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PROSPECTS FOR THE DEVELOPMENT OF SOLID WASTE MANAGEMENT SYSTEM: A CASE STUDY OF METROPOLITAN CITY KARACHI

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INTRODUCTION

Tackling the solid waste problem in a megacity like Karachi requires an effective policy framework and its efficient implementation. A holistic understanding of the institutional capacities (technical, financial, human, and physical resources), actors involved in managing solid waste, household socio-economic condition, and political issues along with how they are linked to the stakeholders under various phases of the SWM system given the ground realities is crucial for such policy framework. Identification of the stakeholders and their interests is important in coordinating their participation and involvement in various waste management activities. Therefore it is essential to access the role, interest, and power structure of various stakeholders in process of waste management. The report is unique as it provides an in-depth assessment of all the stakeholders involved in solid waste management – from generation to disposal.

AIMS AND OBJECTIVES

Specifically, the objectives of the study are to:

- evaluate the capacity of the public sector in managing solid waste i.e. the assessment of the public sector to highlight the major problems faced by the public authorities in managing solid waste and point out the inefficiencies within the system.
- evaluate the role of the private sector (contractors directly hired by the public authorities or informally) in managing solid waste, highlighting their motives and the interest in entering the business.



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- estimate the extent of informality in managing the SW.
- evaluating prospects of collected waste for recycling and reuse,
- estimated households' WTP for managing SW
- by assessing the roles of public, private, and informal sectors in managing Solid Waste, the study provide policy options for efficient management of solid waste using SWOT analysis.

METHODOLOGY

The study is based on a survey of 18 towns in Karachi. This helps in evaluating the role of District Municipal Committees (DMCs) in managing solid waste in localities across all 6 districts. The study collected primary information through key informant interviews and household surveys. In addition, small scrap dealers (Kabariya - operating both at large and small scale) and small-scale industries involved in recycling are also contacted for value chain assessment. To assess the objectives, the study performed:

	# Interviews/Surveys
Interview of Key Officials (SSWMB & KMC)	6
Interviews of DMC's	6
Private Contractor	36
Informal Players	50
Households	460

KEY FINDINGS OF THE STUDY

I. Capacity Assessment Analysis

- According to SSWMB total waste generated is around 9839.1 (tons/day), waste collected reported as 8265 (tons/day) and unattended remain near 1574.1 (tons/day)
- According to the information provided by the DMCs, the waste unattended ranges around 43% (for the Districts Malir and West) 80% (for district Central). District East is the only district where DMC East has reported no left-over.



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- Consider that the DMCs are operating with full resources available then it means that the resource needs to be increased from 40 to 80 percent.

II. Process of Collection and SWM – Public-Private Partnership (PPP)

Currently, the system that exists in Karachi can be grouped into 3 different models.

- The one that is properly handled by the public sector through formal subcontracting
- Second that operate through town/UC contracting out informally to private contractors either on personal relation basis or on political grounds
- The one that is completely informal and operates in Orangi town mainly - among the lowest income areas of Karachi

Further, based on the survey of the contractor and informal players (employees hired by the contractor) it can be concluded that

- solid waste in Karachi is still managed by private contractors (around 92%).
- around 8 percent of the public sector managing solid waste comes under the SSWMB contractual agreement made with the Chinese firms (Kangjie and Hangzhou).
- the door-to-door collection through outsourcing to a Chinese firm is very little evident – door-to-door collection by a Chinese firm (SSWMB) is evident in some areas of Korangi and East only.
- hiring of the contractors, are around 69 percent informal, 19 percent formal, 8 percent based on personal relationships while only around 3 percent is based on experience – contractors are hired based on having experience of the work.

III. Private Contractors - Motives and Interest

- the cost of the public sector (KMC and SSWMB) is much higher than the small private contractor – operating mainly through a horse and a cart or 4-wheeler – Chingchi.
- The cost of the public sector is also higher as they are mainly involved in collecting waste from designated/undesigned sites and moving to landfill sites – not involved in the door-to-door collection.
- one contractor is responsible for the collection of waste from around 2000 households.
- They mainly operate through hiring 1 to 2 vehicles and employing 3 to 4 employees.



