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MANAGEMENT OF SOLID WASTE ALLAHABAD MUNICIPALITY

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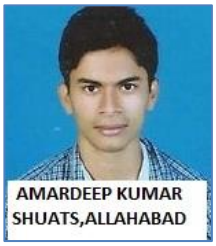


ABSTRACT
Municipal solid waste management is one of the major problem areas in urban India. Management of such enormous qualities of complex waste has become a serious concern for the local authorities and growing nuisance for the public. In view of the above, a survey was carried out in Allahabad city to assess the community requirement and their willingness to pay for improved solid waste generated by household in the Allahabad urban area. The results of survey show that waste generation of different kinds increase with increase in population and urbanization. The total waste generated per day is 568 (metric tons) and collection performance 96%. As efficiency of collection of municipal solid waste is about 80%. The survey revealed that about 85% households were disposing off their waste in open environment due to non-availability of dustbin/Kudaghar in the near vicinity. Maximum people were willing to pay for improved solid waste management practices in Allahabad City. A regression analysis shows that willingness to pay of the household in the city of Allahabad is positively influenced by parameters like households shopkeepers group, offices, schools, hotels and other institutions.

Key words: Solid wastes, Management, Treatment, Disposal, Reduction, Transportation, Transfer, Landfill, Degradation, Biodegradable, Aeration.

INTRODUCTION

In a developing country, the problems associated with solid waste management are more acute than in a developed country. Lack of financial resources and infrastructure to deal with solid waste creates a vicious cycle; lack of resources leads to low quality of service provision which leads to fewer people willing to pay for said services, which in turn further erodes the resource base and so on.

The problem is further complicated by rapid growth in population and urbanization, which adds greatly to the volume of waste being generated and to the demand for waste retrieval service in municipal areas. However, more often than not, an increase in population is not matched with an equal increase in revenue for the local municipalities for waste management. Besides this, rapid urbanization means rapid growth of shanty dwelling units that are largely unplanned for, and add to the waste, health, and hygiene problems. Another significant factor that contributes to the problem of solid wastes in a developing country scenario is the lack of proper collection and transportation facilities.

Improper planning coupled with rapid growth of population and urbanization serves to add congestion in streets, and as a result the waste collection vehicles cannot reach such places, thus allowing filth to build up over time. Lack of monetary resources, at times, results in improper or no transportation vehicles for waste disposal adding another dimension to the ever rising cycle of problems. In any developing country, the threats

posed by improper handling and disposal of solid wastes (though often ignored) contribute to the high level of mortality and morbidity. Human and ecosystem health is also threatened due to improper handling of solid wastes.

Solid waste is the unwanted or useless solid materials generated from combined residential, industrial and commercial activities in a given area. It may be categorized according to its origin (domestic, industrial, commercial, construction or institutional); according to its contents (organic material, glass, metal, plastic paper etc); or according to hazard potential (toxic, non-toxin, flammable, radioactive, infectious etc).

Management of solid waste reduces or eliminates adverse impacts on the environment and human health and supports economic development and improved quality of life. A number of processes are involved in effectively managing waste for a municipality. These include monitoring, collection, transport, processing, recycling and disposal.

Urban India is facing an ever increasing challenge of providing for the incremental infrastructural needs of a growing urban population. According to the 2011 census, the population of India was 1.21 billion; of this 31% live in cities. It is further projected that by 2050 half of India's population will live in cities. With this increasing population, management of Municipal Solid Waste (MSW) in the country has emerged as a severe problem not only because of the environmental and aesthetic concerns but also because of the sheer quantities generated every day.

MANAGEMENT OF SOLID WASTES: AN OVERVIEW

Recognizing that our world is finite and that the continued pollution of our environment will, if uncontrolled, be difficult to rectify the future, the subject of solid wastes management is both timely and important. The overall objective of solid wastes management is to minimize the adverse environment effects caused by the indiscriminate disposal of solid wastes, especially of hazardous wastes. To assess the management possibilities it is important to consider

(1) Materials flow in society,
(2) Reduction in raw materials usage,
(3) Reduction in solid wastes quantities,
(4) Reuse of materials,
(5) Materials recovery,
(6) Energy recovery, and
(7) Day-to-day solid wastes management.

The principal objective of solid waste management is generally to allow Human and industrial effluents to be disposed of without danger to human health or unacceptable damage to the natural environment. No danger to human health or unacceptable damage to the natural environment is expected. Solid wastes include household waste from kitchen, food wastes, fruits, kitchens, sinks. Solid wastes also include waste from industry and commerce.

