SOCIAL CONTEXTS OF SOLID WASTE IN URBAN HOUSEHOLDS: UNCOVERING THE PRACTICES OF WASTE SEGREGATION AND LITTERING IN BHUBANESWAR

By

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A thesis submitted to the

Board of Studies in Applied Systems Analysis

In partial fulfillment of requirements

for the Degree of

DOCTOR OF PHILOSOPHY

of

HOMI BHABHA NATIONAL INSTITUTE

May, 2023

Homi Bhaba National Institute

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List of Publications arising from the thesis

Journal

1. The Interface between Political Ecology and Actor-Network Theory: Exploring the Reality of Waste. Rath, S. & Swain, P. K. *Review of Development and Change*, (2022), *27*(2), 264–278. https://doi.org/10.1177/09722661221122553
2. Narrating Waste Chronicles Through Urban Ethnography: A Tale of Bhubaneswar. Rath, S. & Swain, P.K. *Urbanities*, (2022), *12(2)*, 46-60.

Chapters in books and lectures notes

1. Rath, Swatiprava, and Swain, Pranaya. (2022). Understanding Waste: Social perceptions of the city dwellers of Bhubaneswar, Odisha. In Dwivedi, A. (Ed). Waste Management, Sanitation, and Society, Cambridge Scholars Publishing.

Conferences

1. Urban Health and Solid Waste: Issues and Strategies in Bhubaneswar, India, oral presentation in the 51st international conference of the Urban Affairs Association, 26-29 April, 2023, Nashville, USA.
2. Exploring the fate of Municipal Solid Waste in the current era of Globalization oral presentation in the international conference on Globalization and the Emergence of a New World Order: Theoretical Formulations and Empirical Reality, 20-24 November 2022, Jawaharlal Nehru University, New Delhi.

3. Citizens In Urban space with waste issues: An empirical study of Bhubaneswar, Odisha oral presentation at 46th All India ISS conference, 8-10 December 2021, Mumbai University.
4. Waste and Biodiversity: A case study of Odisha oral presentation in 11th Odisha Environment Congress, 20-22 December 2020, Bhubaneswar.
5. Political Ecology and Actor-Network Theory in Waste study oral presentation at the 45th All India Sociological Conference organized by the Indian Sociological Society, 27-29 December 2019, University of Kerala, Thiruvananthapuram.

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DEDICATIONS

This thesis is dedicated to my grandmother Subarnalata Rath, who introduced me to the world of knowledge.

To all my teachers who have taught me to read, write, think, and see the world beautifully. Thanks for believing in me. All of this I offer to you.

ACKNOWLEDGEMENTS

I had to reflect on a five-year-long journey to write an acknowledgment section. The first person I am grateful to is my supervisor, Dr. Pranaya Kumar Swain. Since 2018, you have guided me gently by giving me intellectual freedom to think, read and write in my way. You have helped me finish my Ph.D. on time and grow. You were always there when I needed your help.

I sincerely thank NISER, the School of Humanities and Social Sciences, doctoral committee members, and all the faculties, seniors, and peers who have helped enrich my research work directly and indirectly. I am also grateful to NISER and HBNI for the financial support throughout my Ph.D.

Besides the academic support, the doctoral journey also required emotional and social support, which I got endlessly from my close people who listened to and cared for me over the years. My best friend Satya, thank you for your encouragement and patience hearing. My sisters, Swagatika and Priyanka, you have undoubtedly been the pillar of support. Thank you, Navaneeta Rath Madam and Debashis Pattanaik Sir, for showing me the way in the darkness. Thank you, Isha Bihari, for sharing all the special moments of Ph.D. journey with me. More importantly, my parents and grandparents always showed endless love and warmth. I am who I am because of you. This work is dedicated to you all.

ABSTRACT

Environmental pollution, climate change, and vulnerabilities associated with waste have been major concerns for policymakers, activists, and academicians across the globe over the past two decades. Waste management is proving increasingly challenging for urban administrators and civic bodies to design and implement sustainable and environment-friendly solutions. However, waste-related issues remain under-theorized despite their significance in the academic world. Waste being a physical and external phenomenon, makes it difficult for social science researchers to understand all of its sociocultural aspects with the help of any existing theoretical paradigm. This research addresses the urgent need to understand the multidimensional nature of waste and waste-related issues with the help of political ecology and actor–network theory (ANT). By adopting theoretical pluralism and a pragmatic approach, this research aims at explaining waste-related issues through the theoretical lens of political ecology and ANT, which corroborate and extend each other on the aspects of analyzing the power structure in waste issues in exploring the changing relationship between waste and people in the globalized world. The study area is located in Bhubaneswar, the capital of Odisha. It looks into the linkage between socio-demographic factors and the nature and volume of waste, dynamics of waste segregation, factors of littering, and the impact of Swachh Bharat Abhiyan on the city. The survey, semi-structured -interview schedule, ethnography, and non-participant observation have been used to conduct the study. The study highlights linkages, conflicts, and power relations between economic, political, and social components of municipal solid waste management issues in the city.

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Summary

The complex interaction between urban space's environmental and social determinants must be researched (Sclar & Volavka-Close, 2011). Urban socio-environmental phenomena have a unique story to tell in developing countries. Urbanization has resulted in not only growth and development but also high population growth, consumerism, capitalism, and a high level of waste generation (Vij, 2012; Hockett et al., 1995; Maiti & Agrawal, 2005). This research attempts to study the social aspect of municipal solid waste in urban space and uncover the linkages, conflicts, and power relations between economic, political, and social components of the solid waste management issue in Bhubaneswar, India.

Literature on the social impact of waste issues in India is few. Most natural scientists are busy bringing out solutions through technological developments to waste-related issues like how to manage waste scientifically, how to treat the waste or polluted substances etc. However, the real cause or the source of the waste problem has yet to be ventured upon. Here the researcher tries to discover the real causes of waste-related issues and answer the research questions such as (1) What are the social causes or processes involved in waste generation and management in the city? (2) What are the lacunae in the government and governing bodies' efforts to manage all kinds of waste?

The research has a few objectives, which include; describing socio-demographic profile and their linkage with the nature and type of waste generated by the households, exploring waste segregation activities among the households and their social and environmental outcomes, explaining factors influencing littering and finding out the influence of policies on household littering.

The study found an association of socio-demographic factors with the nature and volume of

waste generated across households. In this way, households are involved in the grand social process in the city, resulting in inequality and an unjust society. Concerning waste segregation, there is gender, caste, and class aspect, which denotes hierarchy and inequality. Lack of availability of dustbins, laziness, and habits were primary factors of littering. Again here, there was conflict and class aspect to the issue. Non-humans, humans, and waste are involved in the metabolic process of the city. Swachh Bharat Abhiyan, as a policy, has not been adequate to reduce household littering because of non-acknowledgment of the responsibility for waste generated and the political benefits involved.

The seemingly obvious waste is not apolitical but an active actor in the urban space of Bhubaneswar. Humans, non-humans, the state, and waste are all affected immensely. The researcher tried to understand what was going on from the residents' perspective and find out the nature of the waste issue, the associated class conflict, and the connections among the various social groups involved. Negotiation and coordination among all the relevant stakeholders are essential to resolve this issue. Critical actors in this process are the lower-class residents, so far marginalized and without the power to change the waste narrative. The researcher hopes that, as the research findings on waste and the associated conflict make visible latent aspects of the waste problem and local power relations that were previously invisible, they may contribute to an understanding of this situation. The researcher also hopes that they may enable policy advocates and social activists to question governmental bodies and other authorities about the effectiveness of their policies and actions.

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List of abbreviations

ANT	Actor-Network Theory
BMC	Bhubaneswar Municipal Corporation
Capex	Capital Expenditure
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health and Environmental Engineering Organisation
CRSP	Central Rural Sanitation Programme
CSR	Corporate Social Responsibility
GHG	Green House Gases
IES	Information Education Communication
IPCC	Intergovernmental Panel on Climate Change
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
MLA	Member of the Legislative Assembly
MP	Member of Parliament
MSWM	Municipal Solid Waste Management
NBA	Nirmal Bharat Abhiyan
NEP	National Economic Policy
NGO	Non-Governmental Organization
NHP	National Health Policy
NSWAI	National Solid Waste Association of India
NUSP	National Urban Sanitation Policy
OBC	Other Backward Class
PPS	Probability Proportional to Size
SBA	Swachh Bharat Abhiyan

SC	Scheduled Caste
SDG	Sustainable Development Goal
SEBC	Socially and Educationally Backward
ST	Scheduled Tribe
TERI	The Energy and Resources Institute
UIDSSMT	Urban Infrastructure Development Scheme for Small & Medium Towns
UK	United Kingdom
ULB	Urban Local Body
UNEP	United Nations Environment Programme
UNICEF	United Nations International Children's Emergency Fund
USA	United States of America

Chapter 1

Introduction

'To waste or to waste not- it is all in the definition' -B. Quinn

1.1.The ubiquitous waste

Human wants are unlimited. In the pursuit of fulfilling their wants and material consumption, humans generate waste. As societies evolved, there has been an increase in the amount of waste generated leaving symbolic footprints of human civilization. Waste can be relative as its meaning differs from individual to individual. Whatever is waste for one person may not necessarily be the same for another. It can be someone's output and, at the same time, someone else's input. The value and the meaning of waste vary across different spaces, times, cultures, and societies. Waste entails the power to unfold the reality of people's social lives, where it is generated, disposed of, and dumped. As Pongrácz (2002) states, 'Waste is a value concept, culturally constructed and subjective to the individual, be it the observer or the depositor (p.83). Waste affects the economic, social, political, and educational lives of people associated. It is found everywhere: a beach, a household, an organization, a roadside, or any space. Today, most of modern societies are engulfed by the problem of waste. This problem may be related to municipal solid waste, hazardous waste, construction, demolition waste, or electronic waste. No rural or urban society has remained devoid of waste issues these days. While studying waste, it is essential and difficult at the same time to define waste. However, there have been certain commonalities in waste. Waste is defined as a useless material that has a direct linkage with human development (Grover & Singh, 2014). Waste is not just symptom of a culture. It has the power to influence local and global disputes, liberal and illiberal forms of governance and future environmental courses (Reno, 2015). The impact of waste is far-reaching as it extends its

control over the political, economic, environmental, and moral arenas of human life.

