

Evaluation of solid waste collection problem in residential area in case of Kolhapur city

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Abstract: The production of solid waste rises in tandem with economic growth and population growth. The environment and human health are at risk from improperly handled solid waste. Numerous issues are brought on by careless waste management and uncontrolled dumping, including contaminating water, drawing rodents and insects, and causing more flooding as a result of clogged Drainage. Additionally, it could lead to explosions or fires that pose a risk to public safety. Planning for and putting into action a complete program for garbage collection, transportation, and disposal together with initiatives to reduce or recycle waste helps solve these issues. Improper waste management also increases greenhouse gas emissions, which contribute to climate change. Kolhapur is facing rapid urbanization and increasing population. Waste creation rises in tandem with population growth due to overcrowding and the emergence of such areas and informal settlements with inadequate waste management techniques. Generally speaking, they produce a lot of sewage and solid garbage since they use more resources than rural areas. The amount of garbage produced per person is also closely correlated with wealth; high-income families produce more rubbish than low-income households, but low-income households accumulate more waste since waste collection services are not readily available. **Index terms:** solid waste management, collection methods, dumping, recycling, transportation

1. Introduction

This study a brief study of existing practice will be carried out along with essentials of initiating solid waste management i.e. problems, paper worked required, and the optimization stages. A comprehensive program for recycling, dumping, composting, and trash prevention is called solid waste management. An effective system considers how to prevent, recycle, and handle solid waste in a way that best protects human health and the environment. The finest waste management techniques are selected and blended after local demands and conditions are evaluated in solid waste management. The primary SWM activities include waste prevention, recycling and composting, and burning and disposal in properly designed, constructed, and maintained landfills. Careful preparation, funding, collecting, and transportation are all necessary for these operations. The goal of waste prevention, also known as source reduction, is to stop trash from being produced. Reusing materials and products, making items to last longer, and using less packaging are all ways to reduce waste.

Every municipality faces the difficulty of choosing the mix of waste management practices that best meets its requirements based on these variables. Setting attainable goals is essential because integrated solid waste management requires both immediate and long-term decisions. You should decide on goals or objectives when creating your SWM plan. For separately collected recyclables and mixed municipal solid waste, disposal options like landfills and incineration do not represent best practices from a material resource-efficient standpoint. It is crucial to measure the effects of such disposal operations in order to quantify the environmental, economic, and societal benefits realized through the adoption of appropriate waste management practices.

Residential areas are facing significant challenges in the effective collection of solid waste, including irregular collection schedules, inadequate infrastructure, lack of segregation at source, and poor coordination between primary and secondary collection systems. These issues lead to waste accumulation, unhygienic conditions, environmental pollution, and health risks for residents. There is a need to systematically evaluate the existing solid waste collection problems in residential areas and develop a structured approach to rectify these issues through improved planning, management practices, technological integration, and community participation in solid waste management.

2. Need of study

Solid waste operation is a comprehensive strategy for avoiding waste, recycling, Composting and disposal program an efficient solid waste operation system must first evaluate local needs and conditions before selecting and combining the best waste management strategies for specific situations in order to avoid recycle and manage solid waste in a way that best protects human health and the environment. The primary methods of managing solid waste operation are burning and disposal in properly designed, constructed, and managed landfills, as well as trash avoidance, recycling, and composting. These operations require careful planning, finance, collection, and transportation.

You will be guided through the implementation process by the solid waste management strategy. In order to guarantee an informed public and boost public approval, don't forget to solicit community participation when creating your plan. In addition to providing funds and overseeing daily operations, government and local authorities are crucial in creating and implementing solid waste management regulations.

3. Research Methodology

Research methodology plays a vital role in ensuring the accuracy, reliability, and validity of the study. It helps minimize errors during data collection and analysis while providing a systematic approach to achieving the research objectives. This study adopted a **quantitative research approach**, which focuses on numerical data, measurements, and statistical analysis to evaluate the municipal solid waste management system in Kolhapur City. Primary data were collected through field surveys, structured questionnaires, interviews, observations, photographic documentation, and case studies. Secondary data were obtained from literature reviews, government guidelines, reports, journal articles, handbooks, published case studies, and official online sources. The collected primary and secondary data were analyzed using appropriate statistical tools and techniques to assess waste generation, collection, transportation, and disposal practices, thereby supporting the study's findings and conclusions.

4. Data collection and case studies

This data deals with the analysis of all four case studies that have been performed case studies are about solid waste management collection problems .Now the comparative analysis of all four cases has been presented in tabular format with considerations of various parameters. Analyzed and presented in graphical format.



