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Assessment of Door-to-Door Waste Collection in Solan Town of Himachal Pradesh

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Abstract

Urban areas globally grapple with the escalating challenge of efficiently managing the mounting waste generated by their burgeoning populations and businesses. An integral facet of waste management involves the implementation of door-to-door garbage pickup schemes and strategic dustbin placement. This study focuses on the effectiveness of such schemes in Ward No. 9 of Solan Town, situated in the rapidly growing district headquarters of Solan, Himachal Pradesh, India. Solan, recognised as the "Mushroom City of India" has witnessed a surge in human settlements and urbanisation, leading to an increase in anthropogenic issues, particularly in solid waste management. Therefore, the primary objective of this study is to identify the factors influencing the efficiency of door-to-door garbage pickup schemes and dustbin placement in urban areas. Furthermore, the study will also explore potential solutions to enhance the efficiency of garbage pickup schemes and optimise dustbin placement. To achieve the research objectives the data has been collected through field observations, personal discussions and interviews. The findings of this research are estimated to contribute valuable insights towards enhancing urban waste management strategies, fostering sustainable practices, and fostering a healthier living environment in Solan Town and potentially in other urban areas facing similar challenges.

Keywords: *Urban Waste Management, Door-to-Door Garbage Pickup, Dustbin Placement, Solan Town, Sustainable Practices, Anthropogenic Issues*

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INTRODUCTION

These days, municipal trash management is important to discuss in light of environmental and sustainability issues. Solid waste management is turning out to be a global issue, especially in the world's developing nations (Ramachandra et al., 2003; Tchobaanoglous et al., 1993). Waste is produced as a direct consequence of most human activity when energy and resources are used improperly. Urban areas have a great deal of challenge when it comes to trash management since garbage frequently builds up on the streets, endangering both public health and the environment (Grazhdani et al., 2016; Biswas et al., 2018). While some urban areas are properly maintained, many others are left with an accumulation of uncollected rubbish, leading to unsanitary and ugly circumstances. Even with the adoption of the Municipal Solid Waste (MSW) management and handling regulations in 2000, which support economical and ecologically responsible methods, attaining efficient waste management is still difficult, especially for Urban Local Bodies. Factors like population increase, development initiatives, shifting socioeconomic dynamics and rising living standards all contribute to this complexity. Because of competition for limited resources, population growth that is happening at a rapid pace, urbanisation, and global industrialisation, environmentally friendly ways of managing municipal solid waste have thus emerged as a major global concern (SK et al., 2023).

In the context of developing nations, the issue of solid waste management is more complicated. In India, urbanisation, industrialisation, and economic expansion have led to a rise in the amount of municipal solid waste (MSW) generated per person, making solid waste management (SWM) a significant issue for many Urban Local Bodies (PPCB -2020). India is vulnerable to the negative effects of solid waste management (SWM) practices on its already delicate environmental circumstances since it is a fast-expanding nation that is seeing substantial population increase and industrialisation. Concerns about SWM are made worse by the nation's rapidly increasing urbanisation (Hazra & Goe, 2009). Approximately 90% of India's solid waste, especially in bigger cities, is improperly disposed of in landfills. The amount of waste produced in Indian cities varies greatly, depending on the population and lifestyle (200–870 grammes per capita per day) (Sharholy et al., 2007; Agarwal et al., 2013; Agarwal et al., 2005). In spite of notable advancements in the domains of social, economic, and environmental aspects, SWM systems in India have mostly stayed constant. Since 90% of residual garbage is currently discarded rather than properly landfilled (Narayan, 2008). The

transition to more sustainable SWM is urgently needed, and new waste management facilities and management systems are needed for this. The waste produced by the inefficient current SWM systems harms the environment, the economy, and public health (Biswas et al., 2010). The Ministry of Environment and Forests (MoEF) of India created the Waste Management and Handling Rules (Ministry of Environment and Forest, 2015), however, there is inconsistent and limited adherence to them. Addressing inadequate infrastructure, fostering community awareness, and implementing sustainable practices are essential for effective waste management. Without proper policy, technology, and trained personnel, India will continue to grapple with detrimental impacts on public health and the environment (Ramchandra et al., 2018).

One important measure of a region's socioeconomic development is the pace at which MSW is generated. This rate reflects the increasing resource consumption and waste complexity that come with industrialisation and growing income levels (Ramachandra et al., 2018). Therefore, Sorting waste fractions at home for a door-to-door pickup system has been shown to have a beneficial influence on waste management techniques' environmental effects by minimising the quantity of garbage that is landfilled and fostering the development of new circular economies (Laurieri et al., 2020). To determine if a trash collecting system is sustainable, it is necessary to thoroughly consider the environmental effects of garbage transportation and collection, in addition to waste quality (Awasthi et al., 2023).

