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Solid Waste Generation and its Management-A Case Study

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Abstract

Solid waste predominantly, is any garbage, refuse or rubbish which include- domestic, commercial and industrial wastes especially common for disposal. Solid waste should be handled and disposed off properly or else it poses numerous risks. To reduce the effects of waste on human health and environment, Solid waste management should be undertaken. The project was taken up to assess the type and amount of waste generated in St. Pious X Degree and PG College for Women, Hyderabad and suggest the possible ways of managing the solid waste generated in the college campus. The waste was collected on a daily basis from various sources in the college and was separated into dry waste and wet waste. Dry waste was then segregated into recyclables (paper, plastic, glass, metals) and non recyclables and weighed. The results showed that out of the total waste generated, 24% was wet waste, 48.6% was dry non recyclable waste and remaining was dry recyclables- 14.7% paper; 8% plastic; 3.3% glass and 0.7% metals. It was suggested to employ colour coded dustbins for different types of wastes at main sources of waste generation in the college campus.

Keywords: Solid waste, waste management, waste segregation, dry waste, wet waste, recyclable and non recyclable waste.

Introduction

Improper handling and disposal of solid waste in open spaces poses dangers to human health as well as the environment. Waste workers and rag pickers who are involved in direct handling of solid waste are usually affected and suffer from chronic diseases. Moreover, it causes public places to appear ugly and also results in poor water, land, and air quality. Burning of heaps of waste generate greenhouse gases such as methane, carbon dioxide and nitrous oxide which could be the cause of global warming. Thus to reduce the effect of wastes on health and environment or aesthetics, Solid waste management should be undertaken. Solid Waste management is the "generation, prevention, characterization, monitoring, treatment, handling, reuse and residual disposition of solid wastes"[1]. The waste management strategies developed should aim at reduction of waste generation and maximum practical benefits from the products. The waste hierarchy includes: preventing the generation of waste, reducing the generation of waste i.e. by re-use, recycling and composting. The final action is to dispose in landfills and incineration.

The primary goals of sustainable waste management are to protect human health and the environment and to conserve resources. A key precondition is affordable waste management costs. To reach these goals, decision makers apply integrated strategies that consist of a multitude of connected processes, such as collection, transportation, treatment, recycling, and disposal[2]. There are several methods available to handle, treat and dispose of solid wastes[3]. Solid waste management can be distinguished by the following stages: Waste minimization/prevention, Waste separation at source, Waste collection and transportation by vehicles, Recycling and/or waste processing facilities like incineration or composting, waste disposal in Landfills.

Solid waste management is a challenge for the cities' authorities in developing countries mainly due to the increasing generation of waste, the burden posed on the municipal budget as a result of the high costs associated to its management, the lack of understanding over a diversity of factors that affect the different stages of waste management and linkages necessary to enable the entire handling system functioning[4]. There are many factors influencing recycling of municipal Solid Waste in developing countries such as government policy, government finances, waste characterization, waste collection and segregation, household education, household economics, MSWM (municipal solid waste management) administration, MSWM personnel education, MSWM plan, local recycled-material market, technological and human resources, and land availability[5].

Waste is growing by leaps and bounds in India. With a population of over 1.22 billion, rapid urbanization and modernization of India is simply inevitable. One result of a rapid urbanization, a slowly reducing gap between urban and rural, changing consumption patterns and a growing population is the problem of waste. There has been an unpredictable increase in both industrial and domestic wastes. Waste management in Indian cities experience exhausted waste collection services, inadequately managed and uncontrolled dumpsites and the problems are worsening. Problems with governance also complicate the situation. Waste management in these cities is an ongoing challenge and is the responsibility and obligation of all citizens to to ensure that hygienic waste-management becomes a reality soon.

Nowadays, increasing public awareness of the environment compels us to define and adopt new solutions for waste management. The knowledge of the sources and types of waste in an area is required in order to design and operate appropriate solid waste management systems[6]. Thus this project was taken up to assess the type and amount of waste generated in the college campus and suggest the possible ways of managing the solid waste with the ultimate aim of minimizing the waste that needs to be disposed in landfills and thus reduce the environmental impact of disposal sites.

Methodology

St Pious X Degree and P.G College for Women, Nacharam, Hyderabad, affiliated to Osmania University, is a catholic minority Institution and is offering 13 graduate and 5 post graduate programs. The serene campus is spread over 4 acres of land with state of art of laboratories, spacious and well ventilated class rooms and staff rooms in two buildings. A large auditorium, modern conference hall, audiovisual room, gymnasium, playground and canteen are the additional facilities.

The first step in waste management is to gain an understanding of the waste types being generated in order to design appropriate collection and disposal strategies [7]. The project started with the steps to identify the sources of waste generation in the college campus and then to assess the amount and types of waste generated in the college.

Identifying the Sources Of Waste Generation: The various sources of waste generated in the campus and the type of waste generated were determined and tabulated in the table- 1.

Segregation of waste: Waste characterization consists of collecting waste at its source and directly sorting it out into types of materials[8,9]. The waste was collected on a daily basis from various sources in the college and was brought to the common area in the ground for further segregation by category. The collected waste was separated into dry waste and wet waste. Dry waste was then segregated into recyclables (paper and cardboard; plastic and pet bottles; glass, metals) and non recyclables.