Study No. 1 – Sector 68, 'A' Ward, Kolhapur Study Area

Study was conducted in **Sector 68 of 'A' Ward, Kolhapur Municipal Corporation**. The area comprises **Mahada Colony, Shahu Colony, Hockey Stadium area, Kalamba Filter, Sasane Colony, Nandanvan Colony, and Guru Maharaj Colony**. These residential areas were selected to evaluate the existing municipal solid waste collection and disposal system.

Waste Collection System

The municipal solid waste in this sector is collected through a **door-to-door collection system** along with waste collection from community dustbins. The collection operation is carried out daily between **6:00 a.m. and 2:00 p.m.** Primary waste collection is performed from individual households, while secondary collection is carried out using **hopper vehicles and rear garbage compactors** for transportation to the disposal site.

Population and Residential Units

According to the Census data, the total **population** of Sector 68 is **8,953**, comprising approximately **2,240 residential units**. The area is predominantly residential, resulting in the generation of mainly household municipal solid waste.

Waste Generation and Collection Resources

The sector generates approximately **5–6 tonnes of municipal solid waste per day**. To manage this quantity of waste, **four side-loader vehicles** are deployed. The workforce consists of **four drivers, twelve helpers**, and one **Sanitary Inspector, Mr.Sushant Shevale**, who supervises the waste collection operations.

Method of Collection

The waste collection process is divided into two stages:

- **Primary Collection:** Door-to-door collection of waste from residential households.
- **Secondary Collection:** Transfer of collected waste using hopper vehicles and rear garbage compactors for transportation to the designated disposal facility.

Field Observations and Challenges

During the field survey, several operational challenges were observed. These included overflow of community dustbins at certain locations, littering around collection points, improper segregation of waste at the source, and occasional delays in waste collection. These issues affect the overall efficiency of the municipal solid waste management system and indicate the need for improved public awareness, source segregation, and regular monitoring by the municipal authorities.

Photographic Documentation

Photographs of the study area were taken during the field survey to document the existing waste collection practices, infrastructure, and operational challenges. These photographs provide visual evidence supporting the observations and comparative analysis presented in this study.

4.1 Case study comparative analysis table

parameters	Case study Sector 68 1	Case study Sector 67 2	Case study Sector 69 3	Case study Sector 70 4	observations
Communication between users and solid waste collectors	yes	yes	yes	No	yes
Users adopting dumping solid waste methods.	yes	yes	yes	No	yes
Segregation of solid waste generated in residential area	No	yes	yes	No	yes
Public awareness about solid waste management	yes	yes	yes	No	yes
Technical details of communal bins designed on site	No	No	No	No	No
Scheduling for primary and secondary collection	yes	yes	No	No	No
Provision of safety gears	yes	yes	No	yes	yes
Use of digital system	Not provided	Not provided	Not provided	Not provided	Not provided

5. Analysis and Discussion

Questionnaire survey (data is collected form analysis based on case study reports)

- Data are collected from users while collection of primary level lacking behind communication between users and collectors (primary level collection)

In process of primary level collection communication is developed	56%
In process of primary level collection communication is not developed	44%

- Users are adopting dumping methods**

Use of(communal bins, kerbside bins, door to door collection)	90%
Open land dumping	10%

- Segregation of solid waste generated in residential area**

Dry garbage	38%
Wet garbage	34%
Mix garbage	28%

- Public awareness about solid waste management and systems**

Yes ,users are awareness about solid waste management	42%
no awareness about solid waste management	58%

- Municipal corporation (urban local body) providing architectural detail on dumping site**

Proper location for bin provided in residential area with proper embankment of paved area for communal bins(secondary collection)	20%
No provisions	80%

- Scheduled are done for primary and secondary collection**

In zones (wards) manually scheduling are done by urban local body or municipal corporation	70%
No, scheduling	30%