Solid-waste characteristics

The sources of solid waste include residential, commercial, institutional, and industrial activities. Certain types of wastes that cause immediate danger to exposed individuals or environments are classified as hazardous; these are discussed in the article hazardous wastes management. All nonhazardous solid waste from a community that requires collection and transport to a processing or disposal site is called refuse or municipal solid waste (MSW). Refuse includes garbage and rubbish. Garbage is mostly decomposable food waste; rubbish is mostly dry material such as glass, paper, cloth, or wood. Garbage is highly putrescible or decomposable, whereas rubbish is not. Trash is rubbish that includes bulky items such as old refrigerators, couches, or large tree stumps. Trash requires special collection and handling.

Construction and demolition (or debris) is a significant component of total solid waste quantities (about 20 percent in the United States), although it is not considered to be part of the MSW stream. However, because C&D waste is inert and nonhazardous, it is usually disposed of in municipal sanitary landfills.

Another type of solid waste, perhaps the fastest-growing component in many developed countries, is electronic waste, or e-waste, which includes discarded computer equipment, televisions, telephones, and a variety of other electronic devices. In 2006 e-waste made up 5 percent of the total solid waste stream, and the United Nations Environment Programme estimated that developed countries would triple their output of e-waste by 2010.

Solid-waste treatment Generation and storage: Rates of solid-waste generation vary widely. In the United States, for example, municipal refuse is generated at an average rate of approximately 2 kg (4.4 pounds) per person per day. Japan generates roughly half this amount, yet in Canada the rate is 3 kg (almost 7 pounds) per person per day. In some developing countries (e.g., India) the average rate can be lower than 0.5 kg (1 pound) per person per day. These data include refuse from commercial, institutional, and industrial as well as residential sources. The actual rates of refuse generation must be carefully determined when a community plans a solid-waste management project.

Most communities require household refuse to be stored in durable, easily cleaned containers with tight-fitting covers in order to minimize rodent or insect infestation and offensive odors. Galvanized metal or plastic containers of about 115-litre (30-gallon) capacity are commonly used, although some communities employ larger containers that can be mechanically lifted and emptied into collection trucks. Plastic bags are frequently used as liners or as disposable containers for curbside collection. Where large quantities of refuse are generated such as at shopping centers, hotels, or apartment buildings dumpsters may be used for temporary storage until the waste is collected. Some office and commercial buildings use on-site compactors to reduce the waste volume.

Solid-Waste Collection: Proper solid-waste collection is important for the protection of public health, safety, and environmental quality. It is a labour-intensive activity, accounting for approximately three-quarters of the total cost of solid-waste management. Public employees are often assigned to the task, but sometimes it is more economical for private companies to do the work under contract to the municipality or for private collectors to be paid by individual home owners. A driver and one or two loaders serve each collection vehicle. These are typically trucks of the enclosed, compacting type, with capacities up to 30 cubic metres (40 cubic yards). Loading can be done from the front, rear, or side. Compaction reduces the volume of refuse in the truck to less than half of its loose volume.

The task of selecting an optimal collection route is a complex problem, especially for large and densely populated cities. An optimal route is one that results in the most efficient use of labour and equipment, and selecting such a route requires the application of computer analyses that account for all the many design variables in a large and complex network. Variables include frequency of collection, haulage distance, type of service, and climate. Collection of refuse in rural areas can present a special problem, since the population densities are low, leading to high unit costs.

Refuse collection usually occurs at least once per week because of the rapid decomposition of food waste. The amount of garbage in the refuse of an individual home can be reduced by garbage grinders, or garbage disposals. Ground garbage puts an extra load on sewerage systems, but this can usually be accommodated. Many communities now conduct source separation and recycling programs, in which homeowners and businesses separate recyclable materials from garbage and place them in separate containers for collection. In addition, some communities have drop-off centres where residents can bring recyclables.

Transfer Stations: If the final destination of the refuse is not near the community in which it is generated, one or more transfer stations may be necessary. A transfer station is a central facility where refuse from many collection vehicles is combined into a larger vehicle, such as a tractor-trailer unit. Open-top trailers are designed to carry about 76 cubic metres (100 cubic yards) of uncompacted waste to a regional processing or disposal location. Closed compactor-type trailers are also available, but they must be equipped with ejector mechanisms. In a direct discharge type of station, several collection trucks empty directly into the transport vehicle. In a storage discharge type of station, refuse is first emptied into a storage pit or onto a platform, and then machinery is used to hoist or push the solid waste into the transport vehicle. Large transfer stations can handle more than 500 tons of refuse per day.

REVIEW OF LITERATURE

Jin et al. (2006) presented an overview on the current solid waste management practices and situation in Macao during the last decade. However,

they drew conclusions that due to Macao's geographic area and high cost of land, land filling has the lowest priority for waste disposal and solid waste incineration has been given a top priority over the other waste disposal methods although it is much more expensive.