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- The average cost per house on fuel is very minimum; less than Rs. 1 while the average wage per household is around Rs. 15.6 resulting in an average total cost per household born by a contractor is Rs. 16 only.
- The income generated as reported by the contractor is almost 65 percent higher than the amount collected through fees, the revenue estimated is also very high. The income from the collection by Contractor shows:
 - Fee Per Household – Rs. 179.7,
 - Income reported per month Rs. 128,472,
 - Income generated (through Fee collected from households covered) Rs. 358,583,
 - Revenue (Fee collected minus total cost) Rs. 344, 023, while Revenue per Household Rs. 163.7

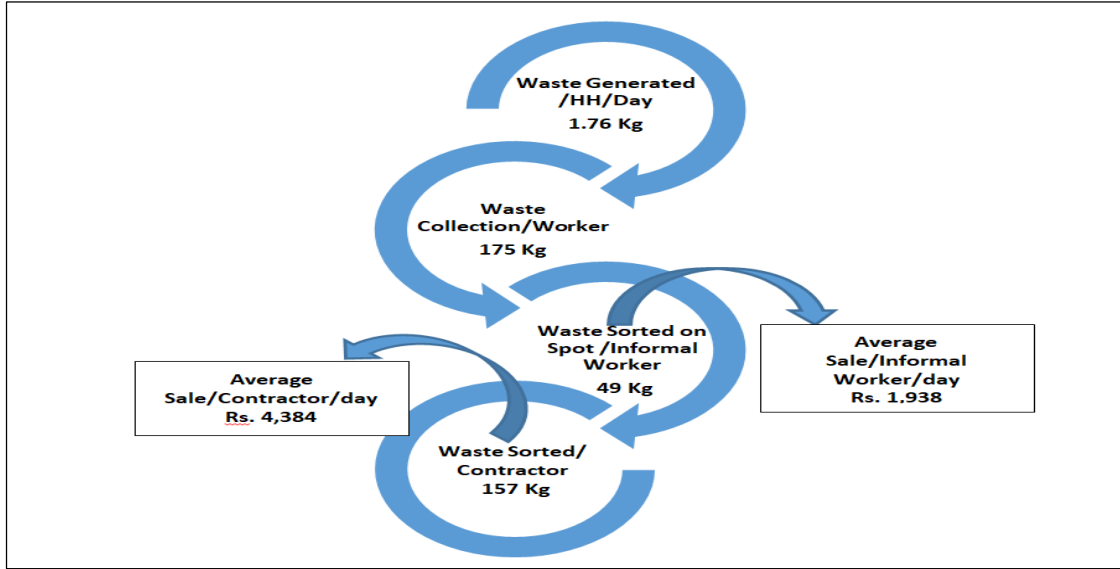
IV. Informally Hired workers

- Income generated (# Household *Fee) is around Rs. 226,018,
- Wage received if Hired - Rs 11,678,
- Total Amount of Waste Collected (per day/workers) kg 1910,
- Amount waste collected (per HH/day) kg 1.76.