Waste has created social, economic, and political crises. If we look at the annual municipal solid waste generation world wide, it is 2.01 billion tonnes, of which 33 percent is not managed safely. World Bank (2018) estimates that global waste generation will be 3.40 billion tons by 2050. Such a severe condition of waste makes it a global social issue and calls for attention from the social science researchers. Waste is more than litter. The ownerless waste has made our landscape a 'trash escape' (Thill, 2015). This refers to the current state of the world, where waste is everywhere. Waste is an object discarded after losing its value and utility, and they tend to burden sanitation and health in that space of its existence (Brownell, 2011).

Emily Brownell (2011) 'Waste is a designation given to an object (or liquid) as it is discarded. Such designation renders an object either valueless or possessing a negative value due to its expired utility within its context, by being burdensome to health and sanitation or taking up space.' (p. 264). Understanding waste issues goes beyond the natural and social sciences boundary. Time, space, and need are the factors involved in determining why and how something is considered waste. Anything can be wasted in the future even though it is a resource in the present. For example, electronic products such as mobile phones and TV may be resources in the present, but they will be wasted in the future as they become obsolete. Whether developed or developing, every nation has its problems with waste. Hence waste related issues must get the attention they deserve.

1.2.The ontology of waste

Before researching waste and waste-related issues, it is essential to understand what waste as such is. It is also important to understand the reasons why waste exists. Knowledge of waste and its nature can augment the understnding so as to research waste-related issues efficiently. Hence ontology of waste will give insights into the nature and reality of waste in the modern

world. Waste particularly attracted the attention of academicians when Susan Strasser (1999), in her book "Waste and Want," initiated a debate over "waste," the ignored phenomenon that is a classic in consumer culture. She described the social and cultural history of trash and how it influenced the life of people in Western countries as a social process. Her focus was more on discovering a throwaway culture's evolution through historical evidence. She described the historical evolution and development of different types of waste and their meaning. She also discussed the need for an existing theoretical framework that regarded waste as an integral part and association with human behavior and society. Before her, Douglas(1966), Thompson (1979), and Appadurai (1986) had written in detail about rubbish or dirt and its meaning in cultures associated. Significant works in waste literature that followed are Blumberg and Gottlieb (1989), Rathje & Murphy (1992), Faber (1993), Crooks (1993), Watkins (1993), Alexander (1993), Hine (1995), Bilitewski (1997), Humphrey (1998), Clemons (1998), Tammemagi (1999), Cross (2000), Donohue (2003), Bauman (2004). Enger (2004), Houser (2004), Melosi (2005), Scanlan (2005), Girling (2005), Royte (2005), Hawkins (2006), Brantlinger et al. (2006), MacBride (2008), Dauvergne (2008), Beck (2009), Ekbladh (2010), Pye (2010), Anderson (2010), Foote & Mazzolini (2012), Humes (2013) Viney (2014), Morrison (2015), Reno (2016), Spelman (2016) in the field of waste.

Martin O'Brien (2008) tried to paint the picture of the rubbish society with a detailed analysis of rubbish histories in the context of European societies. He discussed waste in a broader sense by using the term 'rubbish.' For him, waste is never a waste but entails value. It is an unavoidable and essential constituent of social life. It has the power of technological, economic, and social transformation. He emphasized understanding the reality of waste more with the help of research. Waste is not simply waste but has the power to bring social and economic changes in society. For example, the trash industry flourished in South East Asia and helped many people economically (O'Brien, 2008). The entrepreneurial role of waste is economically enriching.

Hence, if this is the case, why has the full potential of waste been realized globally? Furthermore, what are the lacunae in understanding the social processes associated with waste and waste management? It brings the opportunity to study society's reality and different waste management aspects.

Douglas (1966), in Purity and Danger, viewed how dirt is considered a disorder in society. Absolute dirt does not exist; instead, dirt lies in the eyes of the beholder. Eliminating dirt from surrounding by cleaning is not a negative movement but a positive effort to organize the environment. In doing so, people reorder the environment. Cleaning, separating, and tidying are the functional acts, leading to better functioning of societies. These acts signify the ideas on which the social system is based. Human perception greatly determines the classification of what is order and what is disorder. Orders and disorders are similarly generated to stabilize the social system and maintain equilibrium. A pattern is maintained where some objects are accepted, and some are rejected. The social system and structure continue and grow with this help. In doing so, the role of culture is prominent. The standardized values of society pass on to everyone. People have the idea of social structure in their consciousness, and they accordingly frame their actions as per the established norms, symmetries, and hierarchies. Their social consciousness leads to such behavior, which Goffman (1956) has beautifully put in his theory of the presentation of self in everyday life**.**

In removing and condemning waste and dirt, an order is imposed. Dirt is considered out of the space, something external, objectionable. They are unwanted matters, considered dangerous, and an identity of impure, unclean, and undesirable comes in (Douglas, 1966)**.** Affluence is a strong dictator of waste volume and variety throughout the world**.** Melosi (2005) has discussed the problem of waste in the USA and Europe, mainly in Western countries, concerning waste management in history. The solid waste problem, therefore, is part of life—ancient and modern. The experience with waste in the USA grows out of its history and culture as much as out of

the inherent reality that garbage will always be with us.

For Bauman (2004), human waste produced or what can be called wasted lives is the inevitable outcome of modernization. Wasted lives have resulted from economic progress and modernity. The spread of modernity led to high population growth, which has further led to inequalities and scarcity of resources, and ultimately people are deprived of the means to survive. He has showcased how understanding 'human waste' is critical to understanding the culture, politics, and strategies of global domination and the intimate aspects of human relationships. Human waste or wasted humans is the result of modernization. These are waste because they are excessive and redundant. Modernization and modernity include economic progress and order-building where unfit and undesirable are cast away.

Waste problems have been there because there is ambiguity regarding waste. Waste includes anything and everything. Waste can and cannot be wasted at the same time. This makes us question if waste as something ever exists. Waste symbolizes the failure of humanity to preserve the value of the objects. Due to a lack of effort in preserving values, things go beyond control, and the lack of responsibility leads to waste generation. Waste results from the devaluation of matters by humans, referring to dehumanization (Kennedy, 2007). Hence waste results from the failure of human beings to attribute worth to objects or matters.

Baudrillard (1998) has observed that ‘all societies have always wasted, expended and consumed beyond what is strictly necessary for the simple reason that it is in the consumption of a surplus, a superfluity that the individual—and society—feel not merely that they exist, but that they are alive’ (p.76). For Baudrillard, waste does not necessarily refer to deprivation and death; instead, it includes life processes, abundance, and exuberance of nature.

The ontology of trash can help in understanding the relationship between human beings and what Martin Heidegger (1962) calls being as such. In that sense, the current dominance and power of humanity over nature have resulted from an inadequate understanding of what it

means to be human. Human dominance has continued for ages for security and control over the planet. Nature, matter, and all objects need not be understood regarding their value and usefulness to humans. All of them need not necessarily fulfill human purposes. The true goal of life is not to exploit all matters and objects but to accept them as they are without imposing value on them. There is the need of compassion for all creatures, as mentioned in Heidegger's notion of releasement. Heidegger's ideas provide a philosophical background to the issue. Trash should be considered a being. In the words of Zimmerman (1981), "We become ourselves when we let beings be." The existence of the being of trash symbolizes the failure of humans to let things be.

The issue of waste is primarily an urban issue (Kennedy, 2007). Traditionally, agrarian societies have avoided solid waste pollution. The cities and the towns have suffered more from such issues. Melosi (2005), in Garbage in the Cities Garbage, has described how settlements are related to waste issues. Due to more settlements, fortification, and aspiration to live a secure life, the need for waste management has become prominent. With the settlement, accumulation comes in, the population rises more, and much waste is generated. Accumulating matters in modern times has become a significant issue, giving rise to the high amount of unused matter wasted. Everything that becomes excess than required is a problem. The excess matters threaten the existence of all other phenomena. Poor organization of waste collection and lack of sewer systems are issues in most cities worldwide. This has resulted in inhuman conditions living in the cities.