Himachal Pradesh, with its sprawling 55,673 km² area, boasts picturesque Himalayan valleys and relies heavily on tourism and horticulture for its economic sustenance. Despite being one of India's least urbanised states, it faces a significant challenge in managing municipal solid waste (MSW). Official data indicate a modest MSW generation of 370 TPD, but reports from organisations like TERI suggest a higher figure of 304.3 TPD in 2011, with projections anticipating a rise to 416 TPD by 2021. The waste composition is predominantly biodegradable, followed by paper, plastic, textile, inert materials, glass, rubber, and metal (Bajala et al., 2021). In this regard, the Municipal Council, Solan's current solid waste management infrastructure serves as an excellent example of a well-run garbage collection and disposal system. But difficulties still exist, especially when it comes to making the best use of available resources and taking environmental issues seriously. Studies on citizen behaviour have revealed that residents who use a door-to-door system for separate garbage collection are more aware of and happy with the recycling process (Xue et al., 2010; Calabro et al., 2019). Improving the number of employees and

equipment available within the garbage collection network is essential to halting environmental deterioration and preserving public health (Botti et al., 2020). Therefore, proper implementation of a proficient door-to-door rubbish pickup programme is essential for complete waste management. Thus, the overall objective of this research is to improve the MSW management system by assessing the efficacy of such a plan.

STUDY AREA

Locational Extent

Solan is the district headquarters of Solan district (Created on 1 September 1972) in the Indian state of Himachal Pradesh, which has the largest Municipal Council of Himachal Pradesh. It lies between 30°44′53″ North to 31°22′01″ North latitude and 76°36′10″ East to 77°15′14″ East longitude.

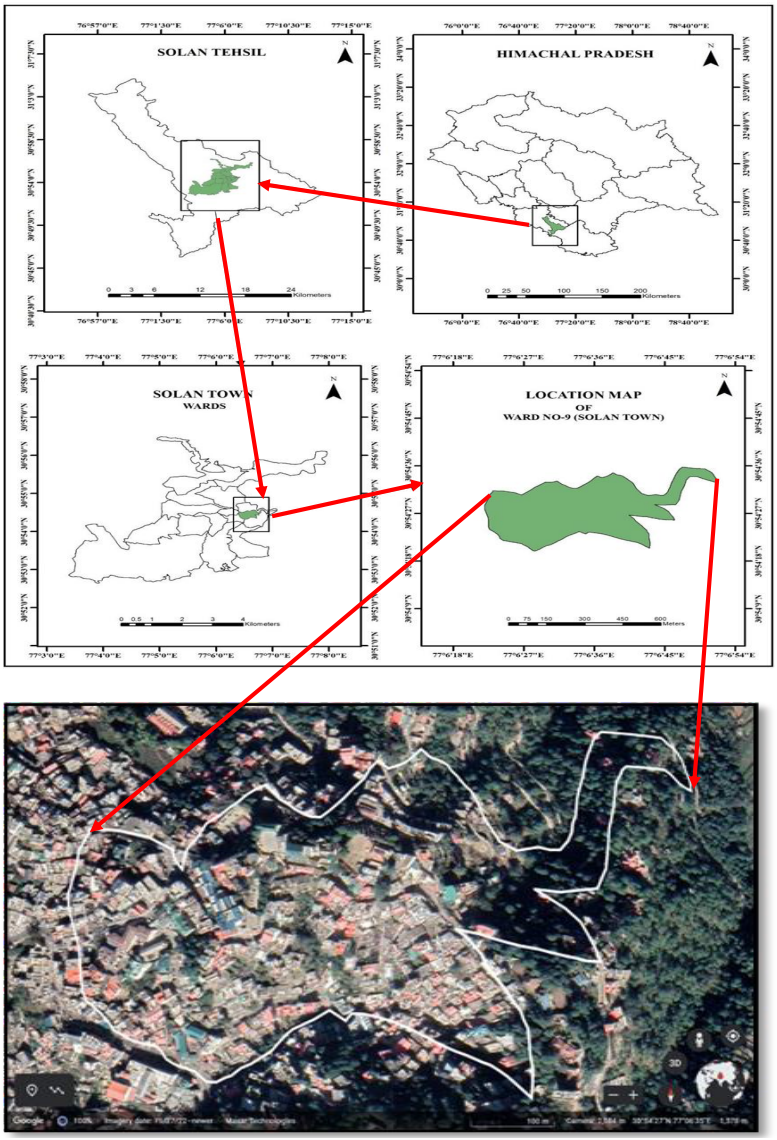
Historical Aspect

The district is a gateway of Himachal Pradesh, bordering the southern and western states of Haryana and the Punjab respectively. The place is named after the Hindu goddess Shoolini Devi. Every year in the month of June, a fair is celebrated in the memory of goddess Shoolini, featuring a 3-day Mela at the Thodo Ground. The area's historical evolution dates back to the Pandavas era, with remnants of British colonial influence evident in heritage buildings and landmarks. Cultural facets include annual festivals celebrating Hindu goddesses and the legacy of British architecture.