V. Value Chain Analysis

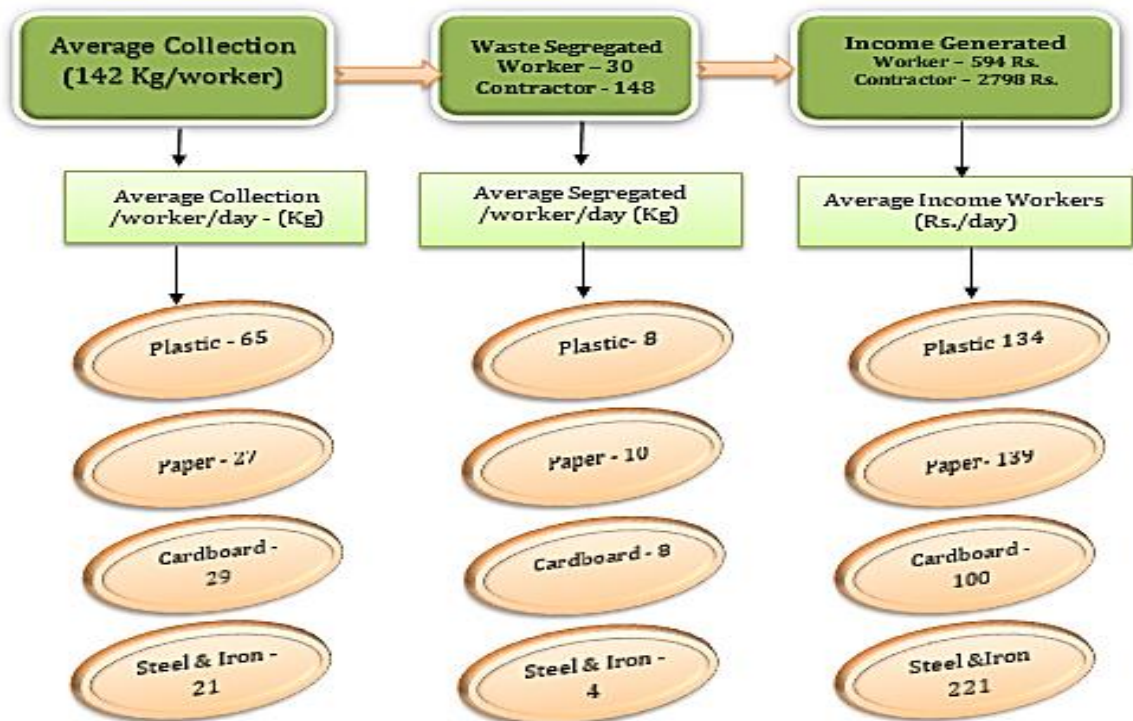
- Contractors hiring informal workers are sometimes involved in segregating waste and in recycling; however, the public sector is not involved in reselling recyclable material for the obvious reason – a non-profit organization.
- The main recyclable items are plastic, paper, cardboard and steel, and Iron.
- The average income generated by the contractors from the sale of these products is much higher than the income generated by the informally hired workers per day
- The below figures provide a flow of waste from collection to segregation of recyclable material.

Figure 1: Generation, Collection, Segregation, and Income from the sale of Recyclable



Source: Based on Survey of Private Contractors and Informally Hired Workers

FIGURE 2: FLOW OF RECYCLABLE MATERIAL AND INCOME GENERATED



Source: Author estimation

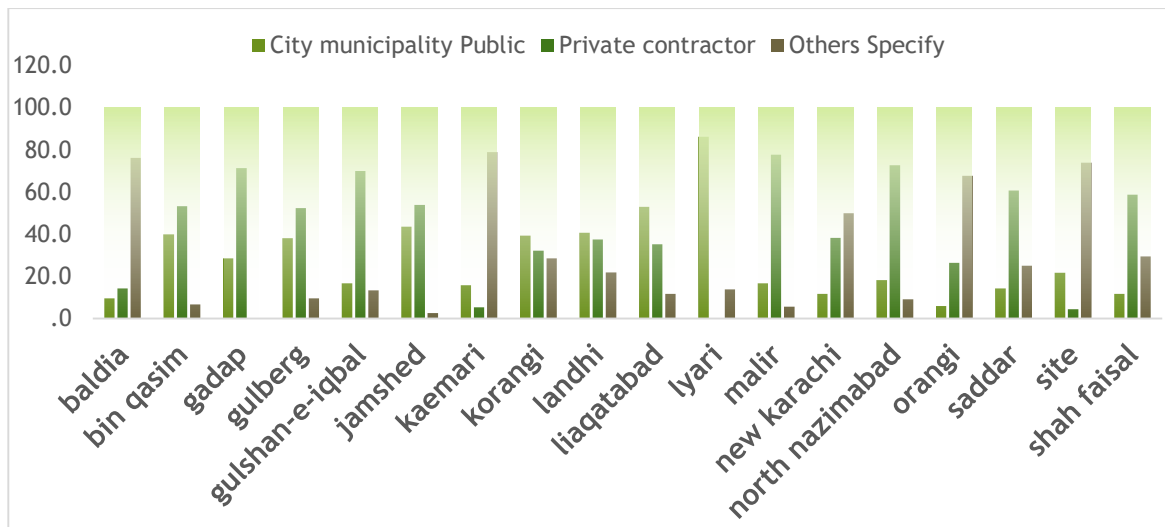
VI. HH Socio-Economic and Demographic conditions

Basic information gathered during the household survey highlighted the solid waste management practices followed by households - their perception, behavior, and awareness as an obstacle in handling solid waste are probed. Recycling and reuse activity (if performed) is assessed at the household level and finally, what a household is spending and what it is willing to spend on solid waste management is also probed.

i. HH Assessment of Waste Collection

Solid waste management in Karachi is in the hand of private contractors. The second-largest waste collector is informal (mainly Afghani). Some part of the city is also managed by the city municipal system – DMC. The Lyari town is mainly managed by DMC while the towns operated under complete informality are Baldia, Orangi, SITE, and Kemari.

