that the private sector has the potential to introduce new technological solutions on one hand, and stronger performance and efficiency-based management on the other, with gains both in terms of costs and reach. Focus group discussions organized as part of this study in 2014 confirmed some of these hopes: some key players in Delhi's waste sector believe that private contractors could supplement the limited resources of municipal agencies with a focus on efficient, quality and accountable services: an interviewee argued that "*private sectors are cleaning dhalaos on a daily basis, earlier [we] had to call up the MCD. Trucks were all open, dhalaos were heaps of garbage, crows and birds hovering over it and burning of waste [was common], surely Delhi is far ahead of that*".<sup>82</sup>

Today, the language of Public-Private-Partnership (PPP) has made its way into government reports, and a growing number of cities across India have contracted corporate waste management companies to carry out part (or the entirety) of their MSW management. But the evidence that privatization could take a city like Delhi out of the current impasse, and ultimately out of its waste problem is still weak.

The recent experience of Kanpur, Varanasi and Ludhiana offer much food for thought, particularly on the risks and opportunities of outsourcing the entirety of a municipality's MSW management to a single corporate contractor.

79 Ahluwalia, *Transforming Our Cities: Postcards of Change*, 198.

80 Central Pollution Control Bureau CPCB, *STATUS REPORT ON MUNICIPAL SOLID WASTE MANAGEMENT*, 2012.

81 *Innovative Approaches to Solid Waste Management in India. Focus on Private Sector Participation*.

82 Interview with Shubhogato Das Gupta, Senior Fellow, Centre for Policy Research, 2014.

## Case Study: A2Z in North India

Till 2008, the city of Kanpur (3.6 million people spread over 260 sq km) spent Rs. 42 crores per year to transport waste from its street to an open and unregulated dumpsite outside the city. In 2008, Kanpur decided to embrace a scientific approach to waste management and signed two contracts with A2Z Infrastructures, a rising corporate provider of waste services in North India. The two contracts signed in 2008 and 2009 covered collection and transportation, on one side, and the processing and disposal of waste on the other. A2Z became the exclusive provider of integrated MSW management in Kanpur. A2Z also launched a Rs. 110 crore project, funded at 51% with a JNNURM grant, to build a Waste-to-Energy plant with a capacity of 1500 tons of waste per day, units for composting, sorting and RDF, a briquette manufacturing unit, and finally the conversion of a dumping ground into a scientific landfill of 46 acres. Further JNNURM funding was secured to buy vehicles with the latest technology for collection and transportation, including GPS trackers and hydraulic garbage compressors. In sum, the venture between A2Z and the city of Kanpur promised to be a pioneering experiment in integrated municipal solid waste management – the first of its kind not only in India but also in Asia. Only 2% of the waste collected was meant to be disposed in landfills. Promises were made to hire part of the people previously working informally to take care of waste collection.

Within a year, however, major problems started emerging: A2Z faced the resistance of local trade unions of waste pickers who

refused to give up their access to waste or be incorporated within the company; the company clashed with the municipal administration and A2Z's own sub-contractors over payments, the amount of user fees collected, the transparency of its operations and the quality of the service provided. The technology installed at A2Z plants also proved inadequate to process the waste the city generates, and by-products like compost met with meager market demand in the agricultural sector, piling up in A2Z storage.

Based on its early plans for Kanpur, A2Z had also won contracts in a number of major cities in Uttar Pradesh, including Varanasi, and in Ludhiana, Punjab. The fate of A2Z's ventures in these cities has proven very similar to that of Kanpur. In Varanasi, A2Z clashed first with the Varanasi Municipal Corporation over payments, and later with its subcontractors over the lack of transparency of A2Z's financial practices. In January 2014, despite holding a contract for the whole city, A2Z still collected waste from only one of 90 wards of the city.<sup>83</sup> Similarly in Ludhiana, after two years of operations, A2Z still failed to reach more than 60% of the city's 75 wards.<sup>84</sup> A2Z admitted not having adequate mechanical means to remove all the trash that accumulated across the city. The clauses that linked A2Z's payments to the number of tons of waste collected, irrespective of segregation, provoked clashes with waste collectors' associations who were suddenly denied access to door-to-door collection, jeopardizing hundreds of livelihoods and bringing the city's informal (and only) recycling sector to a near halt.<sup>85</sup>

83 TNN The Times of India, 2014, and 10 57am Ist, 'A2Z Issues Give Another Jolt to City's Waste Management', *The Times of India*, accessed 18 August 2014, <http://timesofindia.indiatimes.com/city/varanasi/A2Z-issues-give-another-jolt-to-citys-waste-management/articleshow/28463618.cms>.

84 Puneet Pal Singh Gill, 'Perform or Quit, Govt Tells A2Z Co. It Has Not Been Able to Spread Its Network to All 75 Wards of Ludhiana', *Tribune News India*, 10 October 2013, <http://www.tribuneindia.com/2013/20131011/ldh1.htm>.

85 'A2Z Asked to Clear Garbage within 3 Months: Gupta', *The Indian Express*, accessed 18 August 2014, <http://indianexpress.com/article/cities/ludhiana/a2z-asked-to-clear-garbage-within-3-months-gupta/>; 'Deadlock Ends as Sweepers to Wear A2Z Uniforms, Sell It Recyclable Waste', *The Indian Express*, accessed 18 August 2014, <http://indianexpress.com/article/cities/ludhiana/deadlock-ends-as-sweepers-to-wear-a2z-uniforms-sell-it-recyclable-waste/>.

## Are corporate providers the solution?

Municipal agencies have been blamed for not providing waste services that are a) regular, that b) reach all parts of a city irrespective of the socio-economic status, that are c) cost-efficient and scientific. Judged against the same criteria, the performance of corporate ventures can also fall short of expectations and targets. A2Z as a single private actor could handle municipal solid waste in the place of urban local bodies in a number of major cities in North India, proved that there are no quick fixes to MSW management.

In Kanpur, Varanasi and Ludhiana, A2Z was unable to provide regular services and reach all wards; its operations relied on heavy public funding to start, and on-going financial support to run. The expensive technology they implemented proved partly inadequate and contracts with municipal authorities did not incentivize recycling and sorting at source, partly dismantling systems already in place (particularly in the informal sector) irrespective of their waste management capacity and contribution to greenhouse gas reductions.

Finally, repeated waste emergencies caused by the interruption of garbage collection in Kanpur, Varanasi and Ludhiana pointed to the high risk of linking essential public service delivery to the commercial performance of a single corporate.

## Measures that can be taken by the Government of NCT of Delhi?

In light of present and past shortcomings, moving away from the legal paradigm that sees government and municipalities as the only actors in charge of SWM management is a much-needed step forward. International success stories (from San Francisco to

Ljubljana) show that MSW will increasingly need broad alliances between a range of private and the public actors in order to succeed. Delhi should learn from these to structure its own model.

The category of 'private actors' should not be narrowly reduced to corporate providers based on assumptions regarding their superior capacity to deliver. *The case of A2Z shows how single waste providers easily run into the same difficulties municipal corporations have faced for decades, with comparable (if bigger) public spending on often inadequate waste infrastructure.*

The core challenge MSW management poses for a city is two-fold: running day-to-day service smoothly (to minimize immediate health hazards), and planning long-term (to control environmental pollution). So far, for neither one have corporates offered a clear advantage. Rather, the reliance on a single corporate for centralized MSW management can turn into an even larger liability for the city government.

The notion of a city's engagement with the private sector can however move from a focus on 'blanket privatization' to one about joint, responsible urban alliances. A successful model will include residents and businesses as primary waste generators and managers, integrating the network, structure and competencies of the informal waste sector, allowing it to formalize and associate as formal waste service providers, who currently run an important part of the waste chain quite efficiently.

Delhi can therefore take the following steps:

- No blanket privatization. The Delhi government should include in the 'private actor' category small and big businesses, as well as the informal sector, for their different roles.



- Prioritize decentralization. Decentralized waste management solutions—reduction of waste, door-to-door collection, segregation at source, and optimal recycling—should be treated on an equal footing with centralized solutions that have been given policy preference thus far.
- Offer specific roles to the large players in the private sectors. Delhi should include the private sector to take over those segments that can make the greatest contribution to managing the city’s wastes, for example transportation, or high-risk categories of waste.
- Define the value addition of the large private players. Delhi should define the added value of corporates in the waste management chain (for activities as diverse as transportation, disposal, or toxic waste management), and integrate its specific contribution within a larger, composite and long-term plan which keeps municipal agencies at the center as coordinator, monitor and regulator of MSW management. The role of private actors would be essential to manage sanitary and toxic waste, which residents cannot handle themselves, and which need dedicated management strategies.



*The case of A2Z shows how single waste providers easily run into the same difficulties municipal corporations have faced for decades, with comparable (if bigger) public spending on often inadequate waste infrastructure.*

## Belief no. 11

### Extended Producer Responsibility (EPR) is an appealing concept but is difficult to apply for post-consumer waste, especially hazardous ones

Growing volumes are not the only threat municipal solid waste poses for a city like Delhi: the changing composition of MSW poses a threat too. Two categories of waste are particularly likely to turn into a hazard for Delhi and its residents' health. The first category is waste that contains substances that pose personal and environmental health hazards. These range from batteries to toxic chemicals to domestic biomedical waste such as sanitary napkins and diapers. The second category is waste that is so common and ubiquitous – from plastic carrier bags to aluminium and laminate packaging – that it ends up representing, in and of itself, a major percentage of the total waste generated by the capital. In both cases, there are either no incentives to segregate these types of waste or the presence of these wastes mixed

with other waste materials poses occupational health and safety risks for those involved in collecting and segregating the waste. These risks are very likely to have translated over the years into a growing financial liability for governments and Delhi residents, particularly in terms of growing environmental and public health expenditures on one side, and declining quality of life, on the other.

If products as common as mobile phones, light bulbs, batteries, tetra packs and multi-layered packaging pose a potential threat and need dedicated handling processes, who should handle them, and how?

Traditionally, the responsibility for handling potentially harmful objects found in municipal solid waste has instead fallen on:<sup>86</sup>

- **professional recyclers**, who recycle, remanufacture or refurbish goods for a profit, irrespective of the hazard they themselves experience.