Vlachos (1975) viewed - 'Solid waste is a catch-all term that encompasses a wide variety of activities and practices that describes essentially unwanted residues of any given culture.' (p. 294). He further elaborated that the terms like garbage, junk, litter, rubbish, trash, and refuse are all associated with the various stages of waste material. Humans have lived with the waste throughout history. Managing waste through collection and disposal systematically started in

the 19th century; otherwise, traditionally, people littered waste. Littering has remained a typical waste disposal, except for some sanitary practices in Greece and Rome. Due to the growth of the cities in the 18th and 19th centuries, littering on unpaved streets and roadways was regulated due to public health issues.

Beede and Bloom (1995) noted that solid waste is a significant problem in the developing world because of growing economic growth, per capita income, and waste generation. This ultimately increases the government's waste collection, processing, and disposal cost. The features of the municipal solid waste problem differ from location to location based on local geography and the characteristics of solid waste. In this thesis, the research concentrates only on municipal solid waste generated by urban households.

'Solid wastes are wastes that arise from human and animal activities, including the heterogeneous mass of garbage from the urban community as well as more homogenous accumulation comprising of countless different materials such as food wastes, packaging material such as paper, metals, plastic, glass, construction wastes, pathological wastes, and hazardous wastes' (Birhanu & Berisa, 2015, p.155). As waste accumulates without being treated, that becomes environmentally hazardous and aesthetically unpleasing, and behind all these apparent issues, the social and cultural issues are more implicit. There is a need to manage the waste scattered across the spaces. Managing waste is not just the demand of humans for order; instead, it is a process that continuously reshapes ideals and imagination. Waste management and providing adequate services are essential for governing the cities and industries (Reno, 2015). However, managing the waste and controlling its generation depends on an in-depth understanding of the waste itself.

1.3. Is waste a gift of Anthropocene?

The current world is under the dominance of humans (Vitousek et al., 1997). The influence of humans is seen everywhere, from the biosphere to the hydrosphere. Humans have left behind the remains of their civilization as beautiful artifacts called 'waste' in various forms, sizes, and types. Crutzen and Stoermer introduced the term Anthropocene in 2000, referring to the new geological epoch of the age of humans. The age has all set to create a different social world for humans. The significant change has been in the environment. As Braje (2015) puts it, 'Regardless of whether the Anthropocene ever becomes formally designated within the Geological Time Scale, however, we are living at a critical time in Earth's history, and the decisions we make moving forward will have dramatic consequences for the quality and quantity of our time on this' (p.388).

Due to reckless disposal and overconsumption, humans continue to generate waste. Rapid economic development has also led to generation of different types of waste that are sometimes difficult to manage. Furthermore, the lack of concern for nature has contributed to improper waste disposal resulting in chaos in many urban spaces of the world. This changing nature of waste management and disposal has been a vital sign of the Anthropocene. Vince (2014), in her book 'Adventure in the Anthropocene,' wrote about the active roles played by humans and human activities to change their environment. Initially, both nature and man were one. However, with increasing globalization, technological advancement, and economic development, the various physical terrains like the atmosphere, mountains, rivers, farmlands, oceans, deserts, savannahs, forests, rocks, and cities have changed. Human intervention causes environmental issues in all these areas. Only a few individuals and organizations try to bring positive change in different countries. The developed countries are mainly responsible for climate change problems faced by all the developing countries, including Nepal, Brazil, and many more. These denote the arrival of a new age that has changed the environmental scenario

of the whole world. She adds that science and technological advancement can help solve all the environmental problems and climate change.

Waste has always been there in all geological periods. Only the nature and volume of waste have been different. During these periods, time and weathering agents are used to decompose wastes. Similarly, the Anthropocene epoch is unique and has created non-degradable, stable, toxic, and pervasive waste that is contaminating and polluting. However, wastes in Anthropocene do not degrade or take a considerable period for mutation. The unscientific and improper waste management puts more pressure on these mounds of waste. They accumulate day by day and adversely affect the health of humans and animals, leading to substantial social and economic costs. It cannot be said that only humans are prone to such harmful impacts. The flora, fauna, vegetation, groundwater, aquatic, marine, and glacial resources, and ultimately the climate, are suffering, and this colossal devastation has been created by humanity (Mishra & Mishra, 2018). Developing countries must be alert to the growth of wasteful practices resulting from modern industrial processes and new modes of consumption. Concerning the latter, for instance, increased usage of and reliance upon thin plastic film for packaging can lead to increased littering of this material, which, if not controlled, can eventually clog surface drainage systems and pollute rivers and other bodies of water (UNEP, 2005).

1.4. The social phenomena of waste

Waste is not only a physical matter but also a social matter (Rath & Swain, 2022). It exerts its power on society. No waste management system considers the social aspects of waste. That is why it has very little chance of managing successfully. As individuals have generated waste, they are responsible for taking care of that. In India, however, growing protests on environmental destruction and struggles for survival and subsistence point to the fact that caste, class, and gender issues are deeply interlinked (Rao, 2012). There has been an interconnection between humans and nature across different social categories such as sex, race, and class. For

example, regarding gender, women always bear the cost of environmental degradation (Csevar, 2021; Agarwal, 1992). Ecofeminism believes that nature and women have been suffering from all the harmful environmental effects caused by the patriarchal practices of society (Plumwood, 1986; Shiva & Mies, 2014). For ecofeminists, therefore, the domination of women and nature is rooted in ideology. To overcome this, one needs to reconstruct and reconceptualize the underlying patriarchal values and structural relations of one's culture and promote equality, non-violence, and non-hierarchical forms of organization to bring about new social forms (Rao, 2012).

Concepts of nature, culture, and gender are historically and socially constructed and vary across and within cultures and periods (Agarwal, 1992). This brief review of the struggle over environmental issues points to the fact that Indian environmentalism involves the poor, disadvantaged sections of the population, the lower castes, and women. Caste, class, and gender issues are the material base of human interaction and the environment. Without considering political-economy issues, ecofeminism would remain limited and partial (Rao, 2012). Women's interaction with nature and their responses to environmental degradation must be analyzed within the material reality of gender, caste class, and race-based division of labor, property, and power. The population is disproportionally affected by inadequate and unhygienic practices in municipal solid waste management practices. It requires interventions that protect vulnerable sections from the harmful effects of unhygienic practices.

People from lower socio-economic backgrounds or lower classes are also heavily impacted. Children living in slum areas who would take up rag picking as a profession, their health and future are affected. When we talk about waste segregation, the services of the informal sector in waste management cannot be ignored. That is the role of the *kabadiwalas* or the waste pickers. They risk their lives segregating the waste and sending them for recycling. Among them, the worst affected are women and children. In India, caste system is linked with society's

waste management practices. The untouchable caste does the menial jobs (Rathore, 2020; Harriss-White, 2017). Among the untouchable castes, women are the worst sufferers because they cannot migrate, and due to a lack of education, they tend to continue with their job (Datta &Satija, 2020).

1.5. Waste and climate change

Waste is an integral part of the environment. The impact of waste is seen in terms of its environmental and health impacts (Ayomoh et al., 2008). The increase in greenhouse gases, carbon dioxide concentration, and air, water, and soil pollution are mixed results of such impact. The study by Nandan et al. (2017) found that waste downgrades the groundwater quality through leachate percolation and causes air pollution through the emission of greenhouse gases through various courses of treatment. The actual emission from waste is CO_2. Dumping these wastes is a problem of littering which is of grave concern. They have clearly stated that the increase in CO_2 results from the waste management problem.

Waste can create chemical poisoning, congenital malformations, low birth rate, neurological diseases, diabetes, nausea, and vomiting, and it can be carcinogenic. The water bodies also get contaminated, affecting people's health and biodiversity. The biodiversity is harmed by waste dumping and impacts on the species regarding the growth of invasive species, pathogens, infectious diseases, and toxicity. Eutrophication, mercury toxicity, plastic ingestion in the animal's body, and crop depletion are common due to water and soil pollution (Mishra & Mishra, 2018). Hence it can be safely concluded that improper waste management can lead to multiple environmental problems.

According to Menikpura et al. (2012), waste management's greenhouse gas (GHG) emissions lead to global climate change issues. Methane (CH_4) emissions from open dumping and landfilling are the third largest anthropogenic methane emissions source (IPCC, 2007). Municipal solid waste is a significant contributor to GHG emissions globally. Greenhouse

gases, such as transportation, recycling, and dumping sites, are emitted during waste management. Poor waste management can lead to more emissions and degradation of the environment due to improper waste handling, resource recovery, and recycling. The only way to reduce the emission is by minimizing waste at the source in all sectors. The waste management activities create carbon dioxide, methane, and nitrous oxide (Ahluwalia & Patel, 2018).

- Consumption without regard for resource conservation creates excess demand for extraction and manufacturing of goods from virgin materials, all of which contribute to greenhouse gas emissions in varying amounts at different stages of production and consumption.
- Mixing wet waste with dry waste at the source of generation results in several adverse downstream effects.
- The increased volume of unprocessed mixed waste adds to transport demand, increasing fossil fuel consumption for the collection and transportation of waste from the generation source to landfill sites.
- When the mixed waste (sometimes as high as 70%) is dumped at landfill sites, it releases methane gas generated from the anaerobic decomposition of biodegradable waste present in the waste.
- Leachate oozing out of decomposing biodegradable matter releases nitrous oxide.
- Any act of burning waste releases carbon dioxide and other harmful gases.