FIGURE 3: WHO COLLECTS WASTE FROM HOUSEHOLDS?

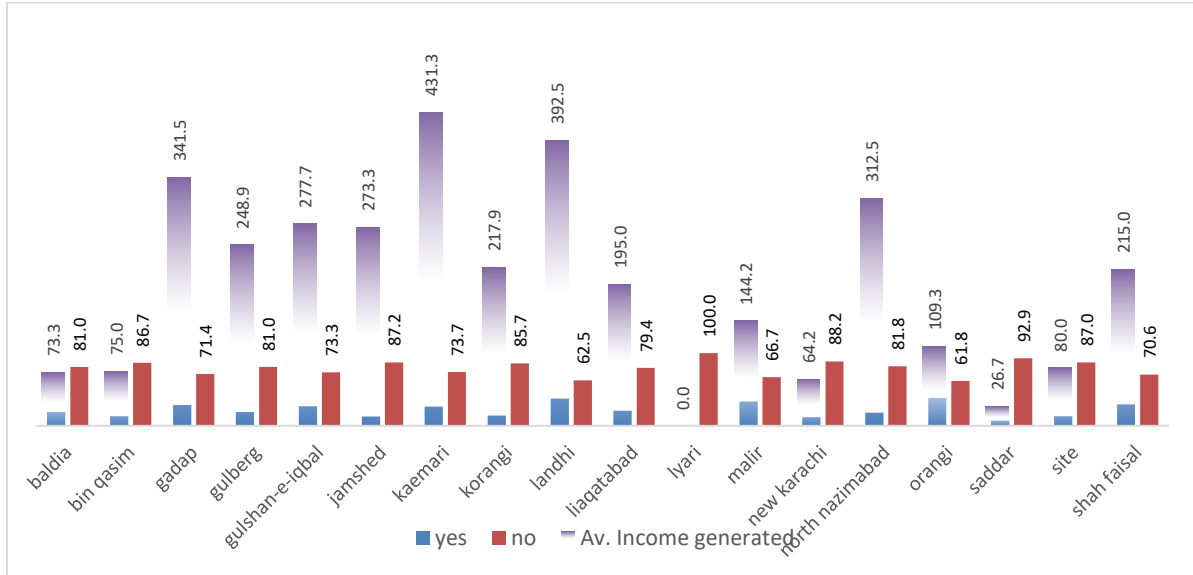


Source: Author estimation

ii. Recycling and Reuse Activity

- To evaluate the knowledge of the household regarding recycling three interrelated questions are probed. Figure 4 shows that households in Karachi are not only aware of recycling but also generate income through recycling. Households in Karachi, generating on average around Rs. 400 monthly from the sale of recyclable material while the main recyclable materials are Paper/cardboard, plastic, and Metal.

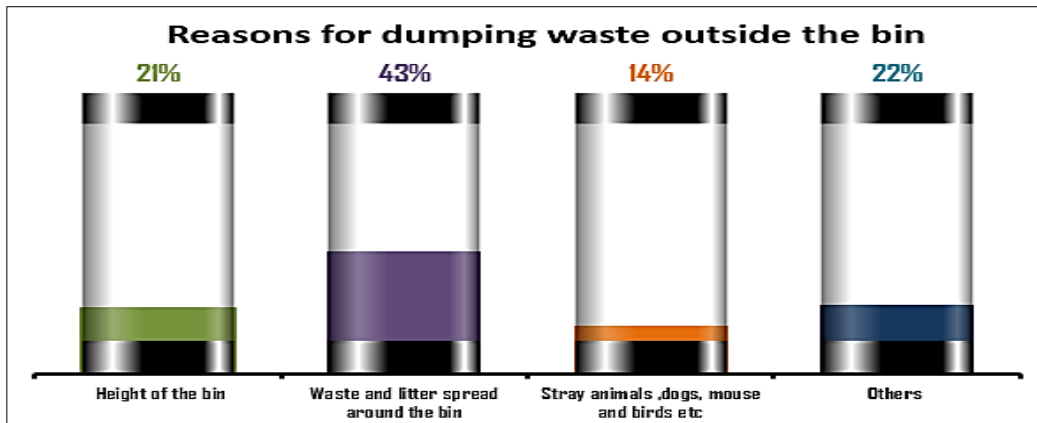
FIGURE 4: DID THE HOUSEHOLD GENERATE ANY INCOME FROM THE SELLING OF WASTE?



