



ECOFRIENDLY APPROACH FOR ENVIRONMENTALLY SAFE AND SUSTAINABLE SOLUTIONS FOR SOLID WASTE MANAGEMENT-A CASE STUDY OF ST.THERESA’S COLLEGE, ELURU, W.G.DIST, A.P.

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ABSTRACT

Solid waste is the unwanted and useless solid materials generated from residential, industrial and commercial activities. Rapid increase in solid waste is due to urbanization population growth and materials produced by human activity. Composition of solid waste varies with different factors like living standard, climatic condition, socio-economic factor etc. Solid Waste Management (SWM) is the “prevention, characterization, monitoring, treatment, handling, reuse and residual disposition of solid wastes. SWM was never taken up seriously either by public or by concerned agency or authorities. Hence it became one of the major human health and environmental problem. Improper management of solid waste causes hazards to inhabitants. Various studies reveal that about 90% of Solid Waste is disposed unscientifically in open dumps and landfills, creating problems to public health and the environment. It is a big challenge all over the world for human beings. Therefore the present study was taken to find out the problems and prospects of solid waste in St. Theresa’s College, Eluru. In this paper, we focus on solid waste generated in and around the college campus and its treatment in order to conserve environment. A detailed investigation was made regarding the methods of practices associated with sources, quantity generated, collection, transportation, storage, treatment and disposal of solid waste in college campus. The study has been carried out to evaluate the current status of solid waste generation and disposal techniques. The data concerning to SWM in college was obtained through questionnaire, interacting with people and photographic evidences. Various adopted treatment technologies for solid waste are critically reviewed, along with their advantages and limitations. The study is concluded with a few fruitful suggestions, which may be beneficial to encourage the competent authorities and researchers to work towards environmentally safe and sustainable approaches regarding solid waste management.

Key words: Solid waste management, problems, disposal techniques, suggestions, sustainable approaches.



Introduction:

Increasing population levels, booming economy, rapid urbanization and the rise in community living standards have greatly accelerated the solid waste generation rate in developing countries (Minghua, Z. F et al 2009). Solid waste may be defined as generation of undesirable substances which is left after they are used once. They cannot be reused directly by the society for its welfare because some of them may be hazardous for human health. The waste quantity is increasing at an alarming rate in India due to rapid urbanization and a high population growth (Sharma, S., Shah, K.W., 2005 and Central Pollution Control Board (CPCB), 2004). The growth rate of population for India in the last decade was 17.6% (Census of India 2011). Domestic, commercial, biomedical and variety of hazardous wastes are generally disposed of by the citizens on the streets, drains, open spaces, water bodies, etc., causing serious problems of health and environment (Abbasi et al. 2012). Expected generation of municipal solid waste until 2025 in India is 700 gram per capita per day (World Bank report 2006). There are many categories of Solid Waste such as food waste, rubbish, commercial waste, institutional waste, street sweeping waste, industrial waste, sanitation waste, construction waste and demolition waste. Solid Waste contains recyclables (paper, plastic, glass, metals, etc.), toxic substances (paints, pesticides, used batteries, medicines) compostable organic matter (fruit and vegetable peels, food waste) and soiled waste (blood stained cotton, sanitary napkins, disposable syringes) (Jha et al., 2003, Reddy & Galab, 1998, and Khan, 1994). Poor collection and inadequate transportation are responsible for the accumulation of solid waste at every nook and corner. Solid waste management was never taken up seriously either by public or by concerned agency or authorities and now the piled up waste is threatening our health, environment and well-being (Chouhan and Reddy 1996, Mazumdar 1994 & Yadav et al. 2009). Unscientific disposal causes an adverse impact on all components of the environment and human health. Therefore, Solid Waste Management (SWM) is one of the major environmental problems of India. SWM system comprises only four activities, i.e., waste generation, collection, transportation, and disposal. The management of SW requires proper infrastructure and maintenance.

