JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Solid Waste Management in Pune Municipal Corporation: A Brief Review on Integrated Waste Management

Dr. Ashalata Amol Vidyasagar
Assistant Professor
Sir Parashurambhau College, Geography department, Pune, India

Abstract

This research paper proposed method smarter way of wet waste management using and applying smart application in Pune corporation, this study avoids soil pollution, air pollution, etc. and create new energy sources from wet wastes on large level and this study creates employment, biofuels, CNG and LPG gases: on large scales. Also this study promotes India's aim i.e. "AATM NIRBHAR BHARAT" in energy sources. Aspects related to the growing pollution of the natural environment and depletion of conventional fossil fuels have become the motive for searching for eco-friendly, renewable, and sustainable alternative energy sources. Particular attention is paid to industrial waste, especially waste of biomass materials, which can be converted into biofuels and energy that meets the growing needs of humanity. The use of biomass for energy purposes is less damaging to the environment, the materials are low-cost, locally available in large quantities, and create employment opportunities for workers in suburban and rural areas around the world. This article discusses issues related to the use of waste biomass materials as renewable energy sources. The current energy situation in the world is analysed in terms of production, consumption, and investments in green energy. Types of biomass and individual physicochemical and energy properties of waste plant materials obtained for energy purposes are described. Currently available methods of converting biomass into energy, including mechanical, thermal, and biochemical techniques are discussed. The conducted analysis indicates the possibility of using it as a competitive source of electricity and heat. Understanding the properties of biomass materials allows us to understand the right way to use them for energy and reduce the consumption of fossil fuels in the future.

Keywords: Wet waste Management, Employment Generation, "AATM NIRBHAR BHARAT", Reduce Soil Pollution.

Introduction

The safe and effective management of health care biomedical waste has received much attention for improper and inadequate management is associated with an increase in the incidence of health risks to the healthcare workers, the patients, and their environment and to the community at large. Hence the development of safe and effective management of biomedical waste along with handling protocols, institutional plans and

policies, appropriate training and feedback programs on proper waste management and handling for all the healthcare workers are highly recommended. In India, with the implementation of

Biomedical Wastes (Management and Handling) Rules 1998, emphasis is being placed mainly on the proper handling, segregation and disposal of the healthcare waste by which the risks and hazards to an individual and to the community can be considerably reduced. Though a technology and treatment protocol already exist, liquid biomedical waste management still remains a major problem for all healthcare facilities. So proper training in handling of waste will enable the health care facility to diffuse this critical problem safely and cost effectively while managing their liquid biomedical waste. So, a literature search using the terms liquid biomedical waste was done and this review describes the problems associated with its management.

Today's world most common issue with waste management particularly in of wet garbage and disposal primarily in the Pune city which is one of the metro city in India. There is approximately 1600-1700 tons of wet and dry garbage collected in Pune. From that 700 tons of garbage is wet garbage, it get collected from, hotel wastes, house waste, human waste etc. there are many initiative took by Pune municipal corporation for waste management particular for wet garbage management , but there is no out come from this initiatives in Pune Municipal Corporation areas. also the amount of wet waste increased from last some years, due to because of increased population, so that's why there are many disease are formed in pune city, particularly in nearby areas of dumping yards (kothrud, warje, urli kanchan, fursungi and other) also climatic condition changed here like unseasonal rain, decreased air quality, etc. the reason behind of this condition are seen by our eyes this reasons are " there is no proper management of wet and dry garbage, particular wet garbage, these mismanaged wet garbage creates new form of disease in nearby areas of dumping yards, also losses fertility of soil and to make reason of unsustainable urbanization planning, and climatic change. This paper going to study and create new form of Indian models of wet waste management on large scale and also on small scale like apartment level, Hotel Level, and large scale means Proper management of wet waste on dumping yards. This study provides proper management of wet waste and create new energy sources on ground level, like hotel, apartment, and also on dumping yards. This also creates employment, help to generates electricity, useful BIO-CNG, LPG gases for various purpose. Also helps to increase economy of corporation.

Objectives of the study

- To identify various wet composting techniques used in Pune City
- To identify the most cost-effective and popular technique of wet-waste management in PMC.
- To study the level of awareness and opinion of the people regarding waste management.