A. J. Spicer and M. R. Johnson, 'Third-Party Demanufacturing as a Solution for Extended Producer Responsibility', *Journal of Cleaner Production* 12, no. 1 (February 2004): 37–45, doi:10.1016/S0959-6526(02)00182-8.

- **consumers** themselves, if they agree to pay a fee for the removal and recycling of a good marked as potentially harmful at the end of their life, by a third party; this kind of service happens for items such as washing machines and boilers in many European countries.
- The **government**, for which managing specific waste categories separately can support environmental policies, MSW management or public health goals. Worldwide, for example this happens widely for domestic-use batteries.

According to the internationally-accepted principle of extended producer responsibility (EPR), producers need to take charge of dealing with the most threatening waste they generate, including everyday consumer goods. There are a number of forms this can take – from additional taxation to compulsory take-back of products once they are ready to be disposed. Can Delhi make producers become more responsible too?

## What is the situation?

The acronym ‘EPR’ stands for ‘extended producer responsibility’, an approach that focuses on forcing producers to be accountable for the end-of-life of the goods they produce – in particular their take-back, recycling and final disposal.<sup>87</sup> From personal computers to crisps bags, EPR has the objective of having producers *think environmentally* when designing, marketing and pricing their products, by establishing their responsibility to handle the waste they contribute to generate. EPR also imposes on manufacturers the obligation to handle products once they do become waste.

In India, the EPR principle was included for the first time in the E-waste (Management and Handling) Rules, 2011 and the Plastic Waste (Management and Handling) Rules, 2011. Its implementation is however far from a reality. Interviews and FGDs that Chintan carried out in 2014 highlighted that EPR, as a matter of fact, is still only *optional* for the concerned actors in the law. The two sets of rules insist on identifying municipal authorities as the actor primarily responsible for SWM, and fall short of defining sanctions for non-compliant businesses.

The president of the All India Plastic Industries Associations put it bluntly: *“there is no clarity in the government, there is no compulsion, no fining, EPR has not been defined anywhere and not quantified anywhere. The point on EPR also, says “may” the Rules on plastic waste, it does not specify much [...] Unless you quantify the chalaan<sup>88</sup>, nothing will change.”<sup>89</sup>*

Beyond the lack of clarity and enforcement tools, EPR raises questions regarding the lack of basic waste infrastructure and the cost EPR would represent for producers in the absence of any economic incentive. In North America, up to 75% of cars taken back by manufacturers at the end of their life are recycled in the production process, at a considerable net gain for producers, but the recycling rate and economic advantage of EPR is strictly dependent on the nature of the products at stake: unlike cars, for example, personal computers cannot be disposed and recycled without a net cost by producers in the USA.<sup>90</sup> Different industries need to devise specific approaches to the products they market, at different costs.

87 Henrik Harjula and OECD Environmental Directorate, ‘EXTENDED PRODUCER RESPONSIBILITY (EPR): Impacts, Benefits and Costs’ (Dublin, 11 January 2012), <http://www.environ.ie/en/Environment/Waste/ProducerResponsibilityObligations/RecyclingConsultativeForum/FileDownload,16402,en.pdf>.

88 Hindi term for ‘fine’.

89 Chintan, Environmental Research and Action Group, Interview with Ravi Agarwal, President, All India Plastic Industries Association.

90 Spicer and Johnson, ‘Third-Party Demanufacturing as a Solution for Extended Producer Responsibility’.

Ultimately, however, the success of EPR depends on a very large extent on manufacturers' capacity to leverage the existing waste management system to take goods through dedicated channels. The example of Compact Fluorescent Lamps is a case in point.

## Case study - Compact Fluorescent Lamps in India

The lighting industry is one of the fastest growing in India (at a 15% rate in 2013). Since 2005, its major driver has been a 700% growth in sales of compact fluorescent lamps (CFLs).<sup>91</sup> CFLs are marketed as 80% more efficient and 20 time more durable than incandescent bulbs, flooding both the residential and business lighting markets.<sup>92</sup>

Most consumers are unaware that these bulbs, like their predecessors, still contain trace amounts of mercury, a neurotoxin with proven disruptive effects on vital organs such as the liver and the nervous systems, and with a disproportionate impact on children and pregnant women. Even if the amount of mercury contained in each CFL bulb is relatively minimal and safely stored (21.21mg in India, against 1 to 6mg/bulb in Western countries)<sup>93</sup>, it is also easily dispersed in the environment whenever the bulb breaks. The NGO Toxics Link calculated that 8.5 tonnes of mercury are employed every year by this growing sector, and unless proper systems are put in place a significant part of this mercury will eventually be dispersed in the environment, with a higher concentration in large cities and particularly in solid waste.<sup>94</sup>

A recent study by Chintan and GIZ found that currently CFLs are disposed with regular waste by 90% of users, and recycled for parts and material across the city. The study identified six different intermediaries between the initial disposal of a CFL lamp and its recycling in Delhi's informal sector (including door-to-door waste collectors, itinerant waste buyers, aggregators, and dismantlers). With the consumer (and his/her family) and the recycler, up to six groups of people handle a disposed (possibly broken) CFL lamp, and the mercury it contains, without any protection. Very few among these actors are aware of the presence of mercury in the bulbs, and the hazard it poses.

In Delhi, the handling and recycling of CFL bulbs takes place almost completely in the informal recycling sector, following a purely economic logic. Chintan and GIZ calculated that the incentives to divert a CFL bulb from the general recyclers to specialized ones are relatively minimal: a Rs 2.47 subsidy would make it profitable for the collector to deliver the bulb safely and directly to a specialized recycler, rather than channeling it along with MSW. This is a cost that, within an EPR framework, could potentially be borne by producers, or by consumers themselves, if clearly marketed. The same research found out that more than two thirds of consumers are willing to spend Rs. 5 or more for the correct disposal of a CFL bulb, and the cost could be easily marketed as part of the cost of a new bulb.

This, of course, assumes that both consumers and waste handlers are aware of the risks that

91 Lighting Association of India ELCOMA, 'Lighting Industry in India (Value in Rs. Crores Calculated at Wholesale Prices Year 2013 (Jan-Dec)', 2014.

92 Lighting Association of India ELCOMA, 'Light Sources - Future Trends', 9 September 2014, <http://www.elcomaindia.com/lighting/future-trends>.

93 Ashis Chaturvedi et al., Light without the Poison. Putting and End to Mercury Escape from CFL Bulbs., n.d.

94 Toxics Links, Toxics in That Glow. Mercury in Compact Fluorescent Lamps (CFLs) in India (New Delhi, 2011), <http://toxicslink.org/docs/CFL-Booklet-Toxics-in-That-Glow.pdf>.

incorrect handling of disposed CFL bulbs pose, something which can be achieved through widespread awareness campaigns. Urban local bodies have a large role to play in spreading such awareness and in monitoring basic health and safety standards. Without the need to build a parallel infrastructure, this solution could have a significant impact on the quantity of mercury dispersed in the environment in Delhi, in the short and even more so in the long term.

## Measures that can be taken by the Government of NCT of Delhi?

Since the 1970s, putting the burden of pollution on the shoulders of polluters has been an increasingly compelling option. It reduces the quantity of waste produced in the first place, spreads awareness about the hidden environmental and health hazards, forces the inclusion of environmental consideration in the production process, and it impacts the use and scale of toxic and harmful substances in everyday life.

EPR emerged in the first place as a strategy to alleviate the financial burden of pollution on governments and integrate environmental costs in decision-making of private actors, with benefits in the short and long terms alike. Delhi businesses must embrace EPR too as an opportunity to contribute to a new comprehensive SWM strategy for the capital.

The Delhi government can:

- Keep an inventory of toxics present in or as consumer goods, or materials difficult to recycle. The Delhi government should identify and monitor the number and type of toxic and harmful substances present in its MSW.

- Leverage existing policy. It should also initiate discussions with producers' associations under the purview of the E-waste (Management and Handling) Rules, 2011 and the Plastic Waste (Management and Handling) Rules, 2011, and include expert organizations in the definition of EPR implementation frameworks tailored to the current SWM systems, including and upgrading the major contribution of the informal sector.
- EPR as a condition for retail. The Delhi government should identify manufacturing streams for EPR purposes, and impose compliance with EPR policies as a condition for retail in the capital and tendering with government bodies.
- Identify waste streams in need of EPR on priority. Assess the feasibility of applying the EPR framework to other toxic and sanitary waste materials such as sanitary napkins and diapers.
- Create consumer awareness. Awareness campaigns should target the general public, through information sessions in schools, shops and public spaces about the risks of disposing waste indiscriminately, with the definition of disposal channels.

# Recommendations

This section looks back at the findings of this research to draw a number of overarching policy recommendations for the future of municipal solid waste management in Delhi.

## What are the main waste management priorities of Delhi residents?

Our survey asked Delhi residents to tell us about their priorities if they were responsible for waste management for the city. Based on their responses, these priorities were rank ordered. Graph 092 shows the overall relative priorities for residents.

Based on the data, the following emerge as **high** priority for Delhi residents:

- Improve street sweeping including night sweeping;
- Share collection schedules and other relevant information with citizens;
- Increase the number of bins and provide closed bins; and
- Include citizens in monitoring waste collection.

The following emerge as **medium** priority for Delhi residents:

- Use covered vehicles to transport waste;
- Provide timely, regular and professional collection and removal of waste;
- Take steps to reduce waste generated; and
- Involve waste pickers in the collection and recycling of our waste.