Description of Eluru Town:

Eluru, previously known as Helapuri and has a rich cultural and political history. It was a part of Buddhist Kingdom called Vengi. During the Chalukyas (700AD – 1200AD), Eluru was a province. Later on Eluru remained a part of Kalinga Empire. During division of Northern circars into



district, Eluru made a part of Machilipatnam district. Later it was included in the Godavari district in 1859. Subsequently, Eluru made part of Krishna district. Finally in the year 1925, West Godavari District was formed with Eluru as its headquarters. Eluru town is situated at 16.7 0 N latitude and 81.1 0 E longitude on the Kolkata – Chennai National Highway (NH5) [Peavey, 1985]. Eluru was a selection grade municipality of Andhra Pradesh. It has been upgraded to Municipal Corporation on 09.04.2005. The area of Eluru Municipal Corporation is 14.55 Sq.km with a population of 1, 90,062 as per 2001 Census. It would be seen that during the last decade Eluru experienced a negative population growth. [July 2010].

Objective of study:

1. To characterize the waste generated and source of waste generation in STC Campus
2. To identify the solid waste management practices existing in campus.
3. To suggest about some different practices for better solid waste management in STC Campus.

Layout of survey strategy:

1. Divided the campus into three zones as Academic area, Hostels and Canteen.
2. Collected the information regarding solid waste generation by questionnaire.
3. Collected the information about the solid waste management activities in campus through Questionnaire and Individual field visit.
4. Result and discussion
5. Suggestions and Conclusion

Materials and methods:

Study design:

A survey of the problems of Solid waste management practices were conducted during the month of February 2014. Solid Waste was characterized, quantified and segregated as the part of this survey. The sources of solid wastes were divided into three large units as Academic area, Hostels and Canteen. The S.W characteristics were measured by manual sampling to determine their physical and chemical composition. This was followed by the evaluation of the solid waste quantity and their characteristic to propose management options with sustainable approaches for different waste products.



Study area:

CH.S.D.St.Theresa's College was founded in 1953 and granted autonomy during 1987-88. The college was assessed by NAAC three times in 1998, 2005, and 2012 and was awarded 'A' grade. The University Grants Commission conferred the award of 'College with Potential for Excellence (CPE)' 2 times in the year 2005 and 2014. It consists of 2 girls hostels, Administrative block, Science block, Arts block, Home Science block, MBA block, MCA block, PG block and 2 Auditoriums. Currently with around 3000 students were studying in this institution.

Collection, transportation and disposal system:

Anthropogenic activities in campus generate large quantities of wastes. The solid waste is collected from different sources by various methods. The solid waste management activity in STC is very efficient. In the study area, collection processes start from 10.00 a.m to 5.00 p.m. The total sampling points were five consisting of 10 dust bins '2 bins of different colours at each place' provided by 'STC Eco-club'. One green coloured bin exclusively for waste paper and second one Red coloured bin for other than paper. The wastes were thrown into these two different types of bins by staff and students depending upon waste characterization. The sweepers sweep the road and drain and transfer the waste into the bins. The collected waste from these dust bins is planned to transport in accordance with frequency of container becoming full by the sweepers. Improper disposal leads to spreading of diseases and unhygienic condition besides spoiling the aesthetics. Keeping this in mind the waste is disposed in a proper way into large compost pits constructed at botanical garden and college backyard garden. The remaining is disposed into cement bin which was finally collected by municipality collection tractor on every second day. All the dry leaves and coconut fibre were disposed into vermin-compost unit. In the STC campus 4 Management members, 5 NSS Programme Officers, STC Eco-club members and 10-12 sweepers currently working for the purpose of solid waste management.

Results and discussion:

Observations:

In this campus there is different source area that generates the waste of different type such as Food waste, Plastics, Paper, Glass, cardboard, Leather, Dust, Garden Trimming, Tin, Wood, Metal, Textile, and shown in **Table-1**.



Table-1:
Major Sources of Solid Waste Generation at
STC Campus in February 2015

S.N.	Source	Type of Waste
1	Academic area	Food waste, Plastic, Paper, Glass, Cardboard, leather, Dust, Garden Trimming, Tin, Wood, Metal.
2	Hostel	Food waste, Plastic, Paper, Cardboard, leather, Dust, Garden Trimming, Wood, Metal.
3	Canteen	Food waste, Plastic, Paper, Glass, Cardboard, leather, Dust, Garden Trimming, Tin, Wood, Metal.