Methodology:

1. <u>Collection of Data:</u>

- Collect primary data through surveys, interviews, and field observations from various including waste collection agencies, recycling facilities, government bodies, and local communities.

- Select specific regions or cities for in-depth case studies to understand their waste management systems, policies, and the outcomes achieved.
- Compare the results of these case studies to draw insights into the effectiveness of different approaches.
- Gather secondary data from official reports, college faculties, and academic publications.

2. Data Analysis:

- Analyse the collected data to identify patterns, challenges, and opportunities in waste management.
- Utilize statistical methods to assess the efficiency of current waste management systems, including waste diversion rates, recycling rates, and waste-to-energy conversion rates.

3. Environmental Impact Assessment:

- Evaluate the environmental impact of various waste management practices, including greenhouse gas emissions, landfill space, and resource conservation.
- Assess the potential benefits of implementing eco-friendly waste management solutions.

Study area:

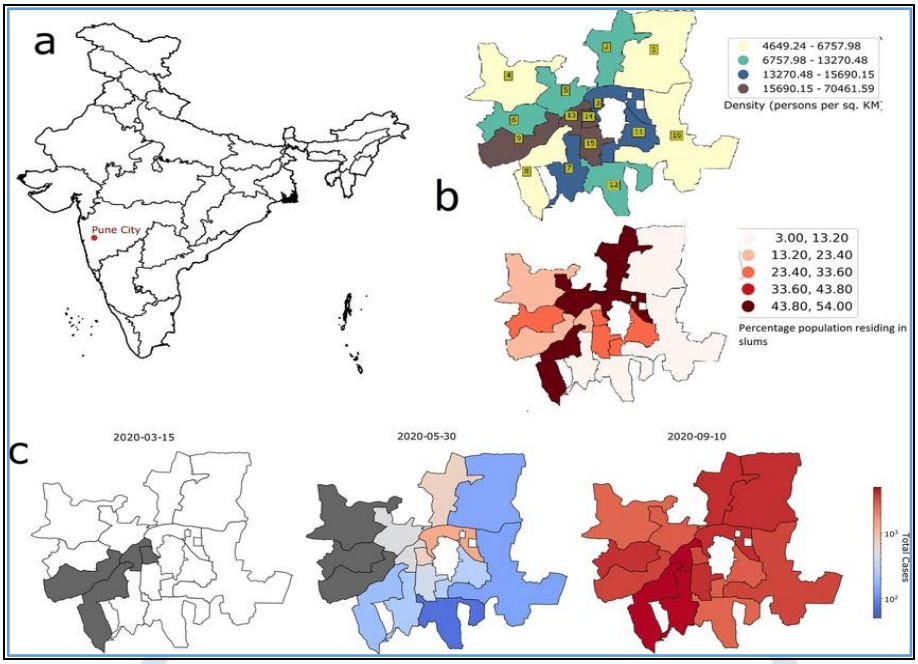
The Pune Municipal Corporation (PMC) administers the city. The Pune Municipal Corporation (PMC) was established on 15th February 1950. PMC is governed by the Bombay Provincial Municipal Corporation (BPMC) Act, 1949. As per this Act, PMC is obligated to provide basic infrastructure like water supply, drainage, sewerage, roads and services such as, firefighting, streetlights, education and primary health. The Municipality serves a large urban population of 4.5 million people and aims at refining their programs with the growing demands of the occupants of the city.

The city comes in the Haveli tehsil of Pune District, Maharashtra. The PMC controls the whole administration of Pune. The executive power of the corporation is unconditional with the Municipal Commissioner, an IAS officer appointed by the Maharashtra state government. The corporation consists of directly elected co-operators headed by a Mayor. The mayor has few executive powers. The collectors are in charge of property records and revenue collection for the Central government. They also conduct national election in the city. The administrative wing of PMC is divided into 14 wards, each headed by a ward officer. The total strength of officers and employees at PMC is about 16,731, as against the approved employment level of about 17,986. Like other metropolises in India, the Pune Police is headed by a Police Commissioner, an IPS officer. The Pune Police is the law enforcing agency in the city and comes under the state Home Ministry.