1.6 Concepts associated with waste and waste management in policy context

- Waste- Solid waste management rules, 2016 defined waste as – materials that are not products or by-products for which the generator has no further use for production, transformation, or consumption.

- Municipal Solid Waste- It includes domestic waste, sanitary waste, commercial waste, institutional waste, market waste, and other non-residential wastes. Street sweepings, silt removed or collected from the surface drains, horticulture waste, agriculture, and dairy waste, treated biomedical waste excluding industrial waste, bio-medical waste, and e-waste, battery waste, radioactive waste generated come in the municipal area come under municipal solid waste.

- Waste generation- Waste is generated when materials become useless to the owner, who wishes to discard them.

- Storage- It is a mid-step between the generation and collection of waste. Storage facilities like big containers, bins, drums, shallow pits, or walled areas should be provided.

- Collection- In this stage, waste is collected from households, shops, or other premises, sweeping places, and so forth, and then taken for disposal. It includes loading, unloading, and transferring until reaching the destined dumping site. Waste collection can be done from different locations using community containers, block collection systems, yard collection, apartment buildings, etc.

- Segregation- This includes the separation of waste at the household level. Private and informal sectors participate in this task. For instance, wastes from markets, restaurants, and hotels may get collected separately from animal feed, street sweepings, and

composting material. Similarly, household garbage can be collected separately from hospitals or medical or healthcare waste. From the households, both dry and wet waste can be collected.

- Transportation- To empty the collection containers and bins, transportation is needed for disposal at the site. It can be done with the help of humans, animals, and power. Human-aided- This transport method includes tri-cycles, handcarts, and barrows. However, these methods are appropriate for short distances, less load, and where larger vehicles cannot enter. Animal-aided- Donkeys, mules, horses, and bulls are generally used, with or without a cart. Power-driven- These include motorcycle trailers, two-wheeled tractors, three-wheeled auto-rickshaws, micro-trucks, etc. All these means are fast and efficient. They can carry the load to a greater distance without much hard work.

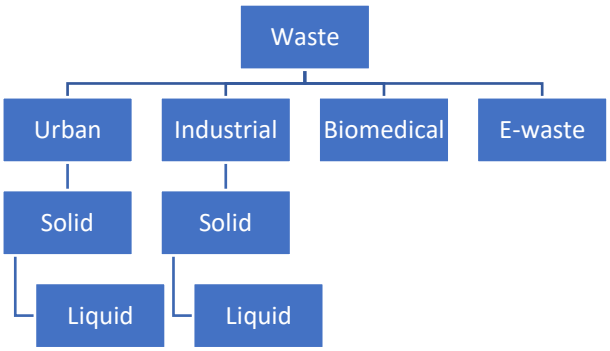
- Disposal- Mainly, there are two types of disposals such as open or crude and sanitary landfilling.

- Open dumping- The waste is unloaded at any convenient open space.

- Sanitary landfilling- Waste is placed in a large pot, and at the end of each day, a layer of soil is spread over the waste and then compacted. Same-day filling back is necessary to prevent animals from eating or digging and flies from breeding (NHP, 2019).

- Solid waste management- Solid waste management may be defined as the discipline associated with the control of generation, collection, storage, transfer and transport, processing, and disposal of solid wastes in a manner that is in accord with the best principles of public health, economics, engineering, conservation, aesthetics, and environmental considerations. (CPR Environment Education Centre, 2018)

Figure 1.1. Different types of wastes



Source-(TERI, 2014)

Waste can be divided into different types, such as urban waste, industrial waste, biomedical waste, and e-waste. Urban waste is divided into solid and liquid waste. Industrial waste is of solid and liquid types.

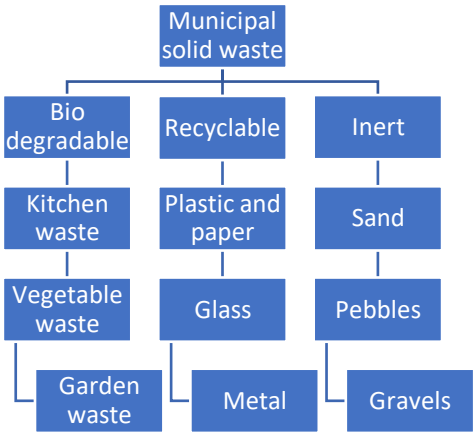
- Urban waste:

It comprises municipal solid waste, sewage sludge, construction, and demolition waste (TERI, 2014)

- Municipal Solid Waste:

It comprises recyclable, biodegradable, and inert waste (non-biodegradable). Biodegradable waste comes from food waste from households. Recyclables are those from which valuable materials can be recovered, such as paper, glass, plastic, metals, etc. In the inert category come sand, pebbles, and gravel.

Figure 1.2. Types of municipal solid waste



Source- (TERI, 2014)

Solid waste management rule 2016 has defined the following as part of Municipal solid waste.

- Biodegradable waste

It refers to any organic material that microorganisms can degrade into simpler stable compounds.

- Dry Waste

Other than bio-degradable waste and inert street sweepings, include recyclable and non-recyclable waste, combustible waste, sanitary napkins, diapers, etc.

- Non-biodegradable Waste

Any waste that microorganisms cannot degrade into simpler stable compounds.

- Combustible waste

Non-biodegradable, non-recyclable, non-reusable, non-hazardous solid waste having a minimum calorific value exceeding 1500 kcal/kg and excluding chlorinated materials like plastic, wood pulp, etc.

- Domestic hazardous waste

Waste contaminated with hazardous chemicals or infectious waste, such as discarded paint drums, pesticide cans, CFL bulbs, tube lights, expired medicines, broken mercury thermometers, used batteries, used needles, syringes, and contaminated gauges, etc., is generated at the household level.

- Residual Solid Waste

Includes the waste and rejects from the solid waste processing facilities unsuitable for recycling or further processing.

- Inerts

Waste not bio-degradable, recyclable, or combustible includes a non-recyclable fraction of construction and demolition waste, street sweeping, or dust and silt removed from the surface drains.

- Sanitary waste

It includes waste comprising used diapers, sanitary towels or napkins, tampons, condoms, incontinence sheets, and other similar waste.

1.7. Waste and Indian cities

The waste problem was not a matter of concern before the industrial revolution. 'It was in the middle of the 19th century, with the growth of population, the industrial revolution, and the emerging consumer society, that solid wastes became a problem. What started as a population explosion was eventually followed by all other explosions, including the 'garbage explosion.' Growth and garbage or affluence and affluence became intricately interwoven as expressions of the new industrial culture, of the conveniences and market imperatives of a consumer civilization' (Vlachos, 1975, p.295)

Waste management was given priority in India after independence in 1947. The provision of solid waste management was included in the state list. Hence the disposal of waste is locally

managed. Gram Panchayat in the rural area and municipalities in the urban area are responsible for waste management activities. Several governmental agencies and ministries are associated with the management of different issues associated with waste, such as the Ministry of Health & Family Welfare, Ministry of New and Renewable Energy, Ministry of Food and Agriculture, Ministry of Urban Development, NITI Aayog (Former Planning Commission), Ministry of Power, Ministry of Chemicals and Fertilisers, Ministry of Coal, Ministry of Environment and Forests, Central Pollution Control Board, State Governments, State Government Pollution Control Boards, Gram Panchayats, Town Municipalities, and City Corporations.

1.8. An account of the policies on waste

Central Public Health and Environmental Engineering Organisation (CPHEEO), the central think tank in the government sector, was established in 1953. The Environmental Protection Act, formulated in 1986, significantly boosted the sector. Gradually changes were introduced through laws, regulations, and policies. The J.L. Bajaj Committee, constituted by the erstwhile Planning Commission, recommended waste segregation at source, primary collection, levy of user charges, use of appropriate equipment, vehicle focus on landfills and composting, and private sector participation on a pilot basis. The Central Public Health and Environmental Engineering Organization (CPHEEO) analyzed the financial requirements of Municipalities and funding issues. In the late 1990s, several Public Interest Litigations in courts resulted in the constitution of the Asim Barman Committee, which made wide-ranging recommendations on institutional, financial, health, and legal aspects of MSW management. Subsequently, the Central Government formulated many rules covering biomedical waste (1998), Fly Ash (1999), MSW Management and Handling Rules (2000), battery management (2001), Integrated Plant and Nutrient Management Taskforce (2005), National Urban Sanitation policy (2008), Plastic wastes (2011), e-Waste (2011), Waste to energy (2014), Revised Manual of Municipal Solid Waste Management, (2013), Task Force on Waste to Energy (2014), Swachh Bharat Mission

(2014) and Construction and Demolition Waste rules (2017) (Tripathy, 2018).