Solid Waste Characterization: The quantity and characteristics of solid waste vary from place to place. Factors that influence the quantity and Compositions are the different activity areas for waste materials. The approximate percentage of various components of SW in STC campus is given in **Table.2, 3 and 4.**

Table-2:
Composition and percentage of Solid Waste Generated in STC
Academic Area per Day

S. N.	Type of Waste	Calculated Amount	Percentage
1.	Food waste	15kg	32.6 %
2.	Plastic	2kg	4.3 %
3.	Paper	5kg	10.8 %
4.	Glass	1kg	2.2 %
5.	Cardboard	4kg	8.7 %
6.	Leather	1kg	2.2 %
7.	Dust	5kg	10.8 %
8.	Garden trimming	8kg	17.4 %
9.	Wood	3kg	6.5 %
10.	Metal	1kg	2.2 %
11.	Tin	1kg	2.2 %
	Total	46kg	

**Table-3:****Composition of Solid Waste Generated in hostel Area of STC Campus per Day**

S. N.	Type of Waste	Calculated Amount	Percentage
1.	Food waste	10kg	40 %
2.	Plastic	5kg	20 %
3.	Paper	2kg	8 %
4.	Cardboard	1kg	4 %
5.	Leather	1kg	4 %
6.	Dust	2kg	8 %
7.	Garden trimming	2kg	8 %
8.	Wood	1kg	4 %
9.	Metal	1kg	4 %
	Total	25kg	

Table-4:**Composition of Solid Waste Generated in canteen Area of STC Campus per Day**

S. N.	Type of Waste	Calculated Amount	Percentage
1.	Food waste	3kg	23 %
2.	Plastic	1kg	7.7 %
3.	Paper	2kg	15.4 %
4.	Glass	1kg	7.7
5.	Cardboard	4kg	30.8%
6.	Dust	1kg	7.7 %
7.	Metal	1kg	7.7 %
	Total	13kg	

Approximately 46 kg/day waste is generated from the academic area, 25 kg/day from hostels and 13 kg/day from canteen region which contribute to the total 84 kg solid waste per day shown in **Table 2, 3 and 4**.

Table-5:**Various Waste Generating Places in Campus**

S.N.	Source Area	Amount of Waste	Percentage
1.	Academic area	46 kg	54.76 %
2.	Hostels	25 kg	29.76 %
3.	Canteen	13 kg	15.47 %
	Total	84 kg	



From the total 84 kg of S.W generation in STC campus 54.76% of the waste generation comes from academic area, 29.76% from hostel areas and 15.47% from canteen area **Table-5**.

Suggestions:

1. Establishment of paper recycling unit.
2. Use of Three bin system for biodegradable waste, recyclable waste and deposition waste.
3. Increase the number of dustbins at different locations.
4. Use of biodegradable waste for Biogas plant.
5. Construction of more compost pits and vermin-composting units.

Conclusion:

The solid waste management in STC campus appears to be adequate but needs some up gradation. To implement proper waste management, various aspects have to be considered such as: Source reduction, Onsite storage, Collection & transfer, Processing, and Disposal (Rajput et al. 2009). Waste minimization is a methodology used to achieve waste reduction, through reduction at source, waste recycling and re-use of materials. Segregation of recyclable material would also leads to reduction in quantity of solid waste for final disposal. The benefits of waste minimization are environmental, health and financial (Dhande et al. 2005). Most often workers are not provided with protective hand gloves and shoes so they are directly expose to the waste. Protective measures are necessary to avoid contracting skin allergies and respiratory diseases. The loading and unloading of waste is done through mechanical system reducing direct contact of worker with the wastes. The solid waste has to be disposed of scientifically through sanitary landfill. A system approach needs to be adopted for optimizing the entire operation of SWM encompassing segregation at source, timely and proper collection, transportation system, types of vehicles and proper operation of sanitary landfill site. A better management for recyclable and biodegradable waste utilization provides the facility to reduce the waste disposal up to 60-70 % of the total waste dispose at present.



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