The following emerge as **low** priority:

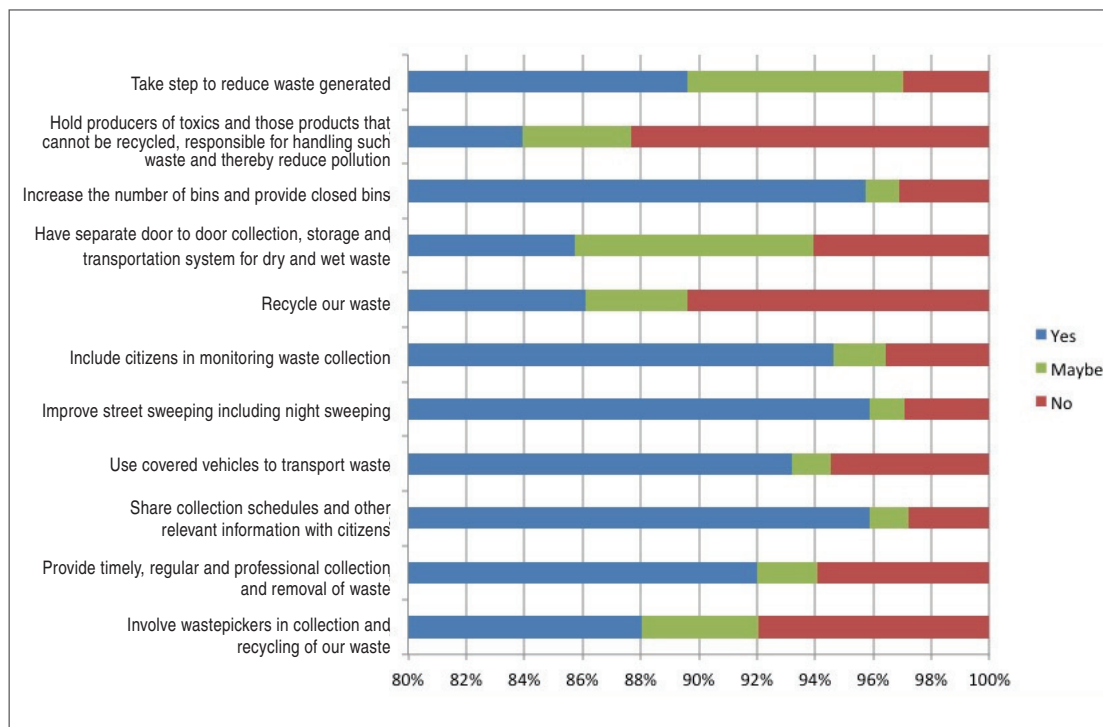
- Recycle our waste;
- Have separate door-to-door collection, storage and transportation systems for dry and wet waste; and
- Hold producers of toxics and those products that cannot be recycled responsible for handling such waste and thereby reduce pollution.

But residents' priorities are not the same across municipalities and income categories. The tables below provide the relative ranking of residents' priorities based on the percentage of respondents who responded affirmatively ("yes") to a particular priority. The same rank for multiple priorities implies

that the same proportion of respondents responded affirmatively to that particular priority.

As the table below suggests, although residents of North and South Delhi municipalities are in overall agreement with city-wide waste management priorities, residents in East Delhi have markedly different priorities. For instance, involving waste pickers emerges as a top priority for East

Delhi residents. In addition, while South and New Delhi residents agree with overall high-priority areas, there are differences in low and medium priority areas that should be taken note of as municipalities try and improve their waste management systems. For instance, reducing waste emerges as a much lower priority for South and New Delhi residents than East and North Delhi residents.



**Graph 102:** Respondents' priorities for solid waste management in Delhi

Priority	Overall	North Delhi	South Delhi	East Delhi	New Delhi
Improve street sweeping including night sweeping	1	2	2	4	2
Share collection schedules and other relevant information with citizens	2	3	1	2	2
Increase the number of bins and provide closed bins	3	1	3	5	1
Include citizens in monitoring waste collection	4	4	4	7	1
Use covered vehicles to transport waste	5	5	5	10	1
Provide timely, regular and professional collection and removal of waste	6	6	6	9	2
Take steps to reduce waste generated	7	7	9	3	4
Involve wastepickers in collection and recycling of our waste	8	8	7	1	3
Recycle our waste	9	10	8	6	1
Have separate door to door collection, storage and transportation system for dry and wet waste	10	9	10	8	2
Hold producers of toxics and those products that cannot be recycled, responsible for handling such waste and thereby reduce pollution	11	11	11	10	2

As the table below demonstrates, respondents in the lowest income category (D) differ from the rest in their priorities. For respondents in the higher income categories (A through C), high priority areas are in alignment with city-wide priorities. But for the lowest income

category respondents, waste collection and transportation system improvements such as covered vehicles and, timely, regular and professional collection services are higher priorities than for other income categories.



Priority	Overall	A	B	C	D
Improve street sweeping including night sweeping	1	2	1	2	3
Share collection schedules and other relevant information with citizens	2	1	2	1	3
Increase the number of bins and provide closed bins	3	3	3	3	4
Include citizens in monitoring waste collection	4	4	4	4	3
Use covered vehicles to transport waste	5	5	6	5	1
Provide timely, regular and professional collection and removal of waste	6	7	5	6	2
Take steps to reduce waste generated	7	6	9	11	9
Involve wastepickers in collection and recycling of our waste	8	8	7	7	7
Recycle our waste	9	11	8	8	6
Have separate door to door collection, storage and transportation system for dry and wet waste	10	9	10	9	5
Hold producers of toxics and those products that cannot be recycled, responsible for handling such waste and thereby reduce pollution	11	10	11	10	8

## Measures that the Government of NCT of Delhi can take

Based on residents' waste management priorities discussed in the previous section, their responses to other survey questions, focus group discussions, and interviews with key stakeholders, the following key ways are suggested in which the Government of Delhi can improve waste management in Delhi.

- 1. Implement the internationally accepted waste management hierarchy** (above). The base of the pyramid of the waste management hierarchy focuses on source reduction and reuse. This study has shown that many Delhiites are willing to change their consumption behaviors in the interest of reducing the city's waste burden. Growing consumption is an indicator of economic development, but so is waste. To



**Figure 3:** Waste management hierarchy (US EPA)

address this dilemma, we believe the city should take the following steps:

- a. Focus on categories of waste that are the biggest problem in terms of volumes: for instance, non-recyclable materials that are used for packaging. Reduction at-source should focus on these specific materials.
  - b. Support the existing positive attitude towards re-using. We have a long and rich tradition of reuse in our economy. The communities that provide such services are being pushed to the margins, despite a growing market for such economic activities. The Government should focus on identifying and encouraging economic activities that promote the reuse of materials.
- 2. Redefine and implement an integrated waste management framework.** One actor cannot be in charge of waste management services end-to-end. Waste can be managed effectively only if each actor focuses on what it does best, with the government setting minimum standards. As chapter 4 of this report has shown, blanket privatization of waste management services has not worked in the country. The Government should:
- a. Map out the waste management lifecycle and identify the various service providers and their specific strengths – private waste management firms, the informal sector, and the Government.
  - b. Delineate the responsibilities of each service provider in the capital’s waste management, and the areas where collaboration between them is essential. For instance, the informal sector can provide collection services and private firm transportation services, but the two actors need to formalize a collaboration based on the complementarity and economic interdependence they have.
  - c. Determine the infrastructure required for future end-to-end waste management. For instance, separate treatment systems should be put in place for dry and waste, and temporary storage systems for those two kinds of waste are needed at the neighbourhood level.
  - d. Set benchmarks and standards for the performance of each actor need to be clearly defined. For instance, establish some cleanliness standards for the work that the informal sector does instead of getting rid of *dhalaos* altogether. *Dhalaos* serve an important purpose in the waste management chain, and are catalyzers of people’s perceptions about waste and the quality of life in their neighbourhood. The Delhi Master Plan 2021 action plan also clearly specifies 0.02% of land per neighbourhood for *dhalaos*.
  - e. Establish processes, policies, and mechanisms for the monitoring and enforcement of performance standards for each service provider including the Government itself. This will allow for identifying where and exactly how the process is not functioning according to standards.

- 3. Do not blindly adopt technology.** Large-scale or advanced technology is not always, or in itself, the answer to Delhi's waste problem. There are cheaper and more efficient ways of managing waste deep rooted in our traditions: they can be adapted and upgraded with minimal investment. In particular:
- Waste-to-energy technologies seem to provide an easy answer to the city's growing waste problem, but they have not performed to its full extent. Pollutants from these plants have not only caused negative health repercussions for communities around the facilities, they have also downgraded their overall image in the public eye. The complexity of the waste stream makes this expensive technology far from an ideal choice in the Indian scenario. Continuing to invest in such technologies is clearly not the answer to a complex problem. For existing plants, the Government should ensure that pollution control standards are in place and are adhered to before they are allowed to continue to function.
  - Hopper vehicles that collect waste at source, compact it and transport it are not necessarily a good idea. In cities like Delhi, they replace more efficient and environmentally-friendly rickshaws and manual doorstep collection by the informal sector. Hopper vehicles are not appropriate as a waste collection system for the city because of three reasons: (a) They are expensive and the cost doesn't reflect increases in collection efficiency; (b) They pollute more because they replace non-fuel consuming rickshaws; and (c) They reduce the number of livelihoods by replacing people with machines, with adverse social and economic impacts. However, they could easily act as feeder

vehicles where doorstep collectors are linked to them.

- 4. Implement and encouraged decentralized waste management solutions.** Several existing experiments by RWAs and individual bulk waste producers show that decentralized waste management is possible and works. The city will see results in the effectiveness of solid waste management if decentralized solutions are encouraged on a large scale. In support of this alternative, the Government should:
- Provide funding, and space for groups to manage the waste they produce to the extent they can, as close as possible to where it is generated (markets, households, hotels). RWAs could employ the informal sector waste collectors to manage composting systems locally.
  - Establish protocols and guidelines for such initiatives to be successful, involving NGOs to provide technical and implementation guidance. Something as simple as a website where groups could access information about setting up such systems, the resources available and a forum for discussion could alone reduce the burden that needs to be managed through a centralized system.
  - Offer financial or non-financial incentives for groups, for instance rewarding waste diversion based on quantities.
- 5. Consider composting as a viable waste treatment solution.** Composting is also not a foregone conclusion. Composting is one of the cheapest options for waste treatment with an unparalleled effect on waste volumes and the environment. Composting at home is likely to yield the best results following by composting at the neighbourhood level followed by city level composting facilities. The Government should do the following:

- a. Encourage composting at the household level through public awareness campaigns.
- b. Encourage composting at the neighbourhood level through decentralized waste management initiatives (see above).
- c. For decentralized composting, support the communities in finding markets for compost, for instance, within the Government's own horticultural department and in neighbourhood parks.
- d. Set standards for compost quality and monitor centralized composting facilities for compliance against those standards.
- e. Develop compost buy-back policies for small organic waste producers (less than 10 tons in one composting site) to encourage internal markets for compost within the city's boundaries and to reduce the burden of wet waste.