Anjana Iyer (2007) Manual on solid waste management This manual is meant to guide the development of an effective solid waste management policy for large cities. It is based on the hypothesis that:

- Keeping a city clean is not only about operating expensive machines but about simple changes such as the design of a broom.
- Communities must be involved in the development and implementation of the system.
- The informal sector actors (waste pickers etc) must be given the attention they deserve.
- A system of collection, transportation and disposal of waste cannot be transplanted from another place where it has been successful – rather it should be adapted to local conditions.
- Trade unions must be taken into confidence for a system to be effective and smooth.

(Mazzanti & Zoboli, 2008) Agamuthu et al. (2009) (Couth & Trois, 2010) (Pires et al., 2011) has discussed**.** Solid waste management has become one of a major concern in environmental issues (Mazzanti & Zoboli, 2008). This is particularly true to urban areas where population is rapidly growing and amount of waste generated is increasing like never before (Kathiravale & Mohd Yunus, 2008). Current earth's population is 6.8 billion and it is estimated that almost half of this population lives in urban areas (Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, 2009). Waste generation increase proportionally to this population number and income, creating the needs of effective management (Mazzanti & Zoboli, 2008).

Integrated Sustainable Waste Management (ISWM) system was then introduced in 1995 to improve earlier system that neglect unique characteristics of a given society, economy and environment (van de Klundert, 1999). For example, European countries had applied various system assessment tools and engineering models to create sustainable communities, manage resources efficiently, tapping innovation potential of the economy, ensuring prosperity, environmental protection and social cohesion in their SWM system (Pires et al., 2011).

Subramani, 2012 said that Pollution and diseases, human-induced climate change is increasingly recognized as a crucial threat and natural variability. Climate change is altering migratory species patterns, causing coral bleaching, etc. (Subramani, 2012). Ecosystems maintain global environmental balance. Anything that alters the function of ecosystems creates an imbalance that affects all life on Earth (www.ehow.com, 2013). On account of the increasing industrialization and rapid growth of population, the solid wastes generation has not only increased but its nature has also been changed. In this context proper solid waste management is highly required to save public health and to protect environment. Environmental pollution needs diverse innovative technologies and managerial plans for better remedies. We should also encourage private and community effort to reuse discarded material.

MATERIALS AND METHODOLY

This study is based on the paradigm of critical social science. The main approach employed for this study is a qualitative case-study of Allahabad municipality, U.P., India. The case study approach allows use of inductive methods, such as interviews, focus group discussions, which allows for general conclusions to be drawn from particular facts.

Case study approach: The case study strategy allowed us to explore the solid waste management system in Allahabad in detail. We collected detailed information using a variety of data collection procedures, which allowed us to study solid waste management system in an urban area. The research involved "how" and "why" questions and the we had no control over the behavioral events, characteristics that make a case study strategy suitable.

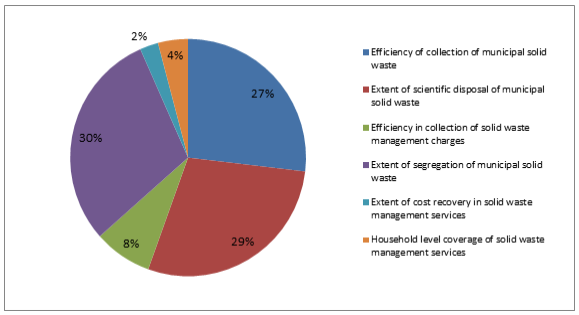
Data collection: The methods used involved semi-structured interviews, mapping, trend and change analysis and non- participant observations. Besides

these, we have reviewed reports, published information, and interviews with key informants and participation of local community people, community groups and non-governmental organizations.

RESULT & DISCUSSION

Management scenario		Other Indicators	
Total Waste Generated/day (metric tons)	568.66	Total quantity of waste collected and transported to disposal site (MT/month)	16470
Total Number of Households and Establishments covered by Door to Door Collection	25070	Collection Performance (%)	96
No. of Vehicles	90	Segregation of Waste	0
No. of Labor engaged in conservancy Total (Sanctioned)	2827	Efficiency of collection of municipal solid waste	80.9
Disposal site	01		

Solid Waste Management indicator of Allahabad



CONCLUSIONS

General conclusions that relate to the study objectives are detailed below.

1. Waste is not segregated, and the collection and transportation of waste is basic and inadequate.
2. The dumping ground is near the town, thus posing a health threat to the people living near the dumping ground, and an environmental risk to the entire area.
3. There are no safety measures in place for waste workers.
4. The Allahabad municipality needs to set targets and goals in terms of what it wants to achieve in the future.
5. Large scale composting can be expensive and may not work in Allahabad; hence the focus should be on developing ward level, or preferably community level, small-scale composting processes.
6. Collection of the waste should be undertaken at the doorstep level and people from economically backward sections may be employed for the same.
7. The municipality should make appropriate provisions for the collection and transportation of waste. Closed wastes transportation trucks with separate compartments for segregated waste should be immediately commissioned.

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