Location and extent of the Pune city

Pune is located at 18°32' North 72° 51' East. It is situated near the Western margin of the Deccan Plateau. Pune Municipal Corporation (PMC) area covers 243.31 sq. km. composed of 144 general electoral wards according to 2007 which comes under 14 administrative wards of Pune Municipal Corporation. The city is located in saucer shaped basin at an average altitude of 560 m. from mean sea level. The area surrounded by off shots of Sahyadri hills extends mostly from west to east. Pune is slight hollow on bank of Mula and Mutha Rivers on Deccan plateau.

Map number 1: Location of Pune Municipal Corporation



(Sources and Composition of MSW)

Population of the Pune City: The total population of the city has reached approximately 39.33 lakhs with almost one million properties. The city's floating population is around 3.4 lakh. There are 564 slums with a population of 11.85 lakhs. Most slums are on Private and Government Lands.

Table no. 1 Population Projections – Alternatives

Alternative I: 12% of the initial population for the beginning years of quinquennia 2001-06, 2006-11, 2011-16, 2016-21 & 2021-26						
Year	2001	2006	2011	2016	2021	2026
Population	25,36,848	30,35,532	36,04,323	44,05,866	51,82,952	60,33,473
Male	13,20,438	15,82,432	18,84,376	23,13,791	27,32,610	31,92,969
Female	12,16,410	14,53,100	17,19,947	20,92,075	24,50,342	28,40,504
Alternative II: (Realistic)						
Year	2001	2006	2011	2016	2021	2026
	12%	12%	12%	10 %	10%	**8%**
Population	25,36,848	30,35,532	36,04,323	43,29,259	49,97,755	55,97,346
Male	13,20,438	15,82,432	18,84,376	22,72,805	26,32,674	29,58,207
Female	12,16,410	14,53,100	17,19,947	20,56,454	23,65,081	26,39,139

(Source: Draft Pune City Sanitation Plan)

Pune was well known as Pensioners Paradise, with people moving in to the city after retirement. But the excellent educational opportunities and rapid industrial growth has changed these basic characteristics of the city. A socio economic study of the city conducted in 2008 reflects that 40 percent of the total population falls in the age group of 21-40 years, while another 32 percent falls in the age group of below 20 years. Around 20 percent of the total population is 40 plus

Solid Waste Management in the Pune city:

Municipal Solid Waste includes commercial and residential wastes generated in a municipal or notified area in either solid or semi-solid form excluding industrial hazardous wastes but including treated biomedical wastes. PMC is responsible for the proper and scientific collection, segregation, transportation, processing and disposal of municipal solid waste within the limits of its jurisdiction, in compliance with:

Table no 2: Municipal Solid Waste Management Acts

BPMC Act 1949 section 63, 290 to 294, schedule chapter 14 & other relevant sections.
Government of India Municipal Solid Waste (Management and Handling) Rules 2000.
Maharashtra Non-biodegradable Garbage Control Act, 2006.
Maharashtra Government Resolution no. Gha. Ka. Vya.1001/ Pra. Kra 546/ Papu-22 dated 5 January 2002 to municipalities concerning waste-pickers and allotting them the works of picking wastes and garbage from houses, shops and market places.

(Source: Draft Pune City Sanitation Plan)

Classification of waste

Waste management: Waste management has been the most challenging aspect of today‟s generation. Of waste management, Wet waste management has been the most challenging issue in this highly populated country. India faces environmental challenges with regard to waste, waste management, waste collection, waste segregation, treatment, and disposal. We all observe how waste is generated in our homes and how it is segregated, it emits greenhouse gases that can be lethal and pose environmental challenges with regard to health and climate. Waste management saves the nature, resources and human life and it also has a positive impact on the economy. It improves the human living standard. Various health issues can be caused due to improper and unhygienic management and disposal of waste. It is high time that people should be made aware of the importance, of techniques to dispose the waste in order to avoid risk to mankind. Preserving the environment is equally important since the waste emits greenhouse gases that cause threats and also effects the atmosphere on a daily basis.

The total waste generated is in the range of 1300 to 1400 metric tonnes (MT) per day (per capita of 400 grams per day). The waste generated was collected, transported and disposed at land fill site which is about 20 km away from Pune, viz at Devachi Uruli. From the 1st of June 2010, PMC has stopped open dumping and total waste generated is processed scientifically.