**6. Involve residents in waste management:**

Contrary to popular belief, this study shows that many residents see waste management as a crucial problem and are keen on getting involved in waste management initiatives. Segregation-at-source is fundamental to optimizing waste management systems. Although they do not understand certain segregation categorizations such as biodegradable/non-biodegradable waste, residents do understand the importance of segregation. The following are three ways in which the Government should encourage public involvement in waste management:

- a. Spread awareness about what and how to segregate among waste generators.
- b. With the support of NGOs, train waste collectors to collect, transport and store segregated waste separately.

- c. Provide separate storage and collection infrastructure at the neighborhood level.
- d. Finally, by sharing with citizens collection schedules and waste management protocols, and providing avenues for residents to submit their complaints, the Government could leverage public involvement in the improvement of the city's waste management systems.

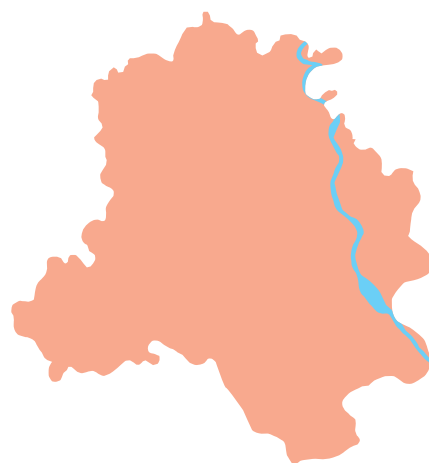
**7. Organize and formalize the informal sector:**

Our study shows that the commonly held belief that informal sector waste pickers should have no place in a modern city like Delhi has very little support. Overall, there is widespread recognition of the important work that the informal sector does in waste management service provision and an interest in seeing their work formalized and organized. Residents see the informal sector as an asset to be leveraged for improving waste management services. The Government should as well by doing the following:

- a. Recognize the work of the informal sector by issuing them identification cards which legitimize them as private providers of public services.
- b. Establish protocols and standards for the professionalization of their work.
- c. Train them to follow the established protocols and standards.
- d. Work with residents and NGOs to ensure that the informal sector is providing services according to established protocols and standards.

**8. Implement Extended Producer Responsibility (EPR) for specific materials in the waste stream.** EPR needs to be implemented. Delhi should lead the country in embracing EPR as a valid waste management solution by doing the following:

- a. Implement existing EPR policies, including for e-waste and plastic waste. The Government needs to ensure that producers know and understand their responsibilities in the implementation of the Plastic and E-waste (Management and Handling) Rules. The Government also needs to operationalize the rules by clearly allocating responsibilities to producers and establish systems for monitoring their enforcement.
  - b. Identify specific waste streams that require producers' direct engagement to manage end-of-life product disposal, like sanitary napkins and diapers.
- 9. Spread awareness** among residents, bulk waste generators, RWAs, and producers on relevant issues related to waste management:
- a. For residents, the Government should focus on segregation, composting, monitoring, collection schedules and the place of waste in a city like Delhi.
  - b. For bulk waste generators, the Government should help them manage at-source as much of the waste they generate as possible.
  - c. For RWAs, the Government should focus on helping establish decentralized waste management initiatives.
  - D. For manufacturers, the Government should engage them on their role and broader responsibilities as economic actors with a direct decision power on what waste is generated, clarifying the mechanisms for monitoring and enforcing those responsibilities.



*Focus on categories of waste that are the biggest problem in terms of volumes: for instance, non-recyclable materials that are used for packaging. Reduction at-source should focus on these specific materials.*

# Frequently Asked Questions

## What is solid waste?

Waste is what each one of us discards thinking that it has no more use. It can be a wrapping, leftover food, a worn out product (large or small) or a device that stopped functioning. We constantly discard things – from food wrappings to old cars: generating waste is an integral part of life, but it is particularly significant in consumerist societies where a growing numbers of goods with a short life are commercially accessible for a growing number of people. Our waste reflects who we are what we do, what we eat – it reflects our beliefs, choices, tastes, our income, and most of all, our lifestyle and the lifestyle of those around us. Solid waste differs from liquid waste in that it cannot be removed automatically through underground sewage infrastructure, but requires a constant logistical effort.

## Is waste bad?

Waste can become a problem when it comes in the way of our present and future wellbeing. This happens when there is too much of it accumulating in the same place, or when waste contains materials that are toxic and hazardous – that is materials that need to be handled with special care. Too many plastic bags thrown in the streets can choke a drain or be ingested by a cow; a single CFL

bulb that breaks when it is discarded will release mercury vapors, a substance that is highly toxic for humans, affecting children and pregnant women in particular. Waste is a particularly bad problem in cities, due to lack of space, growing populations and the ubiquitous availability of disposable goods. However, solid waste can also be a very serious problem in sparsely populated places where regular waste removal is not available, like the trekking trails of the Himalayas or lakes.

## Is all waste bad?

Most of the things we discard are made of materials that, if recovered and segregated, can be reprocessed, in full or in part, to produce new goods without extracting virgin material from the environment. This process is called recycling, and represents an important national economic sector, as well as an important way to preserve the environment for present and future generations and to save limited resourced dedicated to solid waste management.

Some of the things we discard can also be simply reused – with the same use but at a lower quality ('reusing'), or with a new use ('up-cycling' or 'down-cycling', as in the case of old clothes transformed into carpets or plastic bags used to build tarmac roads).

## What is Solid Waste Management?

Solid Waste Management is a set of actions that aim to reduce drastically and in a planned way the chance of waste becoming a threat for people or the environment, in the present and in the future. These actions include removing, transporting, processing and disposing of solid waste away from waste generators, based on its type and composition. The most important categories of waste are wet (biodegradable) and dry (non-biodegradable) waste. Both wet and dry waste include recyclable and non-recyclable materials. Biodegradable waste is typically organic – food waste, leaves, paper etc.; non-biodegradable is material that will not decompose, or will take extremely long times to change physical and chemical structure if not processed – metal, glass, plastic, etc.

## Who is responsible for Solid Waste Management?

Legally, urban local bodies are the main actor responsible for solid waste management in India. Citizens have however the largest power with regard to solid waste management: they are the ones who generate waste, individually, as families, and as businesses. The habits of citizens in disposing of waste can make the work of authorities very easy or very difficult – whatever the technology and approach employed.

Currently, India also has a very large number of people (estimated as 1-2% of the urban population) who work informally in the recovery of recyclable materials that are sent to the recycling industry. The role of the recycling industry, and particularly of informal sector workers – from waste pickers to small scrap dealers – has been proven to be critical in Indian cities' solid waste management, where they handle up to 20% of

the waste generated, but still needs to be fully recognized or supported.

Manufacturers also have a legal responsibility to take on the disposal of the goods they sell, and accordingly to keep in mind disposal when designing a product. This implies not using materials that cannot be recycled, and offering options for consumers to dispose safely of products – including by returning to them – at the end of life of products.

The future of solid waste management depends in large part on the capacity these four (intersecting) groups – government, citizens, manufacturers and informal sector workers to work together. This is what 'participatory solid waste management policy' means.

## What kinds of waste exist?

Waste is categorized by type: different rules apply to the handling of different types of waste in India. At the level of municipalities, government regulations differentiate between: municipal solid waste, construction and demolition waste, e-waste (electronic and electrical waste), hazardous/industrial waste, biomedical waste, and plastic waste. Within the broad category of municipal solid waste, waste materials are often categorized as dry and wet waste, or biodegradable and non-biodegradable waste. Biodegradable or wet waste comprises of kitchen or food waste and is organic waste most of which can be easily composted. Dry waste includes all inorganic materials. Besides from this broad categorization, an important portion of the waste stream is sanitary waste. This includes used sanitary napkins, diapers, needles, condoms and band aids. These are hazardous as they contain bodily fluid through which infectious diseases are easily transmitted – if not segregated from other waste, they pose a high risk to the health of waste handlers. Unfortunately, no specific rules currently apply

to the management of such wastes in India unless produced within the premises of a medical institution.

## How much waste does India produce?

We only have estimates of the amount of waste generated in India. According to a 2007 study, India produces 960 million tons of waste annually.<sup>95</sup> A 2000 Central Pollution Control Board study, India generates about 48 million tons of MSW annually and this number is expected to increase to 300 million tons by 2047.<sup>96</sup> A 2010 McKinsey report estimates urban waste generation in 2007 at 71 million tons per year. The report estimates this to increase to 377 million tons by 2030.<sup>97</sup> A 2012 World Bank report estimates current annual MSW generation in India at 40 million tons and expects it to increase to 136 million tons in 2025.<sup>98</sup> Of this, over 50 percent is produced by cities with population greater than 1 million.<sup>99</sup>

## How much waste does Delhi produce?

Much like at the national level, data on waste generation at the city level is also based on estimates. In this case, estimates are based on the amount of waste that is received at the landfill, which excludes the waste that is never collected (up to 30%) and the significant proportion of the waste (from 20 to 60%) that is recycled by the informal sector and never reaches landfills. According to Delhi

Department of Environment's website, the city produces approximately 8,000 tons of MSW per day.<sup>100</sup> The regional plan for the National Capital Region (NCR) estimates that NCT Delhi produces approximately 9,488 tons/day in 2001 and this is expected to increase to 15,413 tons/day by 2021.<sup>101</sup> A World Bank report estimates MSW generated in Delhi at 5,875 tons/day in 2005 (See footnote 4). A McKinsey report estimates that Delhi produces 3.2 million tons of waste per year in 2007 and this number is expected to rise to 14.1 million tons per year by 2025 (See footnote3).

## How much waste do I produce?

Per capita waste generation rates are typically calculated based on total waste generated divided by the population and are therefore only as accurate as the estimates of total waste generation rates and population sizes. Further, there is significant variation in the amount of waste generated based on household income. A World Bank study estimates per capita waste generation rates in Delhi at 0.57kg/day in 2005. The same report estimates current national waste generation rate in India at 0.34 kg/capita/day. This number is expected to double to 0.7 kg/capita/day by 2025 (See footnote 4).

