

Investigation and Analysis of SOLID WASTE MANAGEMENT SYSTEM OF PUNE MUNICIPAL CORPORATION

Dr. Surekha B. Mujumale



Investigation and Analysis of Solid Waste Management System of Pune Municipal Corporation



**India | UAE | Nigeria | Uzbekistan | Montenegro | Iraq |
Egypt | Thailand | Uganda | Philippines | Indonesia**
www.parabpublications.com

Investigation and Analysis of Solid Waste Management System of Pune Municipal Corporation

Authored By:

Dr. Surekha B. Mujumale

Assistant Professor

STES's Sinhgad College of Science, Ambegaon Bk. Pune - 411046

Copyright 2024 by Dr. Surekha B. Mujumale

First Impression: January 2024

**Investigation and Analysis of Solid Waste Management System of
Pune Municipal Corporation**

ISBN: 978-81-19585-86-1

Rs. 1000/- (\$80)

No part of the book may be printed, copied, stored, retrieved, duplicated and reproduced in any form without the written permission of the editor/publisher.

DISCLAIMER

Information contained in this book has been published by Parab Publications and has been obtained by the author from sources believed to be reliable and correct to the best of their knowledge. The author is solely responsible for the contents of the articles compiled in this book. Responsibility of authenticity of the work or the concepts/views presented by the author through this book shall lie with the author and the publisher has no role or claim or any responsibility in this regard. Errors, if any, are purely unintentional and readers are requested to communicate such error to the author to avoid discrepancies in future.

Published by:
Parab Publications

Acknowledgement

During my research study, I have received the encouragement and help from many academicians, professionals, friends and institutions. I am be holden all of them.

Here are a few lines to express my gratitude towards them.

I express my deep sense of gratitude towards Dr. Anand G. Jumle for his valuable guidance his incisive comments and thought provoking suggestions have enriched my work.

I would like to thank Sarpanch and members of Grampanchayat of Urali Devachi and Phursungi, Head of Solid Waste Dept. of PMC Mr. Suresh Jagtap, Head of 'Kachara Depot Hatav Samiti' Mr. Tatyasaheb Bhadale, Head of 'Environment Protection Committee' Phursungi Mr. Dilip Mehata for their participation in the field survey and suggestions during the research.

I would like to thank Dr. Prashant Sathe Sir (Coordinator of BMCC Research Centre) and Mr. N. A. Ohval (Office Staff member of BMCC) for their support and encouragement.

I would like to express my special thanks to Founder President of STES Prof. M. N. Navale, Founder Secretary of STES Dr. Mrs Sunanda M. Navale, Principal of Sinhgad College of Arts, Science & Commerce Dr. M. P. Ghatule, and Jr. College Coordinator Mrs. Sunita Landage for their support and motivation.

I would like to thank all faculties of Sinhgad College of Arts, Science & commerce, Vadgaon Bk. for their support and cooperation.

I would like to express my special thanks to my husband Mr. Balasaheb B. Mujumale and my daughters Tanaya and Alisha for their constant support, motivation and adjustments in daily routine. I am also thankful to my brother Mr. Ramesh Rajaram

Bhadale and sisters Mrs. Sunanda D. Gadve and Mrs. Urmila N. Khirid for their motivation and active support.

I would like to thank my mother Shrimati Shevanta Rajaram Bhadale for her support and her hardships in life inspired me to achieve my goals.

Last but not the least I would like to thank to all concern Authorities, Associations and professional those who help me lot in this journey of research.

Place: Pune

Mrs. Surekha B. Mujumale

ABSTRACT

The motivation of this research has come from the gap identified in the literature review. Many research papers published on solid waste management in cities and also in solid waste management in Pune city. After reviewing it was observed that no social survey was conducted to find out various problems faced by the people residing near waste depot which was situated near Urali Devachi and Phursungi villages (near Pune Saswasd Road) and the problems faced by Pune Municipal Corporation while discarding solid waste in a large quantity.

In the year 2014 Pune city expanded in area with the additional of 36 villages in the peripheries of the city. There has been an increase of about 50% in the residential area. This rise has led to an increased pressure on the basic amenities. As increase in the total population of Pune city results in increase in the total waste generated in city.

Currently 1300 - 1400 MT solid waste is generated in Pune out of which 950 TPD reaches at landfill site at Urali Devachi, about 20 km away from Pune.

The PMC had started dumping solid waste at waste depot of Urali Devachi in the year 1991. Last since 25 years PMC is dumping solid waste here and all the villagers of Urali Devachi and Phursungi are facing many problems due to poor solid waste management and waste depot. The total environment in these villages is disturbed due to air, water and soil pollution.