Physiography and Demography

The region's physiography is marked by moderate to highly dissected terrain, fertile valleys, and lush Pine and Oak forests, which also contribute to its natural vegetation. Solan's climate ranges from sub-tropical in the valley to moist temperate in the upper reaches, with distinct seasons and occasional snowfall in winter. The Asni River serves as a vital water source, while the district's soil composition varies from sandy loam to skeletal, influencing agricultural practices. Solan District thus offers a rich tapestry of interdisciplinary research opportunities, spanning geography, climatology, history, and culture. It has an average elevation of 1502 meters. It offers a diverse array of geographical, climatic, historical, and cultural characteristics. Situated between the Chandigarh and Shimla regions on the Kalka-Shimla National Highway-22, Solan town serves as

the district headquarters and boasts an average elevation of 1,502 meters, with Mount Karol reaching a height of 2,280 meters. The population, predominantly urban, has experienced steady growth, with a population density of 6,352 persons per square kilometre (Census, 2011).



Source: DSHT, 2023 and Google Earth Imagery, 2023.

Map 1: Himachal Pradesh: Location of Study Area

REVIEW OF LITERATURE

A number of studies have been reviewed under the theme of solid waste management, and a brief description of each one of them is given below:

Guria and Tiwari (2010) in their study sheds light on the challenges of municipal solid waste (MSW) management in Bilaspur City, India. It reveals the absence of a recycling system, leading to the unscientific disposal of waste in open dumps and landfills, posing significant health and environmental risks. Their study underscores the urgent need for competent authorities to address the mismanagement of MSW, emphasising the importance of recycling initiatives for sustainable waste management practices.

Singh et al. (2014) present a case study of Aligarh city, highlighting its inadequate solid waste management systems. Despite the collection of approximately 300 tons per day, segregation at the source is lacking, and disposal practices are predominantly open dumping, with no sanitary landfill in place. The study underscores the urgent need for sustainable management options to address these pressing issues.

In the same context, the study on urban solid waste management in Solan, conducted by Sharma and Ganguly (2014), emphasises the need for sustainable waste management practices beyond mere collection and disposal. Highlighting the significance of waste segregation at the source and the promotion of recycling, the study advocates for decentralised biogas plants to address the rapid increase in municipal solid waste. It underscores the importance of public awareness to mitigate health hazards and stresses the necessity for proper infrastructure and financing to overcome the barriers in waste management.

Rana et al. (2015), in their study, evaluate the solid waste management system in Chandigarh, India, revealing challenges like insufficient budget allocation, manpower, and infrastructure. Despite planned development, the city faces issues such as inadequate collection routes and waste overflow, highlighting the need for improved strategies and public-private partnerships to achieve sustainable waste management.

Similarly, Bharti in his study (2016) highlighted that despite hurdles, including financial constraints, the establishment of the Shimla Environment Heritage Conservation and Beautification (SEHB) Society in 2009 marked a turning point, leading to innovative strategies and legal frameworks to enhance waste management practices. While significant progress has been made, ongoing challenges like source segregation highlight the imperative for sustained efforts in urban sustainability.

Verma and Tripathi (2016), in their study of municipal solid waste (MSW) in three cities of Himachal Pradesh, emphasise the importance of proper waste management strategies. Findings reveal varying levels of waste generation across Shimla, Solan, and Nahan, with predominant fractions including food and carbon waste, paper, and plastic. Chemical and physical analyses underscore the acidic nature and moisture content of MSW, highlighting the necessity for comprehensive waste management practices to mitigate environmental impacts.

Gupta et al. (2017), in their study, address the pressing issue of solid waste management. Highlighting the intricate interplay between social, ecological, and environmental factors, the framework underscores the critical need for collaborative efforts between the public and private sectors to mitigate environmental degradation and health risks associated with improper waste disposal.

In the same context, Sharma et al. (2018), in their study of Himachal Pradesh, reveal that MSW contains complex organic fractions that, upon leachate percolation into the soil, migrate contaminants and affect soil stability and strength. Geotechnical investigation and geochemical analysis using scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDS) indicate significant deterioration in soil properties near dumpsites compared to natural soil, emphasising the detrimental effects of open waste dumping on soil quality.

Another study, the evaluation of existing solid waste management practices in Solan City, India, conducted by Sharma et al. (2018), highlights the pressing need for enhancement in waste management strategies. With only 60% collection efficiency and a mere 32% score on waste-aware benchmark indicators, the study underscores the inadequacies in the current system. The findings emphasise the imperative for improvement initiatives to address the challenges and optimise waste management practices in the region.

Sharma and Jain (2019) offer an extensive overview of municipal solid waste (MSW) management in India, addressing challenges such as low waste treatment rates, inadequate infrastructure, and financial constraints. Their analysis underscores the need for improved government policies and support to enhance waste management practices and mitigate environmental degradation caused by increasing waste generation.