## How can waste tell whether a person is rich or poor?

Waste can tell a person's income in two ways – through quantity and composition. Rich people typically consume more and therefore

95 Pappu, A., M. Saxena and S. Asolekar. 2007. Solid waste generation in India and their recycling potential in building material. *Building and Environment* 42(6): 2311-2320

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101 [http://ncrbp.nic.in/pdf\\_files/13bmodified\\_ch09swm.pdf](http://ncrbp.nic.in/pdf_files/13bmodified_ch09swm.pdf)



produce more garbage than poor people. A 2004 study examined waste generation rates in Delhi's households of differing socio-economic composition and found that per capita waste generation rate in low income household (maximum individual income less than Rs. 3000/month) was 0.14 kg/capita/day, in middle-income households (maximum individual income between Rs. 5,000-10,000/month) was 0.28 kg/capita/day, and in high income households (maximum individual income more than Rs. 15,000/month) was 0.31 kg/capita/day.<sup>102</sup> Rich people also consumer differently and therefore produce garbage of different composition than poor people. A 2007 study commissioned by the Municipal Corporation of Delhi examining waste composition in 4 different socio-economically delineated neighbourhoods in Delhi found that the proportion of recyclable materials and calorific value of waste increases with income (*ibid*).

## Who is responsible for waste in Delhi?

All those who consume commodities and therefore produce waste are responsible in some way for waste in Delhi. The Delhi Municipal Corporation Act and Municipal Solid Waste (Management and Handling) Rules 2000 hold municipalities accountable for ensuring that the waste generated in the city is managed properly. For certain types of waste, such as e-waste and plastic waste, government rules have adopted the principle of extended producer responsibility which holds manufacturers of those commodities responsible for their proper disposal. Under this principle, manufacturers of electronic/electrical commodities and plastics are required to establish collection centers for plastics and e-wastes.

## What is a citizen's role in waste in any city?

Citizens should abide by the principle of the three Rs—Reduce, Reuse, and Recycle. Reducing consumption should be the very first step. Reusing old things rather than buying new things should be next in line. Although citizens typically cannot recycle materials themselves, they can help improve the quality of recyclable waste and enable safer work conditions for waste handlers by practicing segregation-at-source.

## How much does a municipality spend on handling my waste? Does all of it come from the taxes I pay?

According to a 2003-4 budget estimates, municipalities in Delhi spend approximately 17 percent of their annual budget equivalent to about INR 38,601 Lacs on MSW management in Delhi. On a per capita basis, this translates to Rs. 268 annually (See footnote 7). Only about 0.5% of expenditures in waste management are covered through revenues from waste management services. Most of the expenditure in waste management is financed through municipal taxes. But there is widespread agreement within the government and policy advisors that the MSW sector is under-financed and requires significant capital investment to improve service delivery and the cleanliness of cities across India (see footnotes 3 and 5). A 2014 report by the Planning Commission recommends financing models for various MSW management activities in which the share of the Government of India ranges between 30 and 50%, state's share is between 10 and 35% and private investment between 30 and 50% (see footnote 5). Citizens

102 COWI and Kadam Environmental Consultants. 2004. *Feasibility Study and Master Plan for Optimal Waste Treatment and Disposal for the Entire State of Delhi based on Public Private Partnership Solutions*. Delhi: Municipal Corporation of Delhi

contribute minimally to solid waste manager financing directly, by paying waste collectors who dispose their waste in community bins.

## What is the ideal waste scenario from the perspective of an individual, a household, a colony, an office, a ward and a city?

The efficiency of resource recovery from waste decreases as waste moves from the point of generation to the point of disposal because of the potential of contamination of recoverable materials along the way. For example, paper that got wet or dirty with other waste, cannot be recycled. For this reason, the more localized waste management is, the better resource recovery results it is likely to yield. From the perspective of an individual/household/office, the ideal waste scenario is that segregation-at-source takes place in at least three different categories: organic or biodegradable or wet waste; recyclable dry waste; and non-recyclable and harmful waste such as sanitary waste and sharp objects. These should be collected and managed separately by waste collectors and the city's waste management systems. If individuals/households/offices are able to compost at source, they can reduce their waste footprint on the city's systems considerably by processing their organic waste which accounts for anywhere between 50 and 70 percent of total waste generated. From the perspective of a colony, the ideal waste system should involve ensuring that all households practice source segregation and set up decentralized composting systems with the help of informal sector workers. If possible, colonies could also set aside a small area to allow waste collectors to temporarily store recyclable materials. From the perspective of a ward, space needs to be allocated for decentralized waste management activities including composting space in local parks and localized material recovery facilities that

allow for optimal resource recovery. RWAs have a large role to play in this regard. From the perspective of the city, the ideal should be to enable as much resource recovery as possible so that what needs to be disposed is only non-recoverable and harmful material. Cities can do this by providing financial and technical guidance to encourage local waste management systems and ensuring that space for decentralized and centralized waste management systems is allocated in city master plans. The informal sector plays a crucial role in providing waste management services in cities, therefore cities must include, recognize and formalize them to be a part of their urban service provision systems, as a recognized profession.

## What kinds of wastes are the worst?

From the perspective of waste handlers, wastes that are injurious and harmful such as sharp objects and sanitary waste are the worst. From the perspective of cities, toxic waste and non-recyclable waste (waste that cannot be reprocessed into useful materials) is the worst.

## What is the first step I need to take to handle waste?

The first step one can take in handling waste is segregating it into at least three categories: organic or biodegradable or kitchen waste; recyclable dry waste; and harmful or injurious waste such as sharp objects and sanitary waste.

## Does waste cause pollution? If so, how?

Waste causes pollution in a number of ways. Open burning of waste, especially particular kinds of plastics, releases toxic fumes that contain harmful chemicals such as dioxins and furans that pollute the air and can cause various health problems including

reproductive, developmental, hormonal and cancers in humans.<sup>103</sup> Further, toxic metals including heavy metals (Arsenic, Beryllium, Cadmium, Lead etc.) from different kinds of waste pose significant health hazards.<sup>104</sup> Litter is not only unsightly but can choke urban drainage systems that can then cause floods. This disproportionately affects the poor because they often live in areas that have more open drains. Throwing garbage directly into waterways pollutes the water. Aquatic life can choke on various kinds of waste materials particularly plastics. Toxics and heavy metals can leach out from waste materials into the waterways poisoning human and non-human organisms that access those waterways. In landfills and open dumps, rotting garbage produces methane which is a greenhouse gas. Spontaneous fires from methane at dumps also pollute the air. Leachate is a liquid that seeps out of rotting garbage and is highly toxic and is known to be carcinogenic. This seeps into our groundwater supplies posing significant health hazards. A 2014 study by Jawaharlal Nehru University's Department of Environment on the ground soil of Delhi's three landfills showed that the level of organic pollutants on these sites exceeded permissible levels by 158 times.<sup>105</sup>

## Does waste damage our health? How?

Waste damages our health in many ways. First, it most immediately damages the health of those who handle the waste because they often get injuries and various kinds of illnesses from different waste materials. Second, unmanaged garbage allows various kinds of disease vectors to flourish such as flies, mosquitoes and rats. A single household garbage bin can

produce up to 30,000 flies per week.<sup>106</sup> The potential of disease vectors from community bins and open dumps is immense. Third, air, water and groundwater pollution from waste affects all of us.

## Why should we think of wastepickers as useful to our city?

Wastepickers provide crucial waste management services to our city by collecting, sorting and recycling waste materials and thereby reducing the waste burden on cities. Without their work, our city would be buried under piles of garbage. According to some estimates, waste pickers recycle anywhere between 20 and 60 percent of the waste we produce. Furthermore, they are not often paid for the services they provide, so in essence by doing a part of the work of municipalities, they subsidize the urban services that we all benefit from.

## Wastepickers dirty the entire pavement when they sort out the waste-why isn't that being stopped? How can it be stopped?

They could be trained to sort out waste without making a mess. To do so, space can be allocated to them for sorting waste. Further, timely collection and removal of garbage from collection points such as dhalaos can ensure that bins don't overflow.

## Wastepickers are poor, but how poor?

No doubt wastepickers are amongst the poorest of the urban poor. But by extracting

103 <http://www.who.int/mediacentre/factsheets/fs225/en/>

104 <https://www.osha.gov/SLTC/metalsheavy/>

105 <http://www.dailymail.co.uk/indiahome/indianews/article-2864658/Delhi-risk-landfill-sites-leak-cancer-causing-chemicals-water-supply.html>

106 <http://ipm.ncsu.edu/srurban/CHAP6/flies.htm>

and recycling waste materials, they often make enough money to make a living though at the expense of their own health.

## Why don't we recycle our waste in India?

Contrary to popular belief, India has a vibrant and efficient recycling system that is enabled by the work of wastepickers. Most of us segregate and store high-value recyclable materials to sell to kabariwalas or itinerant buyers. Aside from this system, wastepickers go through our garbage to sort out recyclable materials. This recyclable materials is sold to waste dealers who then provide this as raw materials to reprocessing units. Aside from recycling, we also have systems of reuse and exchange such as exchange of old clothes for kitchen utensils. Compared to the West and developed countries where recycling systems need to be heavily government subsidized, our systems are self-sustaining, even though waste professional still pay a high price in terms of health and wellbeing for lack of recognition, training and gear.

## Paper is not recycled in India. What should I do? Shall I start recycling it?

Paper is recycled in India by the informal sector. The only paper that isn't recycled is what gets contaminated and wet by mixing with other waste. What you can do to make this system even more efficient is to keep dry waste like paper separate from wet waste and give it to your kabariwala or doorstep waste collector. The paper industry in India currently imports large quantities of paper from abroad, for lack of waste paper in the domestic recycling market.

## I want to do something to handle the waste in my office-shall I set up a paper recycling unit?

See responses above.

Plastics are terrible, I know. But I can't stop using every single plastic. What should I do?

You can do a few things.