There should be scientific method followed by Pune Municipal Corporation which will protect basic rights of human beings to get pollution free environment.

This research study is an attempt to find out possible solutions of the problem of solid waste generated in Pune city and try to suggest modifications in solid waste management system of PMC to satisfy the villagers suffering from Waste Depot of Pune Municipal Corporation.

This research study is with reference to villages situated nearby waste depot of Pune Municipal Corporation.

SCOPE AND LIMITATION OF THE STUDY

This research is studying Solid Waste Management System of Pune Municipal Corporation only. Researcher is focusing on various problems faced by Solid Waste Department of PMC. Researcher is trying to find out the problems faced by the villagers of Urali Devachi and Phursungi and also problems of employees working in solid waste dept. of PMC.

LIMITATIONS

This research study focuses only the problems faced by the villagers residing nearby Waste Depot of Urali Devachi and Phursungi and not studying problems faced by all citizen of Pune.

The Research work is undertaken to study Solid Waste Management System of Pune Municipal Corporation only and not other cities of Maharashtra.

OBJECTIVES OF THE RESEARCH STUDY

Based on review of literature and available information this research is undertaken with the following objectives:

1. To know about present status of solid waste management in urban area.
2. To study solid waste disposal system of Pune Municipal Corporation.
3. To know about the limitations of SWMS of PMC and problems faced by PMC while implementing solid waste management system.
4. To study various problems faced by the villagers of Urali Devachi and Phursungi where PMC Waste depot is installed and to know about their expectations .
5. To know about the various acts governing solid waste management system in Pune city and suggest expected amendments in it.
6. To find out possible solutions for the problems faced by PMC and the villagers of Urali Devachi and Phursungi
7. To know about future policy and programs for solid waste management system of Pune Municipal Corporation

HYPOTHESIS

The present study test the following Hypothesis.

- a. Pune Municipal Corporation has developed and implementing proper solid waste management system to reduce, reuse and control solid waste generated in Pune city.
- b. The villagers of Urali Devachi and Phursungi (where PMC Waste Depot is installed) are facing many physical and social problems due to poor solid waste management system of Pune Municipal Corporation.
- c. The various acts governing Solid Waste Management services in Pune city are suggestive for creating a good social life of human being but the problem is in its effective implementation.

While collecting primary data survey method is adopted and to determine sample size and location of survey deliberate sampling method is used. While collecting information about ill effects of waste depot 1.5 Km area which is around the waste depot is selected for survey.

While collecting information from students; the school which is nearest and at 1.5 km distance from the waste depot is selected for survey.

This research is carried out with statistical analyses of actual data collected through surveys and personal interviews of different stakeholders. Total 271 families contacted while conducting survey of villagers affecting due to waste depot and information is collected from 53 students of 'Bhekaraimata School, Phursungi' which is just 1Km away from waste depot. Various Stakeholders contacted and interviewed during the research study such as Sarpanch of Urali Devachi and Phursungi, Members of Grampanchayat of both villages, Head of the Solid Waste Management Department of PMC, Manager of Waste Depot, Employees working in solid Waste Department (SWATCH Members collecting garbage), Doctors practicing at Urali Devachi and Phursungi, Principal of school, Chairman of 'Environment Protection Committee', Phursungi and Chairman of 'Kachra Depot Hatav Sangharsha Samiti' Urali Devachi.

For analysis and evaluation of the collected data statistical tools like averages, percentages, comparative charts are used. To present data collected different types of graphs are used like bar diagram, pie diagram and also prepared different comparative charts.

CONCLUSION

After detail research study and analysis it is concluded that the solid waste disposal methods at Urali Devachi Waste Depot (Mantarwadi) generate many environmental as well as health hazards within the surrounding area. It also causes harmful health effect on people living near Waste Depot. It also produces very bad smell at the time of decomposition process. At the time of decomposition it released a various gases within the surrounding area due to that air polluted which again results into global warming. All this gases e.g. SO₂, CH₄, CO₂ etc. releases from waste depot are very harmful to human health.

Leachate formed from waste mixed with ground water and pollutes the water resources of villages. Villagers are not getting pure water for drinking. The dumping ground not only affect environment but also damage the property in the vicinity area. The current practices of PMC need to improve for managing waste scientifically.