iii. Perception and Behavior Regarding SWM

- Households though, aware of the environmental consequences of the waste but, they still throw their waste alongside the bin.
- Around 43% of households reported that they throw the waste alongside the bin as the waste litter spread around the bin and the place is too smelly. Around 21% claim that the bin is too high while 14% claim that they do not go near because of the animals around the bins.

FIGURE 5: PARTICULAR REASON FOR DUMPING OUTSIDE BIN



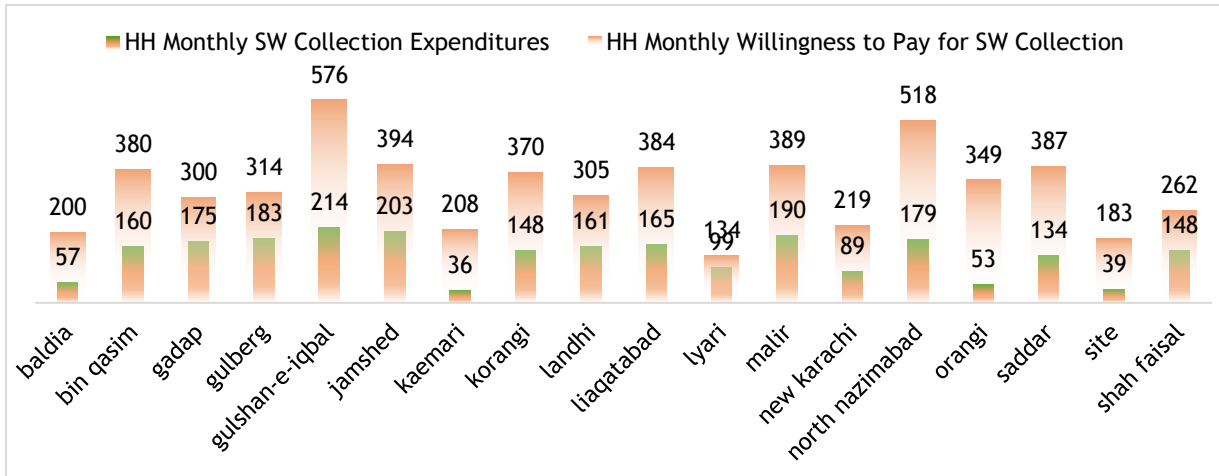
Source: Author estimation

- Further, surveyed households have also shown their concerns regarding environmental degradation caused by the waste.

iv. Household Willingness to Pay (WTP) for Solid Waste

- Figure 6 shows the current expenditure household made on SWM and what households willing to pay for further improving the system by town.

Figure 6: Current Expenditure on SW collection and WTP



Source: Author estimation

V. ABILITY TO PAY (ATP) VS. WILLINGNESS TO PAY (WTP)

- The information regarding ATP and WTP is viable for policy designing. Policies formed without considering who will pay and how much ability they have to pay result in policy failure.
- Result shows High ATP than WTP of HH in all towns in Karachi considering ATP as 1% of household disposable income

VII. SWOT Analysis – For viable Policy options

a) Generation

Internal Factor	External Factor
<p><u>Strength</u></p> <p>S-1: Households show their willingness to adopt environmentally friendly consumption.</p> <p>S-2: Awareness regarding the negative impact of SW mismanagement on the environment and health.</p>	<p><u>Opportunities</u></p> <p>O-1: There exists a wide scope for HH to generate economic benefits from the sale of recyclable waste.</p> <p>O-2: Promoting paper bags or other degradable material in daily transactions would contribute potentially to controlling SW generation.</p>