• **Provision of safety gears and advanced equipment's**

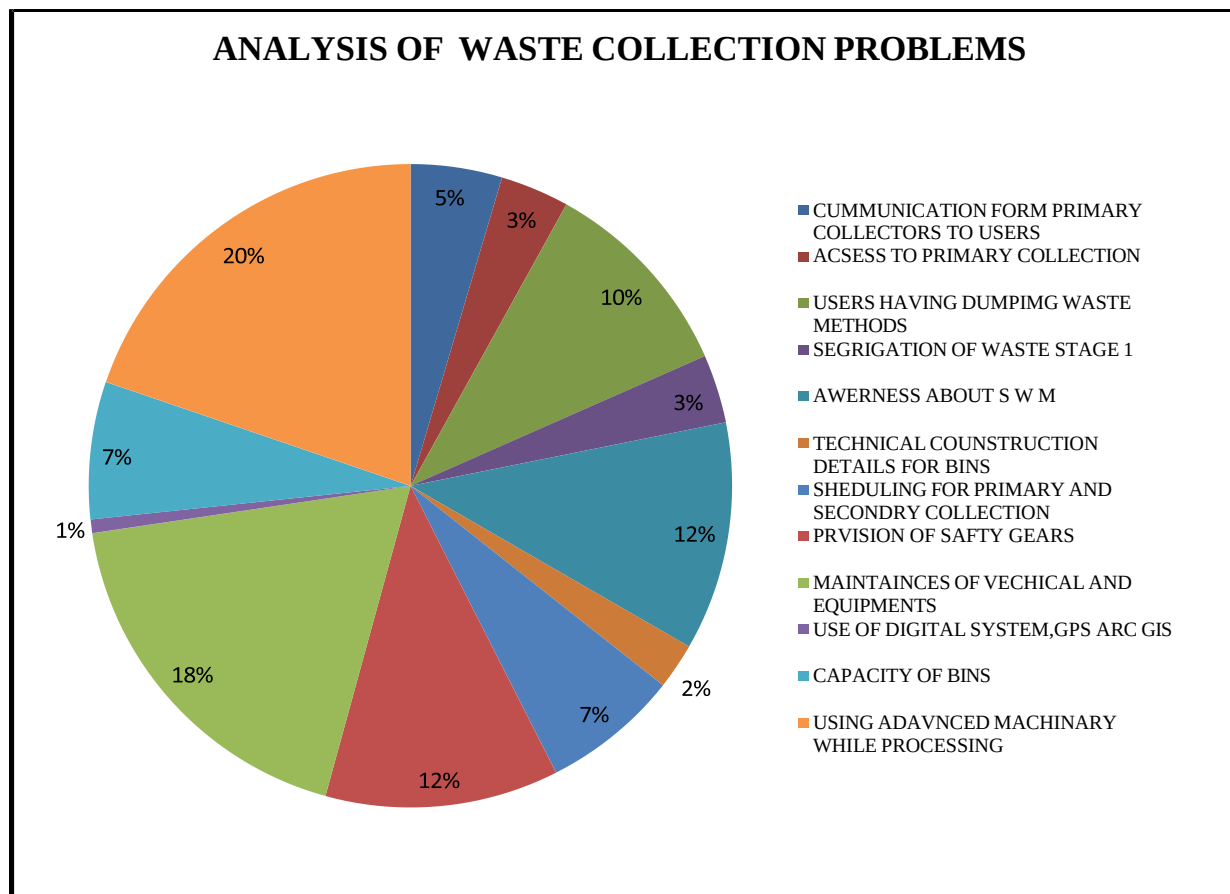
urban local body or municipal corporation provided safety gears for users and use of that	28%
No use of safety gears provided users	72%

• **Use of digital system for vehicle and transfer station like, GPS, GIS ARC, etc**

urban local body or municipal corporation provided advanced PS system for route optimization	1%
No provision	99%

• **Maintains policy of vehicle**

Maintains of primary and secondary vehicle	58%
No Maintains of primary and secondary vehicle	42%



6. Conclusion:

This study evaluate following problems facing toward urban local bodies in Kolhapur city

- 1) Urban local bodies or municipal corporation giving guide lines about solid waste management and also strict rules and penalties that must followed on every dumping site also should be monitor by such bodies this system run smoothly there for a governing body will be them.
- 2) While designing such system for garbage collection and processing consideration of project cost including maintenance cost also.
- 3) Awareness about SWM is giving on digital media platform for executing such system and planning for collection.

- 4) Segregation of waste that is dry and wet, particular way so it's become easy to processing.
- 5) Solid waste management transportation of garbage vehicle should be maintained time to time also under maintenance policy follow all check list for several mechanisms for primary collection to secondary collection respectively.
- 6) Taking initiative in advance technology for transportation and processing equipment giving a proper guidance to worker how to handle vehicle and equipment's respectively.

7. Recommendation:

Before solid waste leaves the facility that creates it, whether it is a home, an institution, an industry, etc., segregation must be done. Since residential areas are where the majority of our waste originates, solid waste management must adapt to local conditions. Trash segregation at the source maximizes resource recovery from trash, improves collection efficiency, and offers localized solutions. Focus on core principles like the **3Rs (Reduce, Reuse, Recycle)**, source segregation, decentralized processing (composting). Creating management information systems (MIS) for monitoring, ensuring statutory clearances, involving communities, and improving collection/transportation logistic

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