Insect and rodent vectors are also attracted to the solid waste and may spread diseases such as cholera and dengue fever in the nearby area of waste depot. Adequate

infrastructure can help to tackle solid waste problem in city. For solid waste management comprehensive policies from household to the dumping ground are need to be followed.

Pune Municipal Corporation must undertake a programme to strengthen its capacity and institutional arrangement to handle all solid waste in the city. PMC can take help of NGO's, researchers, universities and colleges. Stakeholders' participation is essential to ensure a well managed system.

There is also need to conduct an education campaign on waste management and health related issues in school. This can be done by sending messages through radio, television, newspapers and hoarding about the advantages of clean city, such efforts will reduce the open waste and waste at storage sites.

There is urgent need of scientific planning of the solid waste collection at each household, collection points and easiest way of transportation up to land fill sites.

PMC can involve private sector in collection, transport and decompose of the solid waste in city. This will increase the coverage and collection capacity of the solid waste in city. Private sector has money to invest in machinery and transportation of solid waste etc. They can bring the modern machinery to collect solid waste in the city.

The PMC has to keep information system about population, waste created, stored etc. The updated information helps for planning and action of solid waste in city. Waste collected needs to be segregated into different types and decomposition of the dry waste require at the ward level. It will help to reduce the cost of collection and transport.

PMC must pass the strict laws and take immediate action against the households and commercial units which are throwing the waste at open sites. Punishment should be given to all those involved in such activities. In municipal budget, city planning solid waste management should be given more funds. For a growing metropolitan city like Pune, cleanliness must be given top priority.

ABBREVIATIONS AND GLOSSARY

- **PMC** - Pune Municipal Corporation
- **SWM** - Solid Waste Management
- **MSW** - Municipal Solid Waste
- **Anaerobic digestion** - means a controlled process involving microbial decomposition of organic matter in the absence of oxygen;
- **Biodegradable substance** - means a substance that can be degraded by micro-organisms;
- **Biomethanation** - means a process which entails enzymatic decomposition of the organic matter by microbial action to produce methane rich biogas;
- **Collection** - means lifting and removal of solid wastes from collection points or any other location;
- **Composting** - means a controlled process involving microbial decomposition of organic matter;
- **Demolition and construction waste** - means wastes from building materials debris and rubble resulting from construction, re-modelling, repair and demolition operation;
- **Disposal** - means final disposal of municipal solid wastes in terms of the specified measures to prevent contamination of ground-water, surface water and ambient air quality;
- **Generator of wastes** - means persons or establishments generating municipal solid wastes;
- **Land filling** - means disposal of residual solid wastes on land in a facility designed with protective measures against pollution of ground water, surface water and air fugitive dust, wind-blown litter, bad odour, fire hazard, bird menace, pests or rodents, greenhouse gas emissions, slope instability and erosion;
- **Leachate** - means liquid that seeps through solid wastes or other medium and has extracts of dissolved or suspended material from it;
- **Municipal authority** - means Municipal Corporation, Municipality, Nagar Palika, Nagar Nigam, Nagar Panchayat, Municipal Council including notified area committee (NAC) or any other local body constituted under the relevant statutes and,

where the management and handling of municipal solid waste is entrusted to such agency;

- **Municipal solid waste** - includes commercial and residential wastes generated in a municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes;
- **Processing** - means the process by which solid wastes are transformed into new or recycled products;
- **Recycling** - means the process of transforming segregated solid wastes into raw materials for producing new products, which may or may not be similar to the original products;
- **Segregation** - means to separate the municipal solid wastes into the groups of organic, inorganic, recyclables and hazardous wastes;
- **Storage** - means the temporary containment of municipal solid wastes in a manner so as to prevent littering, attraction to vectors, stray animals and excessive foul odour;
- **Transportation** - means conveyance of municipal solid wastes from place to place hygienically through specially designed transport system so as to prevent foul odour, littering, unsightly conditions and accessibility to vectors;
- **Vermicomposting** - is a process of using earthworms for conversion of bio-degradable wastes into compost.
- **Environment** - includes water, air and land and the interrelationship which exists among and between water, air and land, and human beings, other living creature, plants micro organism and property;
- **Environment pollutant** - means any solid, liquid or gaseous substance present in such concentration as may be, or tend to be injurious to environment.
- **Environment pollution** - means the presence in the environment of any environmental pollutant.
- **Hazardous substance** - means any substance or preparation which by reason of chemical or physic-chemical properties or handling, is liable to cause harm to human beings, other living creature plants and micro-organism, property
- **Occupier** - in relation to any factory or premise, means a person who has control over the affairs of the factory or the premises and includes, in relation to any substance, person in possession of the substance;