- You can reduce your plastics consumption by substituting it with other materials such as cloth bags.
- You can reuse your plastic bags rather than getting new ones every time you go to the market.
- You can advocate for plastics manufacturers to substitute plastics packaging with other less harmful materials.
- In 2011, India passed the Plastic Waste Management and Handling Rules that specifically apply to the management of particular kinds of plastic waste. These rules hold producers of plastic packaging accountable for their disposal using the concept of Extended Producer Responsibility which asks that the plastic manufacturers set up collection centers for currently non-recyclable plastic wastes. Unfortunately, these rules have yet to be implemented. You can help by writing to your local politicians to demand that the plastics industry be held accountable for the waste it produces.

## I want to be part of Making Delhi Swachh. What shall I do?

You can be a part of making Delhi Swachh by doing some very simple things. First, you need to segregate your waste at source (into wet,

dry and hazardous) so that you enable safer working conditions for waste handlers and improve recycling rates. Second, you could start composting at home to reduce the waste burden on the city. Third, you could talk to your RWA to make sure source segregation is enforced in your colony and perhaps even set up a local neighbourhood composting system. Fourth, you should talk to your waste collector to understand how you can help them do their work better. Fifth, you should make sure that kabariwalas are allowed into your colony so that our existing system of recycling works well. Sixth, you could make sure you give potentially toxic waste such as e-waste only to authorized collectors.

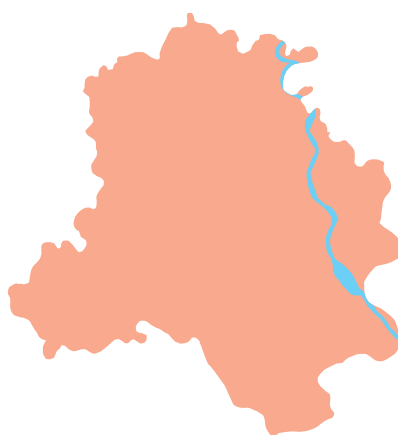
### **I feel that we have to first and foremost stop littering. If we do that, India will become a clean country. Am I right?**

Stopping littering is a great idea but unfortunately is not the panacea for India's waste management woes. Following the three Rs—Reduce, Reuse, and Recycle – will help make India much cleaner. Stopping litter

largely only resolves an aesthetic problem. The garbage produced even if it's not littered around Delhi's streets still needs to be managed. Unfortunately, our existing landfills have reached capacity and space for new landfills is increasingly hard to find. Following the three Rs will do a long way in helping alleviate the waste burden on our cities.

### **We can't move ahead without segregation of waste. Am I right? Is this the biggest problem with India and our waste?**

We can move ahead with source segregation. In the long term, this will be key to making our country cleaner. Most people blame their household members or their domestic help for lack of source segregation. Others blame waste collectors. The problem is partly behavioural but mostly infrastructural. There is no sense in segregating waste at source if separate systems for collection, transportation, and waste processing do not exist. You can do your part by separating waste but the city also needs to do its part by ensuring that those systems and infrastructures are put in place.



## Glossary of Hindi terms

*Dhalao*: community bin. In Delhi they are typically roofed rooms located on the side of the street and open on one full side. *Dhalaos* are a very common small-scale infrastructure built by the municipal authorities to be used as a waste collection point. The Delhi master Plan 2021 action plan also earmarks 0.02% of land per neighborhood for *dhalaos*. Residents are expected to throw their waste at the *dhalao*, where it is later collected by municipal authorities, but most often these spaces are used by informal sector waste workers who carry out doorstep collection, to segregate household waste and recover recyclable material after their rounds in the neighbourhood. The state of *dhalaos* is a contentious issue in current debates around waste, with proposals to eliminate them completely.

*Kabariwala* (also spelled as *kabari*, *kabadiwala* or *kabadiwalla*): itinerant buyers of recyclable material and small scale recyclers and waste traders. They are ubiquitous in residential neighbourhoods in Delhi and other cities in India, where they circle on foot or bicycle with a large bag and purchase used items for recycling from households. They also work with business establishments. The most common items in the trade are newspaper, cardboard, glass and metals scraps, but they also buy old electric appliances or furniture. They need a fixed amount of capital investment for running their occupation as they purchase the waste. They do not handle wet waste.

*Chalan*: administrative fine

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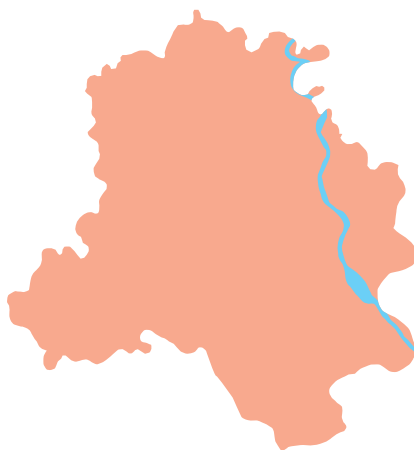
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# Appendix 1

## Survey Questionnaire



Department of Environment, Government of the  
National Capital Territory of Delhi

AND

Deutsche Gesellschaft für Internationale  
Zusammenarbeit (GIZ)

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Knowledge, Attitudes and Perceptions (KAP)  
Survey of Households Regarding Waste Management  
in Delhi

Municipality \_\_\_\_\_

Code \_\_\_\_\_

District \_\_\_\_\_

Surveyor \_\_\_\_\_

SEC Category \_\_\_\_\_

Date \_\_\_\_\_

Phone Number \_\_\_\_\_

Time \_\_\_\_\_

### DEMOGRAPHIC INFORMATION

1.1 What is your age? \_\_\_\_\_

1.2 What is your gender?

Male  Female

1.3 How many people reside in your household? \_\_\_\_\_

1.4 Please take a look at this list and tell me which of these items do you have at home? It could be owned by you, your family, provided by the employer or it could be available in the house you live in; but it should be for the use of just you or your family. We need this information just for survey classification purpose only. Circle and then tick items owned/ have at home. Add the number of ticks in the box.

Question	Circle	Tick
Do you have the following items in your home in working condition?		
Electricity connection	01	
Ceiling fan	02	
LPG stove	03	
Two wheeler	04	
Colour TV	05	
Refrigerator	06	
Washing machine	07	
Personal computer/laptop	08	
Car/jeep/van	09	
Air conditioner	10	
Does your family own any agricultural land, by agricultural land I mean land that is currently under cultivation or plantation?	11	
<b>Number of standard 11 owned</b>		

- 1.5 Are you the person who makes the biggest contribution to the running of the household?  YES  NO
- 1.6 If your response to 1.5 is no, to what level have you studied?
- Illiterate  Some college (including a diploma but not a graduate)
- Literate but no formal schooling/ Schooling up to 4 years  Graduate or post graduate (general)
- Schooling between 5 to 9 years  Graduate or post graduate (professional)
- Senior secondary / Higher secondary
- 1.7 To what level has the person who makes the biggest contribution to the running of the house hold studied? This could be you or someone else. Based on the response to this question and 1.4, circle the SEC category below. Record the result in the SEC category field above also.

Number of Durables (From 1.4)	Illiterate	Literate but no formal schooling/ School-Upto 4 years	School- 5 to 9 years	SSC/ HSC	Some College (incl a Diploma) but not Grad	Graduate/ Post Graduate: General	Graduate/ Post Graduate: Professional
	1	2	3	4	5	6	7
None	E3	E2	E2	E2	E2	E1	D2
1	E2	E1	E1	E1	D2	D2	D2
2	E1	E1	D2	D2	D1	D1	D1
3	D2	D2	D1	D1	C2	C2	C2
4	D1	C2	C2	C1	C1	B2	B2
5	C2	C1	C1	B2	B1	B1	B1
6	C1	B2	B2	B1	A3	A3	A3
7	C1	B1	B1	A3	A3	A2	A2
8	B1	A3	A3	A3	A2	A2	A2
9+	B1	A3	A3	A2	A2	A1	A1

## SOLID WASTE MANAGEMENT

### 2. Waste Generation, Storage and Segregation

ID	Question	
2.1	How much waste do you generate on a daily basis? Estimate in grams or kilograms.	Go to 2.2
2.2*	How do you store your household waste?	Go to 2.3
2.3*	How do you dispose of your household waste?	Go to 2.4
2.4	Do you know the difference between biodegradable and non-biodegradable waste? <span style="float: right;">YES   NO</span>	Go to 2.5
2.5	Do you segregate your waste? <span style="float: right;">YES   NO   DO NOT KNOW</span>	If YES, go to 2.6 Else, go to 2.9
2.6	In what categories do you segregate your waste? <span style="text-align: center;">Dry/wet waste   Biodegradable/non-biodegradable waste   Other (Please specify)</span>	Go to 2.7
2.7*	Why do you segregate your waste?	Go to 2.8

2.8	Does the waste collector mix your segregated waste? YES   NO   DO NOT KNOW	Go to 2.10
2.9*	Why don't you segregate your waste?	Go to 2.10
2.10	Do you sell any items to the kabariwalas? YES   NO   DO NOT KNOW	If YES, go to 2.11
2.11*	What items do you sell to the kabariwalas?	Go to 2.12
2.12*	Why do you sell items to the kabariwalas?	Go to 3

### 3. Doorstep Waste Collection

ID	Question	
3.1	Does someone collect waste from your house? YES   NO   DO NOT KNOW	If YES, go to 3.2 Else, go to 3.9
3.2*	Who collects waste from your house?	Go to 3.3
3.3	How frequently is your household waste collected? Daily   Alternate days   Twice a week   Once a week   Occasionally	Go to 3.4
3.4	Do you pay for doorstep waste collection? YES   NO   DO NOT KNOW	If YES, go to 3.5 Else, go to 3.7
3.5*	Who do you pay for doorstep waste collection?	Go to 3.6
3.6	How much do you pay monthly for doorstep waste collection? Less than Rs. 30   Rs. 31-50   Rs. 51-100   Over Rs. 100	Go to 3.7
3.7	Are you willing to pay or pay more for better doorstep waste collection? YES   NO	If YES, go to 3.8 If NO, go to 4
3.8	How much or how much more per month are you willing to pay for better doorstep waste collection? Less than Rs. 30   Rs. 31-50   Rs. 51-100   Over Rs. 100	Go to 4
3.9	Would you like a doorstep waste collection service? YES   NO	If YES, go to 3.10 If NO, go to 4
3.10	Would you be willing to pay for doorstep waste collection? YES   NO	If YES, go to 3.11 If NO, go to 4
3.11	How much would you be willing to be pay for doorstep waste collection per month? Less than Rs. 30   Rs. 31-50   Rs. 51-100   Over Rs. 100	Go to 4