Weighing of different categories of waste: The different waste categories segregated were then weighed using a weighing machine and respective weights were noted down. The procedure was repeated on a daily basis for a month. The average per day weight of each category waste and total waste generated was calculated.

Results and Discussion

The waste collected was separated into wet waste and dry recyclables (paper and cardboard; plastic and pet bottles; glass, metals) and non recyclables. The different waste categories segregated were then weighed using a weighing machine and average per day weight of each category waste and total waste generated was calculated. The percentages of different categories of solid wastes generated in the college campus were then calculated and results are given in table-2 and figure-1.

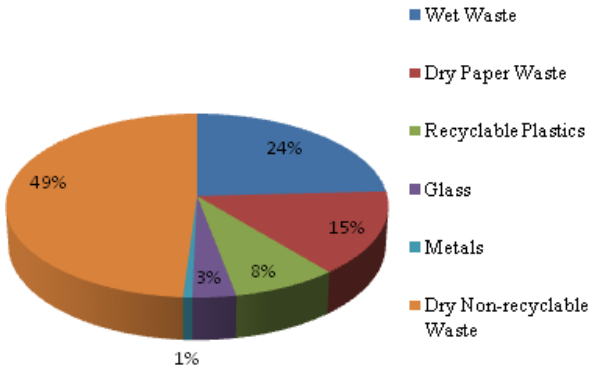

Figure-1
Solid waste generated in the College campus

As per the statistics most of the recyclable waste was wet waste, paper and plastic waste. Therefore it was suggested to employ colour coded dustbins at main sources of waste generation in the college campus (figure-2).

Table-1
Sources and Type of waste generated from various sources

S. No	Source	Number	Type of waste generated
1.	Class rooms	32	Paper, plastic (Polythene covers, PET bottles, Wrappers-chocolate and chips), aluminium foil, pens, disposable cups, metal cans, Charts, Cardboards, thermo cols.
2.	Laboratories	21	Paper, plastic (polythene covers, plastic bottles), Glass (slides, cover slips, glass bottles, blotting papers, tissues, syringes.
3.	Staffrooms	15	Paper, plastic(polythene covers, plastic bottles, disposable containers)
4.	Office	4	Paper and plastics
5.	Canteen	1	Paper, plastic, wrappers, paper boxes, disposal cups, PET bottles, metal cans, glass bottles.
6.	Library	3	Paper and plastics
7.	Toilets	29	Paper, plastic, and sanitary napkins

Table-2
Percentages of different categories of solid waste generated in the college campus

Types Of Solid Waste	Percentage (%)
Wet Waste	24
Dry Recyclables i) Paper waste	14.7
ii) Plastic waste	8
iii) Glass waste	3.3
iv) Metal waste	0.7
Dry Non-recyclable Waste	48.6

Figure-2
Colour coded bin system employed in the college campus

Green for wet waste (leaves, twigs, vegetable waste, fruit waste etc.), Blue for paper waste (newspapers, magazine, light paper, paperboard cartons etc.), Red for plastic waste (plastic bags, PET bottles, buckets etc.)

An important step was to ensure student and faculty to segregate waste by using different dustbins to dispose of wet and dry wastes like paper, plastics, glass, metal etc. This was made possible via continuous awareness programs through lectures, advertisement on notice boards, displaying slogan boards in the campus.

Three different coloured dustbins –green for wet waste; blue for paper and red for plastic were bought from Begum Bazaar, Hyderabad and kept on each floor and canteen for collection of respective wastes. Dry Non Recyclables were asked to put in dustbins provided in classrooms and staff rooms. Wet waste could be used for composting. This is not only because composting is a cost-effective process practiced since Vedic times, but also because India's soils need organic manures to prevent loss of fertility through unbalanced use of chemical fertilizers[10]. Paper and plastic wastes collected can be sent to be recycled in the respective recycling centres.

Conclusion

Solid waste is any garbage or rubbish which includes domestic, commercial and industrial wastes. Improper handling of solid waste and indiscriminate disposal in open spaces give rise to numerous potential risks to the environment and to human health. To reduce their effect on health, the environment or aesthetics Solid waste management should be undertaken.

Waste segregation at the source should be adopted to avoid a mixing or pollution of the different waste fractions, which could be an obstacle to easy recycling. Moreover, direct handling/ sorting of garbage or solid waste by the waste workers and the rag pickers results in chronic diseases. Thus waste sorting / segregation at source ensure and promote recycling and reuse of segregated materials. And also helps to minimize the waste (Dry non recyclables) that needs to be disposed in landfills and thus reduce the environmental impact of disposal sites.

All households/ apartments, Institutions, communities should have their own dustbins for collection of dry and wet wastes separately. Biodegradable items can be composted and reused. The best option for India is daily / weekly doorstep collection of "wet" (food) wastes for composting or construction of backyard compost pit. The non-degradable wastes can be recycled very economically in the recycling plants in apartment communities or Neighborhood Depository/Recycling Centers. Hence the government should take initiatives to create awareness and sensitize people about waste segregation and promote recycling or reuse of segregated materials. It is the responsibility and obligation of all the citizens to adopt proper waste management strategies and ensure a hygienic city and country.

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