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S-3: Average earning of HH from the sale of recyclable waste is around Rs 400 per month.	O-3: Individuals are concerned regarding waste management.
<u>Weakness</u> W-1: Statistics for industrial waste generation are not available for evaluation and monitoring.	<u>Threats</u> T-1: Growing population & uncontrolled migration influx

b) COLLECTION

Internal Factor	External Factor
<p><u>Strength</u></p> <p>S-1: Public-Private partnerships through tendering for improving collection and controlling system informality.</p> <p>S-2: High ATP than WTP of HH in all towns in Karachi.</p> <p>S-3: Financial support received for SWM, nationally and internationally.</p>	<p><u>Opportunities</u></p> <p>O-1: under the umbrella of public-private partnership the government may utilize the informal network for efficient waste collection.</p> <p>O-2: Fundraising opportunities are available as HHs are willing to pay additionally for improved SWM system,</p> <p>O-3: profitable recyclable waste - if collected properly</p>
<p><u>Weakness</u></p> <p>W-1: Historically, responsibilities have remained shuffled between federal, provincial, and local governments.</p> <p>W -2: unclear duties and overlapping functions under the current structure</p> <p>W-3: Sub-contracting based on a personal relationship or under political influence</p>	<p><u>Threats</u></p> <p>T-1: Lack of interest in managing SW by stakeholders.</p> <p>T-2: Political influence in managing SW.</p> <p>T-3: Delay in waste collection exaggerates various health and environmental concerns.</p>

c) Disposal Recycling

Internal Factor	External Factor
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<p><u>Strength</u></p> <p>S-1: Individuals agreed to segregate waste by type.</p> <p>S-2: Increasing industries for recycling, especially the informal ones, is contributing towards tackling and generating revenue from solid waste</p>	<p><u>Opportunities</u></p> <p>O-1: Segregated waste would expedite the recycling process as it can be directly sent to relevant recyclers.</p> <p>O-2: Around 20% of plastic waste collected is resalable while only around 12% is currently sold. Further, through on spot sorting about 8kg plastic, 10 kg paper, 8 kg cardboard, and 4 kg iron/steel collected daily is resalable and sold by the worker while the worker claims that around 20% of the remaining waste is still resalable.</p> <p>O-3: Boosting industries recycling food waste into animal feed could also be a potential revenue source.</p>
<p><u>Weakness</u></p> <p>W-1: Lack of coordination and connections between KMCs and informal pickers</p> <p>W-2: Informal dumping points: dumping of waste at nearby vicinity, Streets, park, etc.</p> <p>W-3: Despite acknowledging the impact of SW on health and the environment, individuals behave reluctantly while disposing of their waste properly or in an environment-friendly manner.</p> <p>W-4: Untrained worker for collecting waste.</p>	<p><u>Threats</u></p> <p>T-1: Households don't bother where and how the waste is disposed of after collection from their houses.</p> <p>T-2: Lack of interest in managing SW by stakeholders.</p> <p>T-3: Lack of implementation of environmental legislation.</p> <p>T-4: Non-availability of standard procedure for disposal.</p>

ADDITIONAL POLICY RECOMMENDATION

Based on the assessment study draw the following conclusions and recommend policy measures:

- The assessment highlighted that issues have been exacerbated by unclear duties, overlapping functions, and inadequate coordination among the numerous institutions responsible for solid waste management. The functions are largely divided between KMC and SSWAMB,



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resulting in a lack of coordinated planning and integration. There is a need to resolve the issue by clearly assigning the responsibilities – there should be only one authority responsible for the SWM

- The assessment predicts high profitability from recovering recyclable material, mainly enjoyed by the private contractors and informal workers. Given the profitability, the study recommends that the problem of solid waste management (SWM) can be dealt with by adopting policies for improved municipal solid waste services characterized by regular collection, timely transportation, careful disposal, and proper separation of recyclable waste.
- Households are concerned with the improved solid waste system and are ready to make efforts for it but for those who are reluctant to adopt sustainable waste management strategies, motivational aspects are needed.