Balu et al. (2020), in their study, highlighted the importance of community involvement through a participatory Human-Centered Design (HCD) process to address challenges like inefficient waste management and insufficient sanitation in rural villages. It proposes a solution of plastic

block construction aligned with Sustainable Development Goals (SDGs), aiming to empower Self-Help Group (SHG) members and achieve self-reliance while enhancing community health and sanitation.

Laurieri et al. (2020), in their study of Altamura, Italy, revealed that while door-to-door collection positively impacts waste management, challenges persist. Glass waste collection proved inefficient, citizen education enhanced waste sorting, yet disposable items remained prevalent. Proposed changes aim to enhance the efficiency and sustainability of waste collection services.

Similarly, the study by Pandit and Bhardwaj (2020) of solid waste in urban areas of Solan District, Himachal Pradesh reveals varying quantities of waste generation, with organics comprising the majority (50.01%), suggesting significant potential for resource recovery. Per capita waste generation rates ranged from 0.217 to 0.408 kg capita-1 day-1, emphasising the need for source-level waste separation to promote reuse and recycling, thereby reducing waste volumes.

Rossi et al. (2022) compared the environmental impacts and occupational risks of waste collection methods in Italy. They found the smart bin system to be environmentally superior, with reduced landfill waste and lower CO_2 emissions, but noted ergonomic challenges in door-to-door collection, particularly during lifting and emptying tasks.

Another study by, Saifi and Jha (2023) conducted a literature survey focusing on solid waste management in Indore, Madhya Pradesh, India. They highlighted challenges such as waste segregation, doorstep collection, and recycling, while also discussing Indore's success in achieving 100% segregation, efficient collection, and processing through innovative methods like GPS-enabled vehicles.

Farre et al. (2023) provide an insightful review of pneumatic urban waste collection systems, emphasising their importance in fostering sustainable waste management practices, particularly in urban areas. Despite limited scientific literature, the study highlights key aspects such as energy use, emissions, and cost-benefit analysis, offering valuable insights for future research and development in this field.

RESEARCH GAPS

- Research lacks insight into the implementation and impact of comprehensive recycling systems, essential for sustainable waste management. Therefore, there is a gap in understanding how

inadequate infrastructure and financing hinder sustainable waste management practices.

- Limited research focuses on effective strategies for promoting behavioural change and public awareness in waste management. The long-term effects of solid waste on soil quality and potential remediation strategies require further investigation.
- There is a need for comparative analysis of solid waste management practices across different urban areas to inform policy and practice effectively.
- A door-to-door garbage pick-up scheme in Solan presents an opportunity to address these gaps by integrating recycling initiatives effectively. The scheme requires an assessment of infrastructure needs and financial viability to overcome barriers hindering sustainable waste management.
- Evaluating the scheme's impact on community engagement and behavioural change can contribute to filling the gap in effective strategies for public awareness.
- Additionally, studying the scheme's implications on soil quality and comparing its effectiveness with similar initiatives in other areas can inform sustainable waste management practices comprehensively.

RESEARCH OBJECTIVES

- To evaluate the efficiency of door-to-door garbage pick-up scheme in Ward no. 9 in Solan City.
- To suggest improvements to existing garbage pickup schemes and dustbin placement strategies.

RESEARCH METHODOLOGY

Primary Data Collection: The study relies entirely on primary data, which was collected through a field survey conducted in Ward No. 9 of Solan Town, Himachal Pradesh.

Sample Size and Sampling Technique: The study surveyed a total of 50 households in Ward No. 9. The selection of households has been done using the purposive sampling technique, ensuring that the sample is representative of the population and providing reliable insights into the effectiveness of the garbage pickup scheme.

Field Survey with Questionnaire: A field survey has been conducted to gather data directly from the residents of Ward No. 9. This survey likely involved visiting households and administering a questionnaire to collect relevant information. The questionnaire was likely designed to gather insights into residents' perceptions, experiences, and opinions regarding the Door-to-Door Garbage Pickup Scheme.

Data Processing and Analysis: Once the data has been collected from the field survey, it underwent thorough processing and analysis. This likely involved organising the data, cleaning any inconsistencies or errors and analysing it thematically to derive meaningful insights. Although descriptive analysis was the major approach followed throughout the analysis.

Results Representation: The results of the analysis were represented using various visual aids such as figures, pie charts, pictures from the field, and maps. Figures have been used to present numerical data, pie charts to illustrate proportions or percentages, and maps to visualise spatial patterns or distributions. The use of ArcGIS indicates that geographical information system (GIS) tools were utilised to create and analyse spatial data, possibly to map out the effectiveness of the garbage pickup scheme in different areas of Ward No. 9.