LIST OF TABLES

Chapter No.	Table No.	Name of the Table	Page No.
I	1.4.1	Solid waste generation by source	4
	1.4.2	Estimated waste generation in Pune city	4
	1.5.1	Sample Selection and Justification	6 – 7
III	3.5.1	Physical characteristics of municipal solid waste from Indian cities	29
	3.6.1	Classification of waste	30
	3.6.2	Composting Ingredient	31
IV	4.1.1	Population of some of the major cities in India	41
	4.1.2	Population of some of the major cities in Maharashtra	41 – 42
	4.1.3	Approximate increase in solid waste generation in future	43
	4.5.1	Details of Transportation of Solid Waste	47
	4.5.2	Ward wise Information of Ghanta Gaddies using for transportation of solid waste.	47
	4.5.3	Information about Solid Waste Storage/Collection Centre Facility available in the City	48
	4.5.4	Waste processing units are installed in Pune City:	48 – 49
	4.5.5	Proposed waste processing plants in Pune City	49 – 50
	4.5.6	Pune Municipal Corporation's Biogas Projects in the City	50
4.5.7	Performance based on SLBs	52	
VI	6.1.1	Average age of villagers	87
	6.1.2	Occupation of Villagers	87
	6.1.3	Annual Income of Villagers	88
	6.1.4	Average Family Size	88
	6.1.5	Number of years of residents of the village	89
	6.1.6	Incidents of fire taking place at Waste Depot	89
	6.1.7	Environment of Phursungi and Urali Devachi is totally destroyed Due to Waste Depot	89
	6.1.8	Reasons for poor functioning of waste Depot	90
	6.1.9	Social Problems faced by the villagers	91
	6.1.10	Health Problems faced by the villagers	93

6.1.11	Per month expenditure on medicines and for Doctors' fees	93
6.1.12	Amendments suggested in existing Acts by villagers	94
6.1.13	Suggestions to Waste Dept. of PMC	95
6.1.14	Expectations of villagers from State Government	96 – 97
6.2.1	Incidents of fire taking place at Waste Depot	98
6.2.2	Health Problems faced by the villagers as observed by students	98
6.2.3	Students suffering from various diseases	99
6.2.4	Pollution created due to Waste Depot	99
6.2.5	Precaution taken by students to avoid diseases	100
6.2.6	Action taken by school to resolve the problems created due to Waste Depot	101
6.2.7	Information regarding possible solutions given by students	102
6.2.8	Expectations of students from PMC	103
6.2.9	Amendments suggested by students in existing Acts	104 – 105
6.12.1	H1 – Hypothesis Testing	116 – 118
6.12.2	H2- Hypothesis Testing	119
6.12.3	H3- Hypothesis Testing	120 – 121

Table of Contents

Acknowledgement	IV - V
Abstract	VI - IX
Abbrevations and Glossary	X - XI
List of Tables	XII - XIII
Table of Contents	XIV - XVII

Sr. No.	Title of Chapters	Page No.
I	INTRODUCTION AND RESEARCH METHODOLOGY	
1.1	Introduction	2 – 3
1.2	Objectives of the Research Study	3
1.3	Hypothesis	3
1.4	Background of the Research Study and Statement of the Problem	3 – 4
1.5	Research Methodology	5 – 8
1.6	Scope and Limitation of the Study	8 – 9
1.7	Significance of the Study	9 – 10
1.8	Chapterization	10
II	REVIEW OF LITERATURE	
2.1	Research Papers Related to Solid Waste Problem in Pune City	12 – 13
2.2	Literature Survey Related to Solid Waste Management of Other Cities	13 – 24
III	NATURE AND PRESENT STATUS OF SOLID WASTE MANAGEMENT SYSTEM	
3.1	Introduction: What is Solid Waste Management?	26 – 27

3.2	Present Status of Solid Waste Management in India	27
3.3	Recent Trends in Mswm in India	27 – 28
3.4	Categories of Solid Wastes	28 – 29
3.5	Components of Municipal Solid Wastes	29 – 30
3.6	Disposal Procedure of Solid Waste Management	30 – 31
3.7	Guidelines for Waste Management	31 – 39
IV	SOLID WASTE MANAGEMENT SYSTEM OF PUNE CITY	
4.1	Introduction	41 – 42
4.2	Characteristic of Waste Generated in Pune	42 – 43
4.3	Application of Related Policies or Legislation	44
4.4	Types of Waste Generated in the City	44 – 45
4.5	Present Status of Solid Waste Management of Pune City	46 – 52
4.6	Adaptive Measures	52 – 53
4.7	Responsibility of the Pune Municipal Corporation	53 – 55
4.8	Responsibility of the Owners, Occupiers, Cooperative Societies and Other Generators of Waste	55 – 56
4.9	Future Plans for Strengthening SWM Services in Pune City	56 – 58
4.10	Achievements at A Glance	58
4.11	Conclusion	58 – 59
V	ACTS GOVERNING SOLID WASTE MANAGEMENT SYSTEM	
5.1	Regulatory Framework on Solid Waste in India	61
5.1.1	The Environment (Protection Act), 1986	61 – 69