#### 4. Waste Disposal

ID	Question	
4.1	Is there a community bin/dhalao in your area? YES   NO   DO NOT KNOW	If YES, go to 4.2 Else, go to 4.3
4.2	Is your community bin cleared on a daily basis? YES   NO   DO NOT KNOW	Go to 4.3
4.3	Is roadside/open plot dumping practiced in the locality? YES   NO   DO NOT KNOW	Go to 4.4
4.4*	Where does your waste finally end up?	Go to 4.5
4.5	Should your waste end up at a landfill? YES   NO   DO NOT KNOW	Go to 4.6
4.6	Are you aware of the condition of landfills in your city? YES   NO   DO NOT KNOW	Go to 5

#### 5. Payment for Waste Management

ID	Question	
5.1	Do you pay the government for waste management over and above doorstep collection fees? YES   NO   DO NOT KNOW	If YES, go to 5.2 Else, go to 5.3
5.2	If you pay the government or government officials for managing your waste, how do you pay? Taxes   Tips   Other   (Please specify)	Go to 5.3
5.3	Certain kinds of waste are toxic and cause harm. Do you think the following should be responsible for the proper disposal of such wastes? a. Government YES   NO   DO NOT KNOW b. Producers whose products generate such waste YES   NO   DO NOT KNOW c. Consumers of such products such as you YES   NO   DO NOT KNOW	Go to 5.4
5.4	Should waste generators pay depending on the type of waste they throw away? YES   NO   DO NOT KNOW	Go to 5.5
5.5	Should waste generators pay depending on how much they throw away? YES   NO   DO NOT KNOW	Go to 6



6. Now I will read out some statements. For each statement please tell me whether you think they are true or false?

ID	Statement	True/False
6.1	Littering of municipal solid waste can choke drainage systems and causes backflow.	
6.2	Kabariwalas and waste pickers recycle most municipal solid waste generated.	
6.3	Waste collectors and handlers get injured from dealing with un-segregated waste.	
6.4	Reducing consumption, and therefore waste, is not an option for India at this moment on its path towards economic progress.	
6.5	Burning of waste in a neighborhood is safe as long as it is outside the home.	
6.6	Metals and glass are biodegradable materials.	

7. Based on your understanding of issues related to waste management, please state your agreement for the following statements.

ID	Statement	Yes	No	Maybe	Do not know
7.1	Waste pickers/kabariwalas have always recycled our waste.	1	2	3	0
7.2	I am willing to segregate my waste to make recycling more efficient and to safeguard the health of workers.	1	2	3	0
7.3	Waste pickers make a mess of the pavements and dhalaos by throwing waste everywhere.	1	2	3	0
7.4	I am ready to accept a lower price for my old paper/ plastic/ glass products if it is disposed in an environmental friendly and socially responsible manner.	1	2	3	0
7.5	Waste pickers/kabariwalas can also be thieves.	1	2	3	0
7.6	Reusing more things is better than buying new things.	1	2	3	0
7.7	There is no place for waste pickers/kabariwalas in India in the 21st century.	1	2	3	0
7.8	I am willing to start composting.	1	2	3	0

ID	Statement	Yes	No	Maybe	Do not know
7.9	It is practical for me to live without plastic bags.	1	2	3	0
7.10	Waste management is among the most urgent problems facing us.	1	2	3	0
7.11	Improper waste management causes pollution.	1	2	3	0
7.12	I am satisfied with the current door-to-door collection service provided.	1	2	3	0
7.13	I am satisfied with the level of cleanliness of the community bin.	1	2	3	0
7.14	I am satisfied with the condition of landfills in Delhi.	1	2	3	0
7.15	I think waste pickers/kabariwalas need to be organized.	1	2	3	0

**8. Please answer the following questions about improving waste management services in Delhi.**

8.1 If you were responsible for waste management for the city, would the following be your priority?

ID	Action for Priority	Yes	No	Maybe
8.1.1	Involve waste pickers in collection and recycling of our waste	1	2	3
8.1.2	Provide timely, regular and professional collection and removal of waste	1	2	3
8.1.3	Share collection schedules and other relevant information with citizens	1	2	3
8.1.4	Use covered vehicles to transport waste	1	2	3
8.1.5	Improve street sweeping including night sweeping	1	2	3
8.1.6	Include citizens in monitoring waste collection	1	2	3
8.1.7	Recycle our waste	1	2	3
8.1.8	Have separate door to door collection, storage and transportation system for dry and wet waste	1	2	3
8.1.9	Increase the number of bins and provide closed bins	1	2	3

8.1.10	Hold producers of toxics and those products that cannot be recycled, responsible for handling such waste and thereby reduce pollution	1	2	3
8.1.11	Take steps to reduce waste generated	1	2	3

**8.2 For you, what does ideal waste management look like? Would you recommend any additional things not already noted in your response to 8.1 above.**

**8.3 What is the main role that you as a city resident can play in improving waste management in the city?**

## Appendix 2

# Focus group discussion participants and interviewees

### List of interviewees:

- Bani Roy, Delhi University
- Robinder Sachdev, Come Clean India
- Neelima Khetan, Coke
- Shubhagato Dasgupta, Centre for Policy Research
- Teacher, Bal Bharati School
- EDMC Executive Engineer
- P K Khandelwal, EDMC
- Bharat Bhushan, Ashoka Paper Mill
- Madhulika Chatterjee, C R Park RWA
- Vimlendu Jha, Swechcha
- Jagmohan, Bank Colony RWA
- Amit Jain, IRG Systems
- Dunu Roy, Hazard Centre
- Shashi Pandit, AIKMM
- Ribhu Vohra, Wasteless
- Mahak Singh, Ward Councilor, Usmanpur, East Delhi
- Iqbal Malik, Vatavaran
- Rashmi Paliwal, Art of Living
- Pradeep Pagare, Vasundhara Enclave RWA
- Satish Sinha, Toxics Link
- Praveen Malik, Tetrapak
- Arun Kansal, TERI
- Dr. Suneel Pandey, TERI
- Mrs Banerjee, Tagore Park RWA
- Pradeep Dadlani, Sycom
- Ankit Kwatra, owner of a start-up on food waste
- Deepak Sethi, SPML
- Tuffail, Sanitation Engineer
- Avtaar Singh, Ambedkar University
- Irshad Khan, Seemapuri Market Association
- Subhash Agarwal, Seelampur Market Association
- Meena, Sanitary Inspector
- Dinesh Kumar Sharma, Sanitary Inspector
- Pankaj Agarwal, Safdarjung RWA
- Ajay Kumar, Safai Karamchari
- Chander, Safai Karamchari
- Mange Ram, Safai Karamchari
- Deepak Kumar, Safai Karamchari
- Amar Singh, Safai Karamchari
- Dr. Shayamala Mani, NIUA
- Sthyamurthy, Ramky

- Vijay Singh, Mother Dairy
- Anita Bhargava, Lets Do It Delhi
- Rakesh Narang, Lajpat Nagar Market Association
- Pushkar Srivastava, Asian Development Bank
- Pinaki Dasgupta, IYCN
- Subrata Burman, IFC
- Anuradha Modi, Holy Cow Foundation
- Atit Bhatia, Hindustan Tin Works
- Saurav Bardhan, Green Bandhu
- Rozita Singh, Daily Dump

## Focus Group Discussion Concept notes and list of participant

### FGD on Composting

**Objective:** To determine the ways by which composting is able to become a viable means of wet waste handling at various levels, and therefore, find ways for wet waste to be better handled.

**Date:** 27th February 2014

**Venue:** Conference Room,  
Delhi Pollution Control Committee  
5th Floor, ISBT Building,  
Kashmere Gate,  
New Delhi-110006

### Participants

- Delhi Pollution Control Committee
- Daily Dump
- TERI
- Chintan
- IL& FS
- Green Bandhu

### Themes/questions for discussion:

- What has been the experience of composing in Delhi?
- Why is it not more popular?
- How do we create a sustainable market for compost?
- Should the marketing of compost be left to waste managers?
- What should be the government's input to the creation of this market, bearing in mind that a healthy market would provide considerable savings to municipalities across India?
- What should the role of bulk organic waste producers such as hotels, restaurants, temples, and vegetable markets be in this process? Would an EPR framework work in this case?

### FGD on Waste-to-Energy

**Objective:** To understand how Waste to Energy plants are perceived by the residents of Delhi, and to understand whether or not Waste to Energy plants are a solution for managing Delhi's waste.

**Date:** 28th February 2014

**Venue:** Conference Room,  
Delhi Pollution Control Committee  
5th Floor, ISBT Building,  
Kashmere Gate,  
New Delhi-110006

### Participants

- Department of Environment, Govt of NCT Delhi
- Centre for Science and Environment
- Jawaharlal Nehru University
- CDC
- Delhi Pollution Control Committee
- SafaiSena

### Themes/Questions for discussion

- What are the advantages of having Waste to Energy plant in Delhi?
- What are the disadvantages of having a Waste to Energy plant in Delhi?
- Are Waste to Energy plants a viable option for Delhi at this point in time?
- What are the economics and subsidy a plant needs to function. Is this the cost of clean up?
- Is waste-to-energy better than recycling?
- How are the informal sector recyclers getting affected by the W to E plant in Delhi?
- How are the residents of surrounding areas getting affected by W to E plants in Delhi?
- If Waste to Energy plants need to be made a viable option for solving the twin problems of energy shortage and increasing amounts of waste, what are the institutional, technological, and policy changes that need to be brought about? Are these viable?
- Who are the key stakeholders in this process of change? What are the roles, responsibilities and rights of each of these stakeholders?
- What does Delhi's experience tell us about rehabilitating waste pickers?

### FGD on Waste Storage, Segregation, Recycling

**Objective:** To understand how post collection storage, tertiary segregation, and recycling, currently largely informal, can play a role in closing the loop within Delhi, as well as handle materials optimally and reduce pressure on landfills.