RESULTS AND DISCUSSION

Ward number 9 of district Solan possess certain challenges in the collection and management of waste generation because of hilly terrain especially during adverse weather conditions and peak tourist seasons, which significantly increase the floating population. Consequently, the pristine and delicate environment of the hills is at risk of degradation due to the inadequate management of MSW. The present study is an attempt in this regard to explore the effectiveness of the door-to-door garbage pickup scheme, and results are as discussed below:

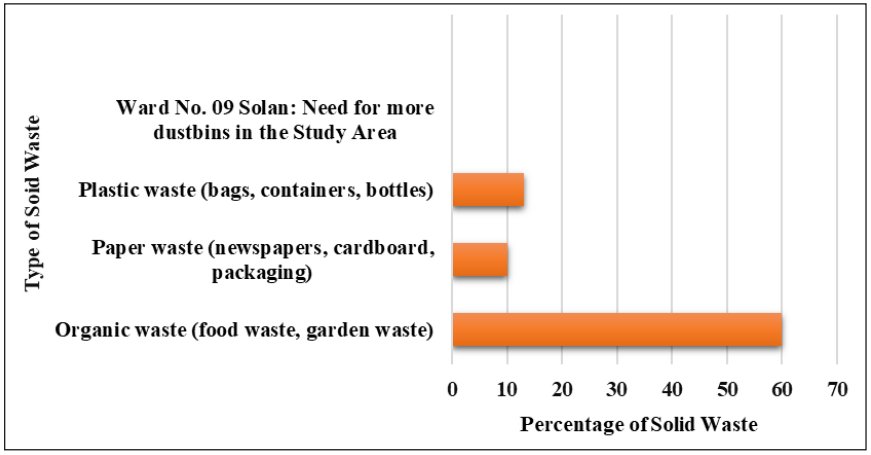
- *General Introduction of the Surveyed Household*

This section of the present study shows the demographic variables and occupational patterns of the surveyed household. Based on the gender survey of 50 household it shows that 66% of the surveyed households are male, and 34% are female. When it comes to age distribution, the majority of people (36%) are in the 18–30 age range, while the next largest age group (30%) is in the 30–40 age range. The households that were interviewed had a wide range of occupations: 40% work in the private

sector, 30% are housewives, and there are considerable representatives from other industries, including business, government work, and farming. This complex composition lays the groundwork for the present research paper's examination of family dynamics in relation to gender, age, and occupation.

- *Type of Waste Generated by Surveyed Household*

Waste is an inevitable byproduct of human activity and, if managed improperly, may have detrimental effects on both the environment and human health. Determining the types of waste generated in households is essential to putting appropriate waste management strategies into place. According to an analysis of the waste composition of Ward No. 9 in Solan, the most common waste types among households (Fig. 1) are organic waste (such as food and garden waste), paper waste (such as newspapers and cardboard), plastic waste (such as bags and containers), glass waste (such as bottles and broken glass), metal waste (such as cans and foil), and e-waste (which includes electronics and batteries).



Source: Primary Field Survey, 2023.

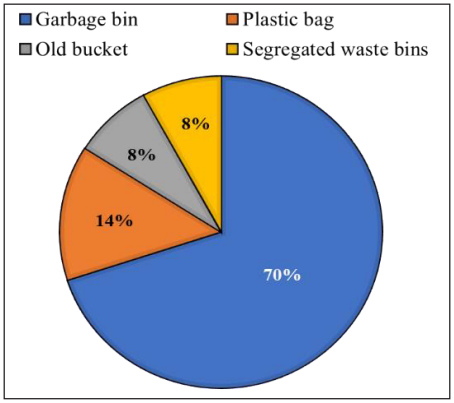
Fig. 1: Ward Number 09: Type and Share of Solid Waste Generated by Surveyed Household

Therefore, every category requires a different approach to management, and using efficient waste management methods may lessen negative effects on the environment and human health.

- *Type of Tool Used to Collect Garbage and Segregation of Waste*

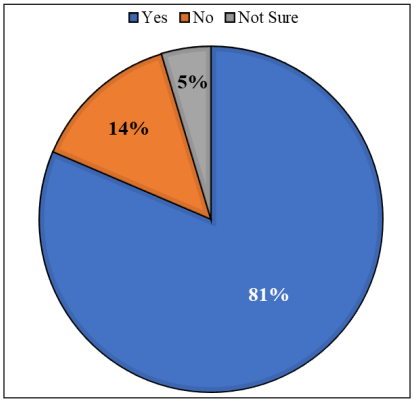
The given Fig. 2, suggests that while most households (70%) are using proper containers for waste disposal, there is a lack of use of segregated

dustbins, which could lead to poor waste management practices. Additionally, the low use of plastic bags is a positive trend, as plastic bags are often not biodegradable and can cause harm to the environment. Similarly, from Fig. 3, it can be interpreted that out of the total households, 81.4% of them have confirmed that the garbage collector segregates waste during collection as they have decided the days when they are going to pick-up garbage, while 14% of the households says that garbage collector do not segregate the waste. Only 5% of the households were not sure about their waste segregation habits.