Table no. 3: Types of waste generated in the city include

Organic Waste
Inorganic Waste
Bio medical waste
E-Waste Construction
Debris Material Industrial hazardous waste
Household hazardous waste

Characteristic of waste generated:

Approximately 270 MT of total waste is recyclable in nature and consists of paper, glass, ferrous/ non-ferrous metals and plastic.

1) **Organic /Inorganic Waste** is mostly generated at household level, the details of which is explained below.
2) **Bio Medical Waste:** The Biomedical Waste Act 1998 defines medical waste as "Any solid waste that is generated in the diagnosis, treatment or immunization of human beings or animals, in research pertaining to, or in the production or testing of biological." Biomedical Waste (Management and Handling) Rules 1998 makes it mandatory to all hospitals and dispensaries to segregate the biomedical waste from other solid waste and to set up an effective collection, treatment and disposal infrastructure for managing the waste. PMC has provided biomedical waste disposal facility through M/s Pasco Environmental Solutions Pvt. Ltd. Pune city produces approximatelyl200 kg of biomedical waste per day and this gets disposed by incinerators. Bio-medical waste in the city, from hospitals and clinics, is collected by eight bio-medical waste collection vans. This facility serves 550 nursing homes, 141 pathology laboratories, 11 blood banks, 1048 clinics and also the area beyond 10 kms from PMC limit.
3) **E-waste:** is defined as "a waste from relatively expensive and essentially durable product used for data processing, telecommunications or entertainment in private households and businesses." The range of these products is given below: Mobiles, VCD and DVD players, telephones, microwave ovens, CDs, pen drives and floppies, scrapped computers and laptops, etc.

Construction and Demolition (C&D) Waste:

The construction boom has led to large quantities of C&D waste being generated in the city. It is recommended that a C&D policy should be prepared which may include the following: Identify sites in the city for dumping C&D waste in accordance with other environment rules and regulations. Set up agencies which would be responsible for certain sectors of the city and would charge developers as per set rates for collection, transport and proper disposal for C&D waste at designated areas. Also create a service that will allow smaller generators of C&D waste. Investigate the possibility of reuse of some of the waste (either in products or in landscaping projects).

Waste Segregation:

While segregation of waste at source is an important activity, not all waste is segregated at source. The status of segregation is given below:

Table no. 4: Segregation of recyclable MSW at source

Total waste segregated – 45 percent to 56 percent
Varies in between 30 percent to 60 percent among wards
About 52 percent properties practice segregation
In societies – 42%
In bungalows – 50%
Slums & Chawls – 35%
Hotels & restaurants – 88%

(Data generated by Self-Survey)

Waste Composting Techniques

They have a paste-like consistency with high viscosity and thereby it is challenging to dewater and prepare for further processing due to their heterogeneous and non-Newtonian nature (Lee et al., 2016). Wet waste composting technique: Composting is a natural process of decaying and decomposition of plant and animal residues. In the process of decomposition, all the materials will be broken down into smaller particles and release nutrients into the soil which can be used as manure.

1. **Bin composting**
2. **Vermicomposting**
3. **Pot composting**
4. **The process of the hydrothermal technic of biomass formation**

In the view of massive production of wet organic wastes from various industries such as animal farming, agriculture, housing and food processing, there is a need for a cost-effective route to convert undervalued resource into a sustainable and renewable energy resource, while emitting very low levels of greenhouse gases (GHG) (Delivand et al., 2015).

Plate no. 1 Wet Waste generated from the residential area

This Photo Shows Wet Waste Management on the Apartmental Level ,also this Management Make a example of Sustainable Urbnisation on the Small Scale level . also this Photo we will use it for Proper Management of Wet Waste on Hotel level. It Decresses Cost of traveling of Wet Waste and also Creates lots of Energy Resources on Small Scale level , and this will boost to Indian economy , and also promotes "AATM NIRBHAR BHARAT" in Energy Sources

Plate no. 2 Wet Waste Management on Dumping Ground

This are the Indian Dumping Grounds of Metro Cities , and there is no Proper Management of this Waste particularly Wet Waste , and this leads to Creation of new type of diseases in nearby areas of Dumping Ground , and also this leads to decrease rate of air quality and , also decrease fertility of soil ,also leads to creation of dirty areas , and Un- Urbanisation .