5.1.2	Hazardous Waste (Management & Handling) Rules, 1989	69 – 69
5.1.3	Bio-Medical (Management and Handling) Rules, 1998	69 – 70
5.1.4	Municipal Solid Waste (Management and Handling) Rules, 2000	70 – 82
5.1.5	Batteries (Management and Handling) Rules, 2001	82 – 83
5.1.6	Recycled Plastics Manufacture and Usage Rules, 1999 as amended in 2003	83
5.1.7	Maharashtra Non-Biodegradable Garbage (Control) Act, 2006	83 – 84
5.1.8	The Maharashtra Plastic Carry Bags (Manufacture and Usage) Rules 2006	84
5.1.9	Electronic Waste (E-Waste) Management	84 – 86
5.1.10	Conclusion	86

VI ANALYSIS AND INTREPRETATION OF DATA

6.1	Analysis of Field Survey of Villagers of Urali Devachi and Phursungi	88 – 98
6.2	Analysis of Survey of Students Residing Near Waste Depot	98 – 106
6.3	Personal Interview of Chairman of ‘Environment Protection Committee, Phursungi	106 – 107
6.4	Personal Interview of Chairman of ‘Kachra Depot Hatav Sangharsha Samiti’ Urali Devachi	107 – 108
6.5	Interview of Principal of ‘Bhekraimata Madyamik Vidyalaya’	109
6.6	Analysis of Survey of Doctors Practicing at Urali Devachi and Phursungi	110 – 111
6.7	Personal Interview of Members of the Grampanchayat of Urali Devachi And Phursungi	111 – 113

6.8	Personal Interview of Employees Working in Solid Waste Department (Swatch Members Collecting Garbage)	113 – 114
6.9	Personal Interview of Head of the Solid Waste Management Department of PMC	114 – 115
6.10	Personal Interview of Manager of Waste Depot	115
6.11	Personal Interview of Sarpanch of the Grampanchayat of Urali Devachi and Phursungi	115 – 117
6.12	Hypothesis Testing	117 – 122
VII	FINDINGS AND CONCLUSION	
7.1	Findings	124 – 126
7.2	Conclusion	126 – 127
7.3	Contribution to Body Knowledge	127 – 128
7.4	Scope for Further Research	128
VIII	SUGGESTIONS AND RECOMMENDATIONS	
8.1	Suggestions to the Citizens of Pune	130
8.2	Suggestions to Maharashtra Pollution Control Board	130
8.3	Suggestions to the Policy Maker	130 – 131
8.4	Suggestions to the Pune Municipal Corporation	131 – 132
8.5	Recommendations	132 – 133
	REFERENCES	133 – 136
	WEBLIOGRAPHY	137 – 138

CHAPTER I
INTRODUCTION AND RESEARCH METHODOLOGY

- **Introduction**
- **Objectives of the research study**
- **Hypothesis**
- **Background of the Research study and Statement of the Problem**
- **Research Methodology**
- **Scope and limitation of the study**
- **Significance of the study**
- **Chapterization**

ABOUT THE AUTHOR



Dr. Surekha B. Mujumale has 25 years teaching experience. She is a well qualified faculty with Ph D in Commerce (Business Administration), M. Phil, M. Com, B. Ed. At present she is working as an Assistant Professor at STES's Sinhgad College of Science, Ambegaon Bk. Pune - 411046 affiliated to Savitribai Phule Pune University and also holding the responsibility as the Coordinator of B. Com course. She is specialized faculty in banking, management, marketing and finance.

She has published research papers in Business Administration - waste management area and in recognized national and international journals. She also presented research papers in state and national conferences. She also presented research papers in State, National and International conferences.



India | UAE | Nigeria | Malaysia | Montenegro | Iraq | Egypt | Thailand | Uganda | Philippines | Indonesia

Parab Publications || www.parabpublications.com || info@parabpublications.com