Source: Primary Field Survey, 2023.

Fig. 2: Ward No. 9: Type of Tool Used to Collect Garbage



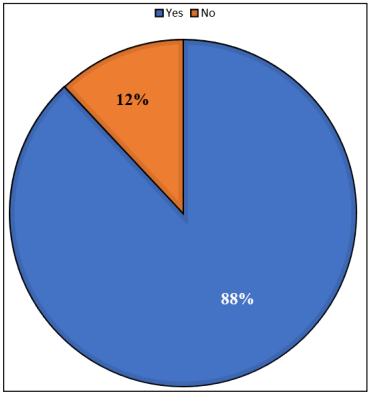
Source: Primary Field Survey, 2023.

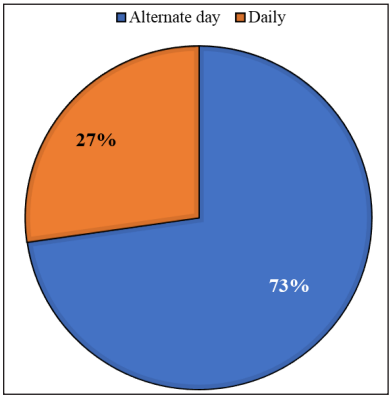
Fig. 3: Ward No. 9: Segregation of Waste During Collection

This data suggests that a majority of households are aware of the importance of waste segregation and are actively practicing it. This is a positive trend towards proper waste management, as segregation at the source is the first step towards efficient waste management.

- *Collection of Garbage from Door to Door and Frequency of Collection*

The collection of garbage at one place from all households is a very important step in context of waste management. In this regard the figure 04, suggests that 88% of the households are participating in the door-to-door garbage pickup scheme, or either they are giving their garbage to the garbage collector, but on the other hand, 12% of the households are not giving their garbage to the garbage collector and the reasons are timing clashes between the household and the garbage collector. In addition to this, it is also observed (Fig. 5) from the survey households that the waste is being collected relatively frequently in the study area, with a majority of households reporting alternate-day waste collection. However, it is also important to note that a significant portion of households (27.3%) still report daily waste collection. This could be due to the fact that some households may generate more waste than others, or that they prefer more frequent collection to avoid any unpleasant odour or accumulation of waste. Overall, the data suggests that waste collection in the study area is relatively frequent, which is a positive sign for effective waste management. Therefore, it can be inferred that the majority of the participants are using the door-to-door garbage pick-up scheme.





Source: Primary Field Survey, 2023.

Fig. 4: Ward No. 9: Garbage Collected from House

Fig. 5: Ward No. 9: Frequency of Waste Collection

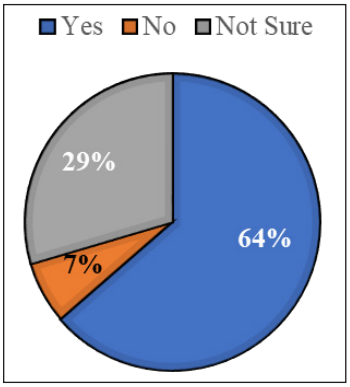
This data suggests that the door-to-door garbage pick-up scheme is

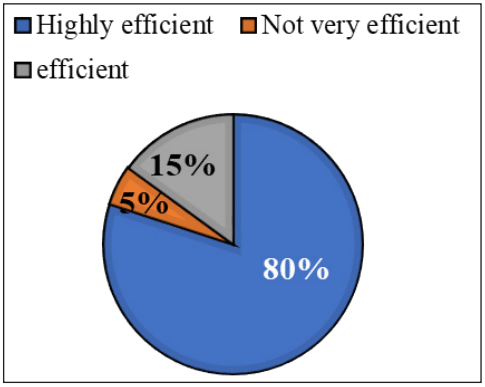
widely accepted and preferred by the residents. It can also be inferred that the scheme is effective in keeping the neighbourhood clean, as more people are using it.

- *Efficiency of Door-to-Door Garbage Pick-Up Scheme*

Any scheme would only be successful if everyone in society was following to that scheme. In this regard from the field survey, it has been observed from the Fig. 6, that 63.6% of households stated that everyone in their neighbourhood gives garbage to the garbage collector, while 29% were unsure. Only 7% of households stated that some individuals in their neighbourhood do not give their garbage to the garbage collector. This indicates a need for improving awareness and adherence to proper waste management practices in the area. Similarly, based on the results shown in Fig. 7, it can be interpreted that a majority of the households (80%) rated the door-to-door Garbage Pick-up Scheme as 'Highly Efficient', while 15% of the households rated the scheme as 'efficient' but only 5% of the household rated it as 'Not Efficient'. No household rated the scheme as 'Somewhat efficient' or 'Inefficient'.

Thus, the Above Fig. 7, suggests that there is room for improvement in the efficiency of the door-to-door Garbage Pick-up Scheme.