Govt. of India has formulated various legislations and policies for handling waste generated by the country. There is the National Solid Waste Association of India (NSWAI), a non-profit organization in the field of solid waste management in India. Govt. Initiatives such as JNNURM and Urban Infrastructure Development Scheme for Small & Medium Towns (UIDSSMT) have been framed. "Recycled Plastics Manufacture and Usage Rules (1999) amended and now known as The Plastics Manufacture and Usage (Amendment) Rules (2003), "Draft Guidelines for Sanitation in Slaughter Houses (1998)" by Central Pollution Control Board (CPCB), Non-biodegradable Garbage (Control) Ordinance, 2006, Municipal Solid Wastes (Management and Handling) Rules, 2000, etc. At the national policy level, the Ministry of Environment and Forests has legislated the Municipal Waste Management and Handling Rules 2000. This law details the practices to be followed by the various municipalities for managing urban waste. Other policy documents include the Ministry of Urban Affairs' Shukla Committee's Report (January 2000), the Supreme Court-appointed Burman Committee's Report (March 1999), and the Report of the National Plastic Waste Management Task Force (August 1997). The Government of India announced the National Urban Sanitation Policy (NUSP) in 2008. As a part of this, the government proposed encouraging states to develop their sanitation strategies to tackle their sanitation problems and meet the goals of the NUSP (Agarwal et al., 2015). Other policies, projects, programs, and initiatives formulated to deal with waste-related issues are mentioned below.

- 74th Constitutional Amendment Act, 1992
- Environment (Protection) Act, 1986
- National Environment Tribunal Act, 1995
- National Environment Appellate Authority Act, 1997
- Water (Prevention & Control of Pollution) Act, 1974

- Water (Prevention & Control of Pollution) Cess Act, 1977
- 1978 Water (Prevention and Control of Pollution) Cess Rules
- 1981 The Air (Prevention and Control of Pollution) Act
- 1986 The Environment (Protection) Act
- 1989 The Manufacture, Storage, and Import of Hazardous Chemical Rules
- 1991 The Public Liability Insurance Act
- 1995 The National Environment Tribunal Act
- 1997 The National Environment Appellate Authority Act
- 1998 The Bio-Medical Waste (Management and Handling) Rules
- 2001 Batteries (Management and Handling) Rules
- 2008 Hazardous Waste (Management, Handling & Transboundary Movement) Notified 2008
- 2010 National Green Tribunal Act
- 2011 The Plastic Waste (Management and Handling) Rules
- 2011 E-Waste (Management and Handling) Rules
- 2016 Solid waste management rules
- 2016 Plastic Waste Management Rules,
- 2016 Bio-Medical Waste Management Rules,
- 2016 E-Waste Management Rules,
- 2016 Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016,
- 2016 Construction and Demolition Waste Management Rules, 2016.

<u>Policy Initiatives</u>

• National Urban Sanitation Policy, 2008

• National Environment Policy, 2006

• Policy Statement for Abatement of Pollution, 1992

• National Conservation Strategy and Policy Statement on Environment and Development, 1992

• Ecomark Scheme, 1991

Key Government Programmes

- JNNURM
- Total Sanitation Campaign
- MNRE's Waste-to-Energy Programmes
- Integrated Low-Cost Sanitation Scheme
- National Biogas and Manure Management Programme

Key Projects

• Kolkata: SWM Improvement Project

• Kanchrapara: SWM through Citizens' Participation

• Kollam: MSW Management Project

• Chennai: MSW Project

• Navi Mumbai: MSW Management Project

• Gurgaon: Ultra Modern Waste Management Plant

• Namakkal: Zero Garbage Status

• Suryapet: Dustbin Free and Zero Garbage Town

• Visakhapatnam: SWM Though Citizens Participation

• Thiruvananthapuram: Decentralised SWM

• CIDCO: SWM System at Areas Adjoining Navi Mumbai

Key Initiatives

• Chennai: GPRS Equipped Waste Bin

• Ahmedabad: Tapping Methane Gas

• Goa: Solid Waste Management Corporation

• Nagpur: Bye-Laws to Collect Waste Generated in Hotels

• Nagpur: Management of Construction Debris

• Akola: CBO for Waste Management

• Yavatmal: Door-to-Door Collection of Solid Waste

(Source- India Infrastructure report, 2009)

Along with these, the Constitution of India has Article 51(a) g, which deals with the fundamental duties of the citizens of the country which states, 'It shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers, and wildlife and to have compassion for the living creature.'

1.9. Solid waste management in India

MSW (Municipal Solid Waste) refers to the heterogeneous collection of wastes produced in urban areas (UNEP, 2005). Waste management is a complex issue in Indian society. However, municipal solid waste has a far-reaching influence on non-humans and the urban eco-system. This perspective has yet to be prioritized when all the laws and policies are formulated. Waste management comprises a collective activity involving segregation, collection, transportation, re-processing, recycling, and disposal of various types of waste (TERI, 2014).

According to the 2011 census, the population of India was 1.21 billion; of this, 31% live in cities. According to CPCB, 1,27,486 Tons Per Day of municipal solid waste were generated in India during 2011-12, with an average waste generation of 0.11 kg per capita per day. Of the total waste generated, approximately 89,334 TPD (70%) of MSW was collected, and only 15,881 TPD (12.45%) were processed or treated.

As per the Ministry of Housing and Urban Affairs Annual Report for 2016-17, the total

generation of solid waste is estimated to be approximately 1,50,000 tons per day. Out of the total, approximately 90% (1,35000 MT per day) is collected. Out of the collected waste, 20% (27,000 MT per day) is processed, and the remaining 80% (10,8000 MT per day) goes to the dumpsites. Central Pollution Control Board (CPCB) conducted a study in 60 major cities of India and estimated that around 4059 tons per day of plastic waste are generated from these cities. It is estimated that around 25,940 tons of plastic waste are generated annually in the country. In India, 52,971,720 MTPA waste is generated, from which 46.03 % is processed. In Odisha, 992,800 MTPA waste is generated, and only 12% is processed. Bhubaneswar generated 400 tons of solid waste per day, of which 7.98% was plastic waste in 2010-11(Ministry of Environment, Forest, and climate change, 2018). CPCB (2020-21) report stated in India, 160038.9 TPD of solid waste is generated. Out of that, 79956.3 TPD (50%) is treated, 29427.2 TPD (18.4%) is landfilled, and 50655.4 TPD (31.7%) is unaccounted.

Figure 1.3. State wise per capita waste generation

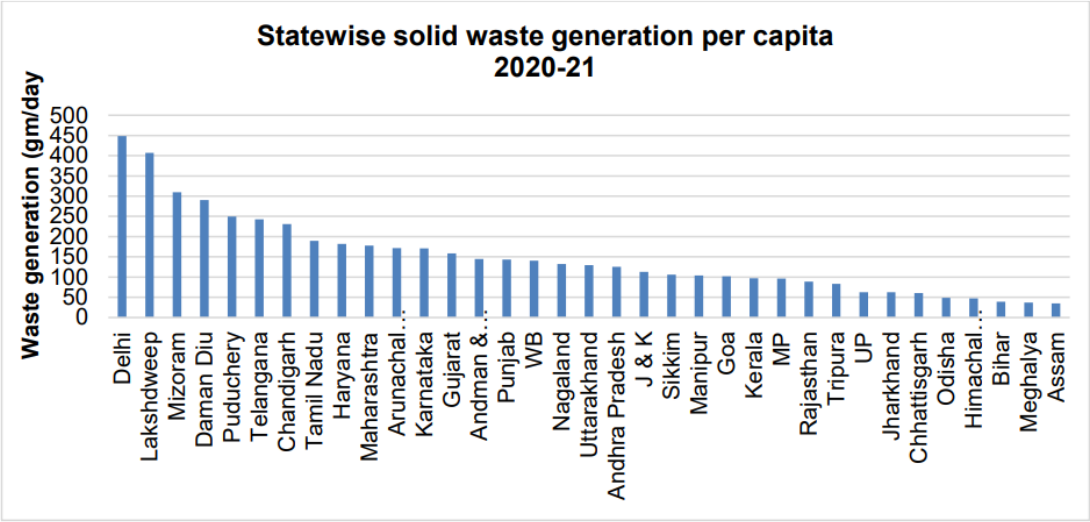
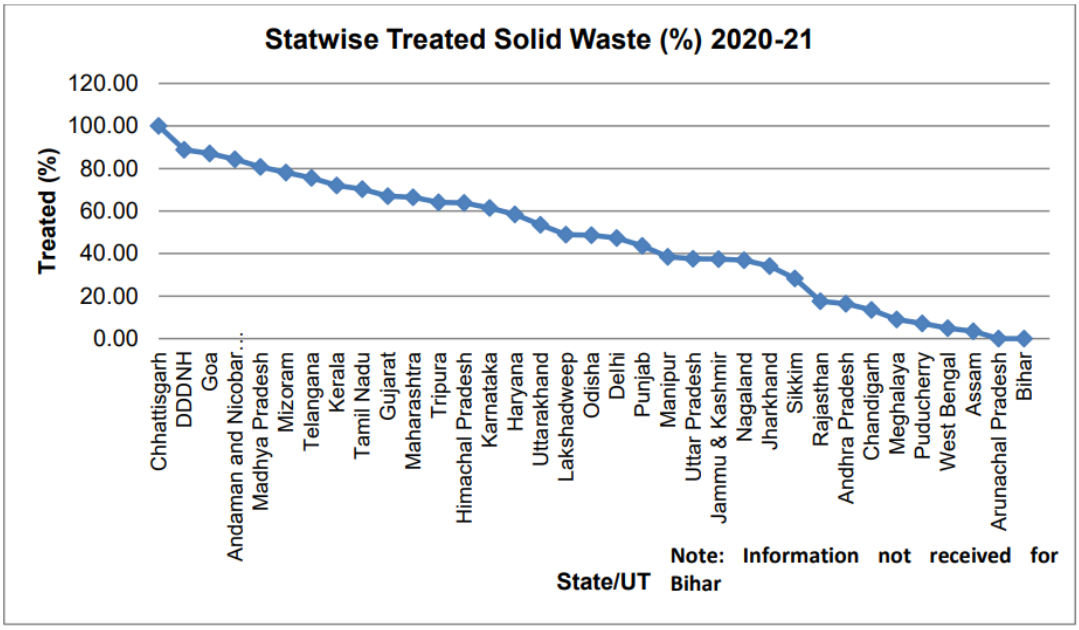