**Date:** 25th February 2014

**Venue:** Eschborn Room,  
Deutsche Gesellschaft für  
Internationale Zusammenarbeit (GIZ)  
GmbH  
B-5/2, Safdarjung Enclave,  
New Delhi - 110029, India

### Participants

1. Delhi Development Authority (DDA)
2. Department of Environment
3. Department of Urban Development
4. National Institute of Urban Affairs
5. SafaiSena
6. Tetrapak
7. NIDAN
8. Centre for Urban and Regional Excellence (Cure)
9. School of Planning and Architecture (SPA)
10. Sycom Project and Consultants Pvt. Ltd
11. Chintan
12. GIZ

### Themes/questions for discussion

- Is it possible to close the loop largely within Delhi, given our resources?
- What should the Masterplan be doing for the city's waste, apart from giving landfills and disposal sites?
- What standards should we maintain for waste storage and segregation?
- At what levels do we need these? Ward? Zone?
- How will these be run and by whom?
- How to address the issue of visual pollution?
- How can the recycling units be legalized? Is this desirable?

- What incentives can be given to such units?
- How to address the issue of standards of operation?
- How can EPR be effectively used in this case?
- Apart from recycling, there is the issue of reuse. What can be done about this? Several haats, Sunday Baazaretc exist. What more can we build upon? Apart from reuse, what can be done to prevent waste?

### **FGD on Waste Collection and Transportation**

**Objective:** To identify the problems occurring in waste collection and transportation of MSW and to find ways in which the current system of waste collection and transportation can be improved.

**Date:** 25th February 2014

**Venue: GIZ**

Eschborn Room,  
Deutsche Gesellschaft für  
Internationale Zusammenarbeit (GIZ)  
GmbH  
B-5/2, Safdarjung Enclave,  
New Delhi - 110029, India

### **Participants**

- Infrastructure Leasing and Financial Services (IL and FS)
- RWA from South Delhi- Pandara Road and Defence Colony
- IPE-Global Pvt Ltd
- National Institute for Urban Affairs
- SafaiSena
- Chintan
- GIZ
- NIUA

### **Themes/Questions for discussion**

- What are the problems being faced by Municipal authorities in collection and transportation of MSW? Can this list be arranged in priority form?
- What are the problems being faced by private waste management companies in collection and transportation of MSW
- What are the 5 top means by which these problems can be resolved?
- What is the ideal scenario from the point of view of Delhi's residents?
- Should waste pickers be a part of this? If yes, how?
- What are the suggestions of Market Associations for the improvement of collection and transportation of waste?
- Is the current PPP working well for the collection and transportation of MSW? If not, then what are the changes that need to be brought in?
- What are the strategies for the improvement of waste collection and transportation for Delhi?
- What will be the indicators for improved collection and transportation?

### **FGD on Segregation at Source**

**Objective:** The Focus Group Discussion aims to make the participants reflect upon the various ways in which source segregation can be initiated, what are the possible hurdles that they may come across, and the possible ways of overcoming those hurdles.

**Date:** 28th February 2014

**Venue:** Conference Room,  
Delhi Pollution Control Committee  
5th Floor, ISBT Building,  
Kashmere Gate,  
New Delhi-110006

## Participants

- Department of Environment
- Development Alternatives
- Sycom Consultants
- Door step waste collectors
- Resident Welfare Associations
- SafaiSena
- Chintan
- Green Bandhu

## Themes/Questions for discussion

- What are the successful cases/examples of waste segregation at source in India?
- What parts of Delhi have you seen successful in segregation?
- What are the factors that led to the success of these cases?
- What are the ways in which waste segregation at source can be initiated?
- What are the possible hurdles coming in the way of waste segregation at source?
- How can these hurdles be overcome?
- What should be the role of the urban local bodies, RWAs, Market associations, NGOs, Sanitary inspectors and doorstep waste collectors?
- What incentives should exist for segregation? What disincentives for not doing so?
- How can source segregation be made a part of the formal waste collection process?
- Do you believe this is possible at all in India?

## FGD on Landfilling

**Objective:** To plan for minimum landfilling in the future.

**Date:** 27th February 2014

**Venue:** Conference Room,  
Delhi Pollution Control Committee  
5th Floor, ISBT Building,  
Kashmere Gate,  
New Delhi-110006

## Participants

- Delhi Pollution Control Committee
- Infrastructure Leasing and Financial Services (IL and FS)
- School of Planning and Architecture
- Green Bandhu
- Toxics Link
- Chintan
- SafaiSena

## Themes/Questions for discussion

- Should Delhi have more landfills? If yes, what should be the strategy to use these landfills
- What elements should be banned from landfills?
- How can these bans be made possible?
- What are the possible ways in which the currently existing landfills can be managed effectively?
- Should private waste management companies play a major role in managing these landfills?
- What should be the Government's role in managing these landfills?
- What shall we do with wastepickers on current landfills?
- What should be the role of the informal sector recyclers/ragpickers in managing these landfills?
- What are the future strategies for managing Delhi's landfills



# Appendix 3

## Existing Policies and Delhi Master Plan

Several national-level and local policies and regulations are in place to guide solid waste management planning and implementation. This section provides a summary of these important documents. At the national level, the following policies, rules and other documents are key.

### National Policies

- *National Urban Sanitation Policy* (2008) published by the Ministry of Urban Development; and
- *National Environment Policy* (2006) published by the Ministry of Environment and Forests.

### National Rules

- *Municipal Solid Waste (Management and Handling) Rules 2000* are currently being revised. Draft revised rules were issued in 2013 but have not been finalized yet;
- *E-waste (Management and Handling) Rules 2011*;
- *Plastic Waste (Management and Handling) Rules 2011*; and
- *Bio-Medical Waste (Management and Handling) Rules 1998*.

### Other National-Level Documents

- *National Action Plan on Climate Change* published by the Prime Minister's Council on Climate Change;
- *Performance Audit on the "Management of Waste in India"* (2008) published by the Comptroller and Auditor General (CAG) of India;
- *Solid Waste Management in Class I Cities in India: Report of the Committee Constituted by the Honourable Supreme Court of India* (1999) chaired by Asim Barman;
- *Report of the High Power Committee on Solid Waste Management in India* (1995) chaired by J.S. Bajaj, member of the Planning Commission;
- *Thirty Eighth Report of the Committee on Urban Development of the Fourteenth Lok Sabha: Solid Waste Management* (2008);
- *Action Taken by the Government on the Recommendations contained in the Thirty Eighth Report of the Committee on Urban Development (Fourteenth Lok Sabha) on Solid Waste Management* (2010) by the Standing Committee on Urban Development;

- *Report of the High Powered Expert Committee on Estimating the Infrastructure Requirements of Urban Infrastructure Services* (2011) chaired by Isher Judge Ahluwalia;
- *Manual on the Management of Municipal Solid Waste* (2000) is currently being revised by the Ministry of Urban Development's (MoUD) Central Public Health and Environmental Engineering Organization (CPHEEO) but a revised manual has not been issued yet;
- In addition to these, ministries in the Government of India have sponsored and published several guidance documents related to solid waste management:
  - o *Municipal Solid Waste Management: Treatment Process and Prospects of Public Private Partnership* (2010-11) published by the Jawaharlal Nehru National Urban Renewal Mission (JnNURM) under MoUD;
  - o *Report of the Technology Advisory Group on Solid Waste Management* (2005) published by CPHEEO under MoUD;
  - o *Status of Water Supply, Sanitation, and Solid Waste Management in Urban Areas* (2005) published by the National Institute of Urban Affairs and commissioned by CPHEEP under MoUD;
  - o *Report of the Inter-Ministerial Task Force on Integrated Plant Nutrient Management using City Compost* (2005) published by CPHEEO under MoUD;
  - o *Report of the Committee to Evolve Roadmap on the Management of Wastes in India* (2010) published by the Ministry of Environment and Forests;
  - o *Position Paper on the Solid Waste Management Sector in India* (2009) published by the Ministry of Finance;
  - o *National Master Plan for the Development of Waste-to-Energy in India* (2008) published by the Ministry of New and Renewable Energy;
  - o *Status Report on Municipal Solid Waste Management* (not dated) published by the Central Pollution Control Board (CPCB);
  - o *Toolkit for Solid Waste Management* (2012) published by JnNURM under MoUD;
  - o *Technical EIA Guidance Manual on Common Municipal Solid Waste Management Facilities* (2010) prepared by IL&FS for the MoEF;
  - o *Strategy Paper on Solid Waste Management in India* (1996) published by the National Environmental Engineering and Research Institute (NEERI);and
  - o *Action Plan with Indicative Guidelines for Plastics Wastes Management* (2013) published by the CPCB.

At the local and regional level, many important documents exist that have a crucial impact on the management of municipal solid waste. These are described below.

## Regional and Urban Plans

- *Master Plan for Delhi 2021* is a draft plan published by the Delhi Development Authority (DDA). A final plan has not been issued yet;
- National Capital Regional Plan 2021 is a draft plan published by the National Capital Regional Planning Board. No final plan has been issued yet;
- *City Development Plan: Delhi* (2006) prepared by IL&FS for the Department of Urban Development, Government of NCT of Delhi; and

- *Subcity Development Plan for the New Delhi Municipal Council Area* (2007) prepared by IL&FS for NDMC.

## Local Policies and Bye-Laws

- *Delhi Municipal Corporation Act 1957*;
- *Delhi Cleanliness and Sanitation Bye-laws 2009*;
- *Delhi Gazette Notification* on the ban on plastic bags in Delhi, issued in 2012;
- *Citizen's Charter* issued by the Department of Environment; and
- **Order** banning the burning of biomass and biodegradable waste issued in 1993;

## Other Relevant Local-Level Documents

- *Assessment of Plastic Waste and its Management at Airports and Railway Stations in Delhi* (2009) published by the CPCB;
- *Solid Waste Management in the MCD Area* (1996) published by NEERI;
- *Climate Change: Agenda for Delhi 2009-2012* (2009) prepared by Rakesh Mehta, Chief Secretary, Delhi; and
- *Feasibility Study and Master Plan for Optimal Waste Treatment and Disposal for the Entire State of Delhi based on Public Private Partnership Solutions* (2004) prepared by COWI in association with Kadam Environmental Consultants for the Municipal Corporation of Delhi (MCD).