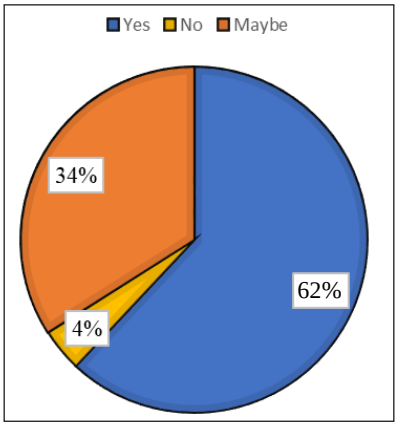
Source: Primary Field Survey, 2023.

Fig. 6: Ward No. 9: Does Everyone in Your Neighborhood Give Garbage to Garbage Collector

Fig. 7: Ward No. 9: Efficiency of Door-to-Door Garbage Pick-Up Scheme

- *Need of More Dustbins in the Study Area*

Efficient collection and disposal of waste also depends on the availability of dustbins provided in the area. Therefore, from the Fig. 8, it can be interpreted that a majority of the respondents, 62%, feel that there is a need for more dustbins in their local area. Only 4% of the respondents felt that there is no need for more dustbins, while 34% were unsure.



Source: Primary Field Survey, 2023.

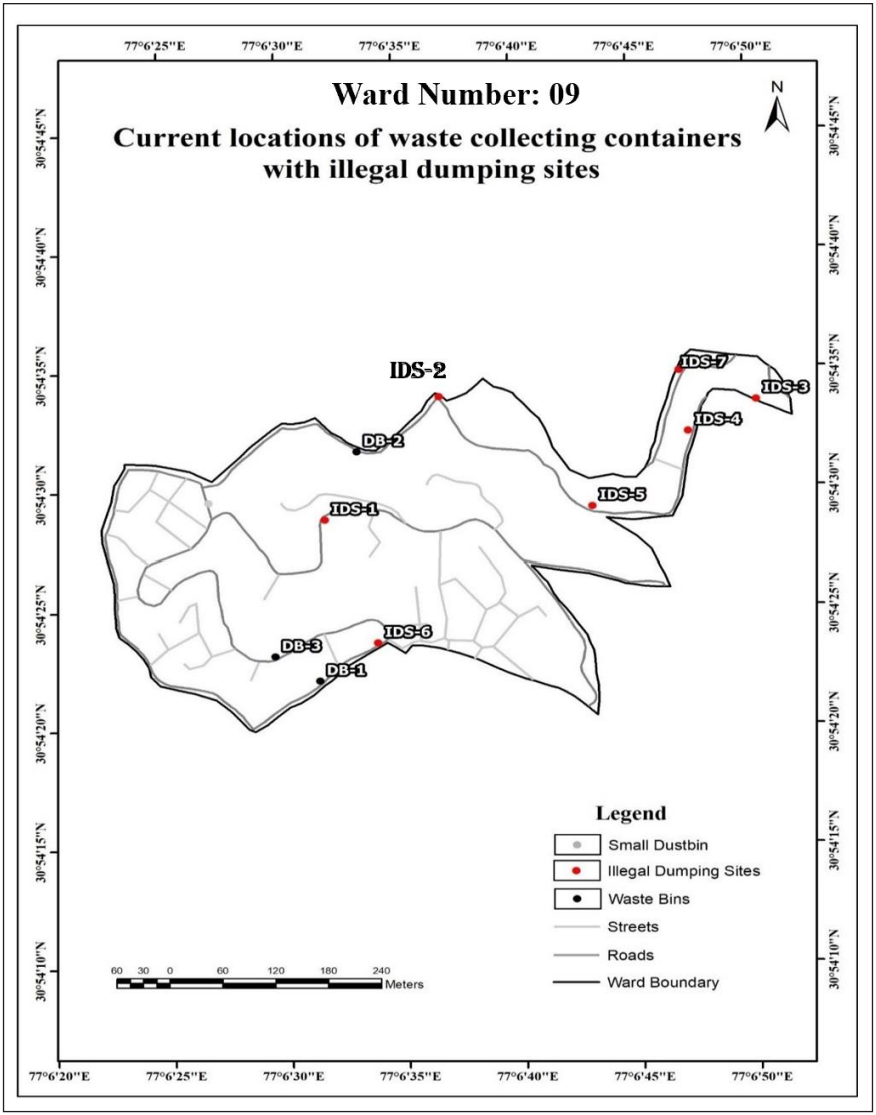
Fig. 8: Ward No.: Need of More Dustbins in the Study Area

The high percentage of respondents who feel the need for more dustbins indicates that the current number of dustbins in the area is insufficient to cater to the waste disposal needs of the residents. Therefore, it is necessary to increase the number of dustbins in the area to improve the cleanliness and hygiene of the locality. The lack of proper placement of dustbins is also a major concern. Many of the existing dustbins are not placed in strategic locations and are not easily accessible, which makes it challenging for the residents to dispose of their waste properly. Overall, the analysis highlights the need for more dustbins and their proper placement in the study area to improve cleanliness and ensure proper garbage disposal.