Figure 1.4. State wise treated solid waste



(Source: CPCB, 2020-21)

31% of the population lives in urban areas in India, according to the 2011 census. In densely populated developing countries, waste creates havoc in the cities. In developing countries, in urban areas, a growing number of people generate as much waste as people in industrialized countries. To reduce waste generation there, households must change their consumption patterns and daily habits (IGES white paper, 2008). The impact of municipal solid waste on climate change has never been an influential factor in decisions on solid waste management in the cities of developing countries in South Asia. As solid waste management problems create environmental and health hazards, the waste management sector needs to take active steps to reduce the impact of climate change (Singh et al., 2018).

The census of India defines urban areas as (a) all places with Municipal Corporation, Municipal Council/Committee, Nagar Panchayat or Cantonment Board or notified town area, and (b) all places having a minimum of 5,000 populations, a density not less than 400 persons per square kilometer, and at least three-fourths of the adult male population employed in pursuits other

than agriculture. Industrialization and consumerism shape urban life. Urban spaces experience not only economic growth but also population growth. In such a culture of growth and development, a throwaway culture results from urban life and the prevailing attitudes of growth and affluence (Vlachos, 1975). Population explosion, coupled with the improved lifestyle of people, results in increased generation of solid wastes in urban as well as rural areas of the country. Generally, 'making garbage out of sight' is common in cities. The more advanced the human settlements, the more complex waste management becomes (Agarwal et al., 2015). The management of the waste produced also depends on the efficiency of the city administration and willingness on the part of all the stakeholders.

MSWM (Municipal Solid Waste Management) has emerged as one of the significant environmental problems in Indian cities. It involves activities associated with the generation, storage, collection, transfer and transport, processing, and disposal of solid wastes. However, in most cities, the MSWM system comprises only four activities, i.e., waste generation, collection, transportation, and disposal. The management of MSW requires proper infrastructure, maintenance, and upgrades for all activities making the task increasingly expensive and complex due to urban centers' continuous and unplanned growth. In India, Gujrat, Delhi, and Tamil Nadu states have the highest per capita waste generation. In the same category, cities like Ahmedabad, Lucknow, Madras, and Kanpur are at the forefront. It may be due to the high living standards, rapid economic growth, and high urbanization in these states and cities. However, the per capita generation rate is low in the states like Meghalaya, Assam, Manipur, and Tripura and in cities like Nagpur, Pune, and Indore (Sharholy et al., 2008).

The urban local bodies in India govern the cities. These urban local bodies need more funds, resources, infrastructure, and appropriate strategies, which leads to a poor solid waste management system (Henry et al., 2006). The most exciting thing is that the cities even do not have accurate data on the quantity of waste produced in India. There needs to be more data

about the actual quantum of waste generation in urban India because there is no system of periodically collecting data on waste generation. Here the efficiency of the ULBs is questioned. There even lies a non-uniformity of waste collection in a single city. The collection is never complete. Only the areas having private contractors and NGOs engaged have a complete waste collection. The uncollected waste lies outside or overflows the bins hampering the environment and health of the community. It happens due to faulty design, strategy, planning, and the poor attitude of people toward the waste they have produced. Solid waste management is indeed a people management issue, and ignoring this fact will result in complex and unsuccessful attempts with poor results (Mania & Singh, 2016).

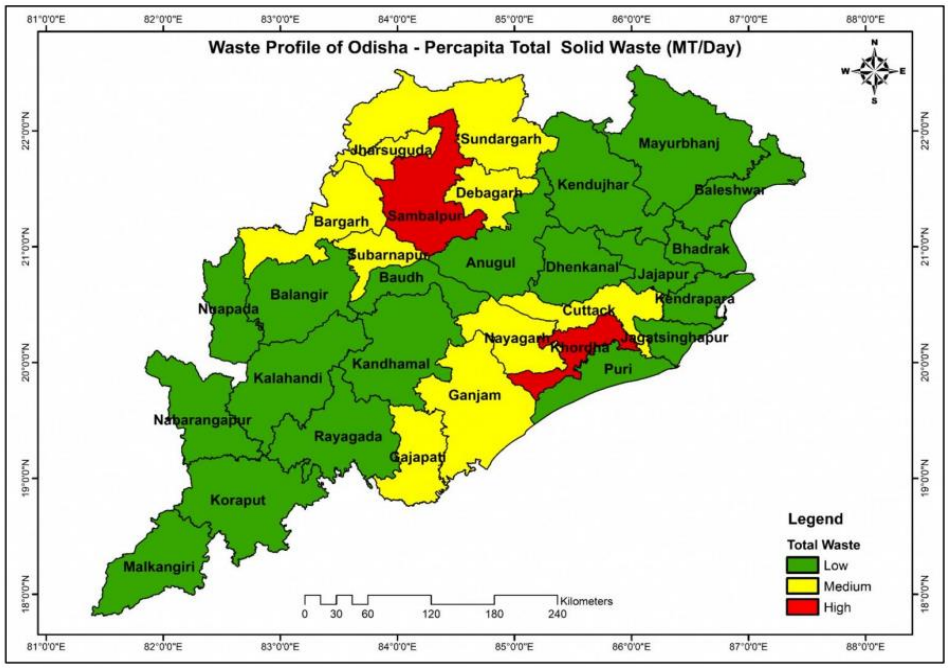
1.10. Waste management in Odisha

Located on the eastern coast of India, with a population of 41.9 million, the State of Odisha occupies an area of 155,707 square kilometers as per the Census of India (2011). It is the tenth-largest state in India in terms of area and the eleventh in population size, accounting for 5% of the country's geographical area and 4% of the country's population. According to the 2011 Census, there are 223 urban centers in Odisha and 103 statutory settings, including 5 Corporations, 35 Municipalities, and 63 Notified Area Councils.

Odisha generates 2132.95 TPD of solid waste daily; 2097.14 TPD is collected, 1038.31 TPD is treated, and 1030.33 TPD is landfilled (CPCB, 2020-21). The total solid waste produced daily in Odisha's 30 districts is 3063.562 MT/day. Among all the districts of the state, Khordha and Ganjam generate the highest amount of solid waste. Balangir, Bhadrak, Cuttack, Khordha, Sambalpur, Puri, and Nayagarh districts have the facility of mechanical road sweeping. Only 14 districts in the state have Waste Deposition Centres. Of all the districts, 47 percent have a 100 percent collection of Solid Waste. 40% of the districts have central bio methanation centers / Composting of wet waste facilities. Sanitary landfills are available in 7 districts of Odisha, such as Baleshwar, Bhadrak, Gajapati, Kandhamal, Khordha, Nayagarh, and Puri (Government

of Odisha, 2023)

Figure 1.5. Per capita solid waste generation in Odisha



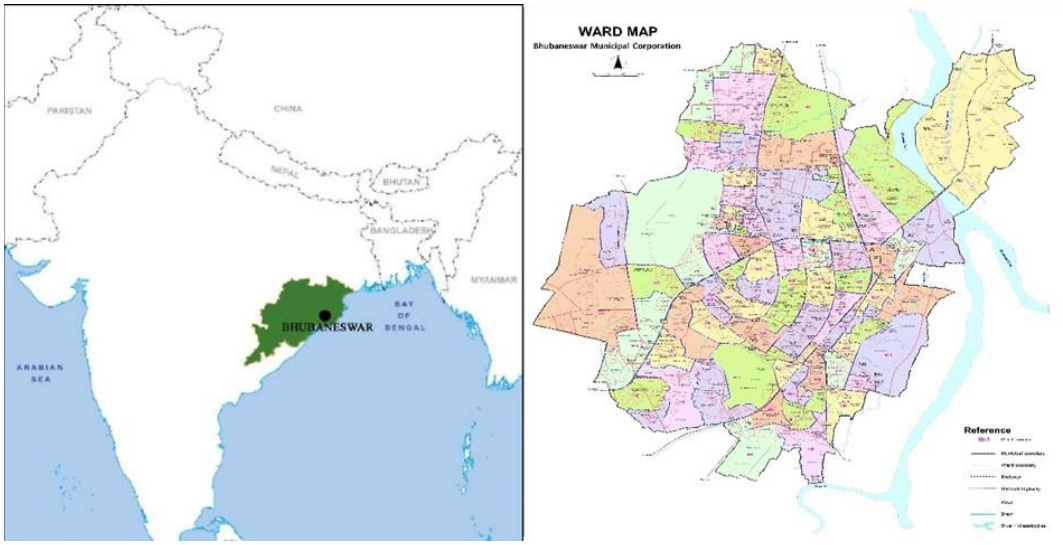
(Source: Environmental Synthesis Report, Government of Odisha, 2023)