If we are manage this Wet Waste then we will get following outputs:

If we are Managed Wet Waste in Proper Way then we will get Organic Fertilizers from it, this Fertilizers helps to Promoting Organic Farming in nearby areas of this Grounds, and also this helps to Increase Fertility of Soil, also helps to Boost Economy.

(1) Formation of Bio-Gas on Dumping Grounds:

We See the in Rural India We Collect House Waste like Vegetable Waste, other type of Wet Waste like dung, and from this type of the Wastes we Create New Energy Source i.e. Bio-Gas. But on dumping ground the Amount of wet Waste is Large, that's Why We Can Create large Amount of Bio-Gas. The picture shows the creation of large amount of Bio-Gas. from this Gas We Can Create CNG Gas (i.e. Removing impurities such as water , N2,O2,H2S,CO2, from Raw Bio-Gas) and this Bio-CNG we can use it for Government Vehicles , also Bio-Gas We Can Supply to Nearby Areas of Dumping Grounds, in low price also this Bio-Gas we can

gives in concession those who paid taxes regularly to Government . **(2) Creation of Electricity through Bio-Gas:**

From Collected Bio-Gas we can generate electricity on large Scale using following Techniques

In this way we can create Electricty .this Genreted Electricity Pramotes Indias Aim "AATM NIRBHAR BHARAT" and Genrates Employment in India ,through this Study .in this Way this study helps and gives Major Outputs . in this Way We Can Say that this Study help us to Pramote Indias Aim "AATM NIRBHAR BHARAT"in Energy.

Zero Garbage Model

Garbage output in Pune has increased manifold in the last few years. To combat this epidemic, Janwani partnered with Pune Municipal Corporation (PMC), Cummins India, SWaCH, waste pickers and other stakeholders to establish a Zero Garbage Ward in Katraj. What is Zero Garbage? Is it No garbage collection or is it No garbage creation? Confused? Let's address this and resolve the confusion! In a zero waste system, all materials are reused until the optimum level of consumption is reached. Zero waste refers to waste prevention as opposed to end-of-pipe waste management. It is a "whole systems" approach that aims for a massive change in the way materials flow through society, resulting in no waste.

Implementation

One of our key project partners, Cummins, launched the "Swatchta Mitra," a cleanliness campaign that involved local citizens. We at, Janwani, commissioned a local performer to enact puppet shows to educate the residents about garbage segregation. This innovative method proved effective. Despite the efforts, when the project was first initiated, residents did not provide waste pickers with segregated waste, so a need for continuous awareness was felt to alter their behavior. In the final phase, the project was implemented in separate pockets of the ward and community garbage bins were removed from the area. Removal of the bins was are a significant step because it forced residents to use door-to-door collection instead of dropping mixed waste into these containers and the mean while the technology to generate value from organic waste was implemented.

Conclusion

This Study Mainly Focus on Wet Waste Management , also this promotes "AATM NIRBHAR BHARAT "in energy , generates employment , generates energy sources like Bio-Gas, Bio-CNG, Electricity etc. this study gives many outputs for sustainable urbanisation . Increases fertility of soil through using organic

fertilizers. Also focuses on increase air quality through proper management of wet waste in this way we can say that this study is helps to sustainable urbanisation.

Refrences:

1) Krishnan,suma MS "Automated Waste Segrator"2014 Texas Instruments India Educators Conference .

2)"Minimization , recycling and segrigation"by WHO .

3)"What Is The Importance of Segrigation of Wastes " by 2020 Ask Media Group , LLC .

Balagugan1, Raja S2, Maheshwaran T3, Savitha S, "Implementation of Automated Waste Segregator at Household level"

4)Muncipal Solid Waste Manegm in India – Current State and Future Challenges: A Review.

5)Understanding the health risks of Solid Waste management practices – applying evidences to Banglores context.

6) An Analytical Study of Solid Wastes Management Project : Manure and Fuel Genration Through Urban Solid Waste .

This are litreture Review took for study**.**

Brief Explanation of Proposed Study:

1. Wet Waste Management on large Scale Also on Small Scale.
2. Generating Bio-Gas, Bio-CNG.
3. Creating Electricity.
4. Promote "AATM NIRBHAR BHARAT"
5. Employment Generation.

Future Scope:

1. Helps to Create Employment.
2. Make India's Made Energy Sources.
3. Increase Air Quality.
4. Decrease Viral Infection Rate in City .