Problems Associated with Door-to-Door Garbage Pickup Scheme

The door-to-door garbage pickup scheme implemented in the study area has also encountered several problems, such as:

- Implementation of this door-to-door garbage pickup scheme resulted in the removal of dustbins from the roadside areas. The authority may have taken this step to encourage citizens to use the door-to-door garbage pickup scheme. However, as a consequence of this decision, people did not have any dustbins available for their use along the roadsides.
- The Municipal Corporation placed some containers for the purpose of garbage collection by the garbage collector use only. In such a scenario, people who doesn't give garbage to garbage collector started to dispose of garbage in these containers, and leadingto the overflow of the containers and the littering of the surroundings. Due to the unavailability of dustbins and lack of awareness, individuals who consume food while walking along the streets tend to dispose of their waste on the sides or directly on the roads (There are only 3 waste bins and 1 small bin placed in the study area shown in the Map 2).
- The absence of dustbins, which are essential for the proper disposal of waste, resulted in the littering of the roadside areas, creating an unhygienic and unpleasant environment. Therefore, it is necessary to ensure the availability of dustbins in residential areas and promote the use of proper waste disposal methods to maintain cleanliness and hygiene in the locality.
- The lack of waste segregation at the source has led to mixed composition of waste, making it difficult for the garbage collectors to handle and dispose of it properly.
- The topography of the area, with its downhill and uphill locations, poses a major challenge in the efficient collection and disposal of garbage.
- The garbage collection is done on alternate days or holidays, and if the garbage isavailable, residents are not able to throw it out due to the unavailability of the garbage collectors. These problems need to be addressed to ensure the proper collection and disposal of garbage in the study area.



Source: Primary Field Survey, 2023 and DCHB, 2023.

Map 2

Dustbin Number - 01 | Dustbin Number - 02 | Dustbin Number - 03

Source: Primary Field Survey, 2023.

Plate 1: Ward No. 9: Bad Condition of Dustbins

Illegal Dumping Site: 01 | Illegal Dumping Site: 02 | Illegal Dumping Site: 03

Illegal Dumping Site: 04 | Illegal Dumping Site: 05 | Illegal Dumping Site: 06

Source: Primary Field Survey, 2023.

Plate 2: Ward No. 9: Illegal Dumping Sites with Full of Garbage

RECOMMENDATIONS

Foremost, a key recommendation involves enhancing the efficacy of door-to-door garbage collection initiatives. This can be realised through the implementation of the subsequent strategies:

- Directly transfer collected waste to designated collection vehicles to prevent dispersal by wildlife, such as primates or canines, and ensure prompt retrieval from assigned bins.
- Provide segregated waste receptacles to residents for efficient waste management.
- Regularly monitor the garbage collection process to maintain operational efficiency.
- Introduce a mobile application to educate users on waste categorisation and offer incentives, like discounts on monthly waste disposal bills, for proper waste segregation.
- Increase small-scale dustbin infrastructure and promote hygiene values in children to strengthen community waste management.
- Conduct awareness campaigns to educate residents on proper waste disposal practices and enhance dustbin cleaning frequency.
- Implement stringent fines and legislative measures, alongside providing waste receptacles, to incentivise adherence to improved waste management protocols.
- Integrate recycling receptacles in public spaces to encourage waste segregation and recycling efforts.
- Combat improper waste disposal practices to prevent groundwater and surface water contamination and associated health hazards.
- Address organic waste disposal by instituting a dedicated collection system, promoting home composting, establishing communal composting facilities, and spreading awareness about the benefits of proper organic waste management.
- Introduce a differentiated user fee system and provide segregated waste receptacles or biodegradable bags to encourage residents to adhere to segregation protocols.
- Consider mandating the provision of communal waste bin facilities for various establishments, including private residences, commercial establishments, offices, and educational institutions.
- Prohibit garbage incineration at disposal sites and embrace effective waste management strategies like composting and recycling to promote environmental sustainability and public health while mitigating air pollution risks.

CONCLUSION

The present in Ward No. 9 reveals that the household waste in Ward No. 9 is largely composed of organic waste, followed by plastic and paper waste.

The implementation of the Door-to-door Garbage Pickup Scheme has been successful in improving the cleanliness of the study area, with a majority of the participants reporting high levels of satisfaction with the scheme. The study also identifies the need for better identification and mapping of garbage disposal sites in the area. It highlights the concentration of disposal sites in certain areas, which may lead to environmental and health hazards if not managed effectively. The problems and issues related to garbage disposal identified in this report include inadequate waste management infrastructure, a lack of awareness among residents, and poor implementation of waste management policies. Therefore, a comprehensive approach to waste management is vital for overcoming challenges and achieving sustainable practices in Ward No. 9 and beyond.

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