1.11. Waste management in Bhubaneswar

Located in the Khurda district, Bhubaneswar became the capital of Odisha in 1949. It was designed by the renowned German architect Otto Königsberger in 1946. The Daya River in the south and the Kuakhai River in the east surrounds Bhubaneswar. The Chandaka wildlife sanctuary is located on the western side. The average altitude of the city is 148 ft. The Bhubaneswar Municipal Corporation (BMC) is the local administrative body with jurisdiction over 135 square kilometers, covering 67 administrative wards (see Figure 1.3. right). The BMC was established in 1994. In the 67 wards, citizens elect corporators for five years. The officials are the mayor, the deputy mayor, and council members who make important decisions about the city, whereas the city's Commissioner handles all the executive functions. According to the 2011 Census, the city's population is 885,363 people, 163,983 (18.5 %) of whom reside in slum

areas. In 2011, there were 445,233 male inhabitants and 392,504 female inhabitants. The decadal growth rate of the city is 45.9%. Literacy rates stand at 95.69% for males and 90.26% for females.

Figure 1.6. Map of Odisha and Bhubaneswar city



Left: The State of Odisha; source: Saha and Banerjee (2018). Right: The City of Bhubaneswar; source: Bhubaneswar Development Authority.

Bhubaneswar Municipal Corporation is the waste management authority of Bhubaneswar. The 74th Amendment of the Constitution, the Orissa Municipal Act, 1950, and the Orissa Municipal Rules, 1953 govern the constitution and functioning of Bhubaneswar Municipal Corporation (BMC). It functions under the overall administrative control of the State Housing and Urban Development Department (H&UDD), headed by the Director of Municipal Administration. The state government can call for information, conduct the inspection, give direction, dissolve the ULB, cancel orders, and even rescind council resolutions under specified circumstances. The functions of the Corporation fall under two categories - obligatory functions (such as maintenance of roads, street lights, sanitation, water supply, registration of births and deaths, public immunization, and regulation of buildings); and discretionary functions (such as construction and maintenance of parks, schools, hospitals, and libraries). Separate departments

perform these functions besides an administrative and a finance department. Solid waste management is one of the obligatory functions of BMC. There are many legislations at the National, State, and Local level which govern the management of municipal solid waste in Bhubaneswar city, like the

- Orissa Municipal Corporation Act of 1950,
- Hazardous Wastes (Management and Handling Rules), 1989,
- Bio-Medical Waste (Management and Handling) Rules, 1998,
- Municipal Waste (Management and Handling) Rules, 1999,
- Manual on municipal solid waste management, 2000,
- Plastic and other non-biodegradable garbage—Ordinance of July 2000.

The ethnographic setting of Bhubaneswar

The research setting was selected due to specific reasons. As the state capital, the city of Bhubaneswar sets an example for other cities in sanitation and waste management. It was inducted into the Smart City Mission programme of the Government of India in 2015 with a specific aim to improve the quality of life for people and drive economic growth. Subsequently, the Government of Odisha constituted a Special Purpose Vehicle company called Bhubaneswar Smart City Limited (BSCL) for implementation of smart city proposal of Bhubaneswar selected under Smart City Mission programme. Efficient solid waste management and sanitation were essential part of the core infrastructure elements of the smart city mission. However, the researcher witnessed several shortcomings in the sanitation and solid waste management raising eyebrows on the efficiency of waste management in the city. Observing improper waste management situations for years intrigued the researcher further to conduct a study on waste-related issues in the city. As the researcher has been staying in the city and witnessing social and economic inequality concerning waste management practices for over a decade, specific

research questions germinated begging for a systematic study. The research interest in the social context of municipal solid waste in the urban space emerged from everyday encounters with urban solid waste issues and text exposure, particularly the literature on waste and urban studies. Secondly, the lived experience of waste-related issues, including environmental, health, economic, political, and social impacts motivated further. Hence a study was undertaken to investigate urban solid waste issues in Bhubaneswar. Against these backgrounds, the objectives were set. The following are the research objectives.

Objectives

- 1. To explore the waste segregation activities at the household level and assess its social and environmental outcomes.
- 2. To describe the socio-demographic nature of the households and its relation with nature and volume of waste generation.
- 3. To find out the influence of policies on household littering.
- 4. To explain the factors influencing littering.

In order to understand the waste management behavior and patterns of waste management issues, urban ethnography was conducted. The study also used observation, surveys, and interview tools to gain insights into waste-related issues.

Waste issues in the city are connected at the political, economic, and social levels, with an interplay of the government and the citizens including the underprivileged communities. The state tried to change the situation by formulating grand policies, yet it leaves a great deal to be desired. At the same time, it has become challenging to understand the political dimension without scientific research because of the complexities involved in waste-related issues. These situations have led to further deterioration of the living conditions of the marginalized communities in the city. The research makes a modest attempt to untangle those complexities for a better understanding of waste-related problems in the city and in

turn hoping for offering implementable recommendations for better service delivery arrangement.

1.12 Understanding the politics of urban waste through urban ethnography

Urban spaces are dynamic in nature. Currently, more than half of the world population lives in cities, making it pivotal to study urban space (Pardo & Prato, 2012). In recent years, there has been a growing attention to the environmental aspects of urban spaces and to the attendant issues. In particular, among the environmental and health aspects of urban geographies, waste and the problems linked to it have attracted the interest of urban researchers. Waste is not just an environmental issue. Waste problems do not just result from high industrialization, urbanization, and population growth. The seemingly apolitical nature of waste also masks a complex reality of urban existence and movements. Waste, we stress, is not apolitical; it is highly political in nature and continuously shapes urban lives and geographies. It is a major aspect of the new political, environmental, and social challenges faced by the new age urban societies, the study of which requires the use of diverse ecological research paradigms (Little, 2007).

The present discussion delves into the social problem of waste, particularly municipal solid waste among the households in the urban space of Bhubaneswar through a political sociological approach supported by urban ethnography. The study of urban settings in India sparked some controversy after Pocock's research (1960) claimed that, here, urban spaces are just the continuity of rural spaces. Yet, Indian urban settings have their unique relevance and identity, calling for detailed study by researchers and policymakers. From time immemorial, cities have provided meaning and identity to people (Bell & Shalit, 2022). As they are transformed in the global economy and the local government is decentralized, urbanization continues to grow (Niti, 2021). In this context, we argue the empirical study of micro-level processes, their socio-economic and political connections with macro

processes, and their impact on the life of individuals and the entire community (Prato & Pardo, 2013) contributes to a better understanding of a given urban social reality (Pardo & Prato, 2012). The history of research in the modern urban spaces traces back to eminent social scientists, such as Ferdinand Tönnies (see his work on Gemeinschaft and Gesselschaft, 1887), Emile Durkheim (see his ideas on anomie in his work on suicide, 1897), Georg Simmel (1900), Max Weber (see his work on bureaucratization, 1958) and Alexis de Tocqueville (his analysis of democracy in America, 1945), who studied urban settings extensively. The Chicago school initiated empirical and theoretical research in American urban society. Cities were recognized as complex settings that were large-scale, heterogeneous, and highly populated, which impacted people's behavior, mindset, separation, regrouping, collaboration, and competition (Imilan & Marquez, 2019). In the early 1980s, there emerged a strong interest in ethnographic research in urban areas. Pardo's pioneering research in Naples (1989, 1996) based on participant observation and case studies reinforced urban ethnography, developing insights into ordinary people's views of and approach to the social, economic and political system in the city and beyond (Prato & Pardo, 2013). Directly significant to the focus of this article, Pardo's work (2011, 2022) on the public health crisis in Naples, Italy, caused by uncollected rubbish and by the illegal rubbish trade has brought out both the inefficiency of the governing bodies to manage waste and the import of citizens' protest against the local government inaction. We shall see that the mismanagement of the waste issues in Bhubaneswar highlights how the interests of a privileged few are fulfilled by the local governing bodies and the state at the expense of the underprivileged many. Here, the mismanagement of waste strengthens the inequality between the higher and lower classes in the city and has a significant impact on the degradation of the environment and public health. In the process, the rich become richer and acquire the power to tackle the waste issues, and the poor become poorer and are

deprived of the capacity to handle those issues.

Conducting ethnographic research in an urban setting gives the researcher a deeper insight into issues not understood earlier. Ignoring socio-environmental problems and the conflicts shaped by the everyday lives of the people living in that very environment would be a great mistake (Zimmer, 2010). Addressing the empirical issues around urban waste with the help of political ecology and actor-network theory helps to unravel ecological adaptation among the local communities and to gain insights into culture-specific use of productive systems and technologies, social practices, and conflict. It also helps to clarify the exploitation of natural resources by certain social groups and the stories and ideas put forward by these social groups to justify adaptation and complacency (Little, 2007).

Urban ethnography has recently emerged as a powerful tool to understand urban complexities. Cities are, without doubt, complex centers of cultural and ethnic interactions which establish the ideal setting for achieving sustainable development (Prato & Pardo, 2013). This goal is regarded as central by the United Nations and individual countries and depends on urban policies resulting in peace, justice, and prosperity for all. In many cases, it has been elusive because urban policies have failed to take into account the historical, social, cultural, and political trajectory of the cities under consideration and have consequently failed to address critical issues, including socio-economic disparities, security and severe environmental and health problems issues (Pardo, 2011; Pardo et al., 2020). As shown by Pardo's ethnography on uncollected rubbish in Naples (2022), effective waste management is one of these critical issues. The case of Bhubaneswar exemplifies how this issue is intricately related to better health care, economic and social equality, and the protection of the rights of all citizens. Addressing this interaction and the underlying views, values, and identity of the people on the ground is a priority that qualifies broader policies and governance that respect democratic principles and citizenship rights (Pardo et al., 2020).

To work effectively, a democratic country needs a good relationship between governance, citizenship, and the law. For this to happen, governance and the law must abide by fundamental democratic principles and refrain from following particular interests (Pardo, 2011).

1.13.The process of waste collection and management in Bhubaneswar

The health and sanitation department of Bhubaneswar Municipal Corporation collects and manages waste generated in the city. Out of 67 wards, 57 are grouped in solid waste management activities such as municipal solid waste collection & transportation, conservancy cleaning, drain cleaning & de-silting. For this purpose, three private agencies, Jagruti, PMR, and Ramky, help in door-to-door garbage collection, street sweeping, MSW (Municipal Solid Waste) transportation, drain cleaning, drain de-silting, conservancy cleaning, and bush cutting under Public-Private-Partnership (PPP) mode. In the remaining ten wards, BMC manages waste. BMC workers sweep the roads twice a day. Mechanical sweeping of main roads is also done. There is one health officer, an assistant unit Officer, eleven sanitary inspectors, 954 sweepers, and 149 antilarval workers. To collect household waste, 'safei gadi' and tricycles are used. Mixed wastes are transported to the dumpsite after collection. The city generates approximately 520 tons of MSW per day. To facilitate better waste management, tri-cyclers, trollies, auto-tippers, and 120-240 liters of bins are provided by BMC. Under Smart City Mission, BMC provides online monitoring and tracking of municipal solid waste management activities. After household waste is collected, it is transported in trucks and dumpers to the Temporary Transfer Station (TTS) located near Sainik School. These wastes are weighed and recorded. Those are then transported to the dump site located at Bhuasuni. The city has no solid waste treatment plant (BMC, 2023). Out of the total waste generated in the city, household

waste comprises 64.1 percent, shops, and commercial establishments generate 15.32 percent, hospitals, and clinics generate around 1.5 percent, and markets generate approximately 3.9 percent of waste (BMC; Rao, 2021).

Research gap

Traditionally waste has been viewed as an external phenomenon without associating with the rest of the social structure and system (Rath &Swain, 2022). The political nature of waste and its influence on humans who generate them are some areas that need deep contemplation. Conventionally, waste has been studied as an issue that should be addressed. However, the networks of the relationship between different actors have yet to be delved into—the social implication of such relationships and what waste represents need to be understood. There are theoretical challenges in the field of waste study as it has not been researched adequately and theoretically. Relevant methods, study variables, and specific ways of analyzing data to navigate problems relating to waste and waste management across space and time must be adopted. The multidimensional nature of waste needs to be studied, and the different disciplines have much to contribute to a better understanding of waste. Almost all the studies on waste issues were based in developed countries, necessitating having theoretical frameworks to study waste and waste management across the countries, irrespective of differences.

The study found a considerable research gap in the sociology of waste in urban space. Social issues involved with municipal solid waste management are yet to be analyzed sociologically. Waste segregation behavior has been studied in isolation without researching its linkage with the socio-political interconnection and impacts. The theoretical explanation of waste segregation behavior has not been adequately explained.

Even if Indian cities face multiple issues due to improper municipal solid waste management, the social perception of the city dwellers has not been considered. As littering is a vital problem in the city, it needs to be studied sociologically. Regarding the policy introduced to bring

behavioral change among the city dweller, Swachh Bharat Abhiyan and its impact on household littering have not been studied in Bhubaneswar.

Chapter Layout

The first chapter is the introduction, including the literature on waste and the research gap. The second chapter explains the methodology adopted to study segregation, littering, and policy-related issues. It outlines the mixed method approach used, the sampling procedure, the tools used, and the analysis. The third chapter deals with the theoretical framework adopted to conduct the study. The fourth chapter analyzes the socio-demographic features of the households and their linkage with the nature and volume of waste generated in the city, along with the results and discussions of empirical data collected through household surveys. The fifth chapter gives an overview of the waste segregation scenario in Bhubaneswar, its need, and current practices. It includes the environmental, health, and social impacts of waste generated. The sixth chapter deals with the littering practices in the city and the social causes. The seventh chapter explains the Swachh Bharat Abhiyan policy and its impacts as perceived by the study participants. The eighth chapter is about theoretical analysis of the research conducted. The ninth chapter is the conclusion with the policy implication.

Chapter 2

Methodology

"Theory is what you talk about, but the methodology is what you do" (Meter, 1994).

2.1. Introduction

The methodology is a detailed account of the actions taken by the researcher to conclude the research. It is the science of finding out and includes the procedures for scientific investigation (Babbie, 2007). Research methodology describes the way to solve the research problem systematically. It explains how research is done scientifically. After defining the research problem, research methodology takes care of the type of data to be collected, the kind of method to be adopted, and the use of the technique of analyzing data (Kothari, 2004, 8, 9). In the methodology, various steps adopted in studying the research problem and the logic behind them are discussed.

The present chapter is dedicated to delineating the methodology followed during the research to land some valid observations and conclusions. There is an attempt to reflect on the research pathway trodden throughout the research endeavor. The methodological delineation traverses through very well-defined stages, which have been adhered to in letter and spirit throughout the work. It has enabled us to make the research systematic, orderly, result oriented, and completed within the stipulated time frame.

The broad statement of the problem lies in exploring the social context of solid waste in the urban space concerning the city of Bhubaneswar, India. It investigates the waste segregation issues at the household level, finding the linkage between the socio-demographic aspect of the households with nature and volume of waste generated, social causes of littering practices in

the city, and policy impact on household littering.

2.2. Research question

Specific research questions and objectives have propelled the present study. However, locating the emanating point of the research topic itself becomes pertinent before spelling out the objectives. The research interest in the social context of municipal solid waste in the urban space arose from real-life encounter with urban solid waste issues and text exposure, particularly the literature on waste and urban studies. These have highlighted urban inequality in solid waste management. Secondly, the real-life experience with waste-related issues, including environmental, health, economic, political, and social impacts were motivating factors. Hence a study was undertaken to investigate urban solid waste issues. Against these backgrounds, the objectives were set. The following are the research question and objectives.

A. How are the household segregation activities linked with the overall waste management of the city?
B. How does the social and demographic feature of the city determine the nature and volume of waste generation?
C. How does 'Swachh Bharat Abhiyan' impact the littering behavior of people?
D. Why is littering rampant in the city?

2.3. Objectives

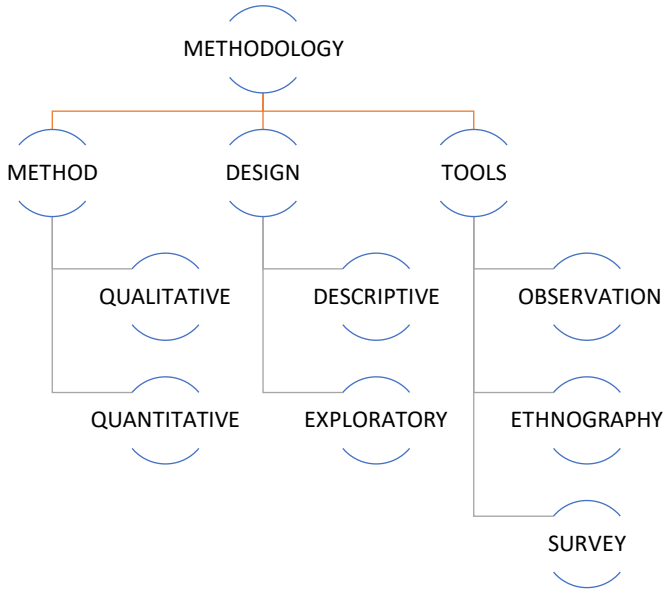
1. To explore the waste segregation activities at the household level and assess its social and environmental outcomes.

2. To describe the socio-demographic nature of the households and its relation with nature and volume of waste generation.

3. To find out the influence of policies on household littering.

4. To explain the factors influencing littering.

Figure 2.1. Methodology



2.4. Research Design

After defining the research problem, there is a need to prepare the design of the research. It includes decisions regarding what, where, when, how, and by what means concerning an inquiry or a research study that constitutes a research design (Kothari, 2004). We used descriptive and exploratory research designs. The descriptive design is used to provide the text view on urban solid waste issues, the need for household waste segregation, an understanding of the practice of littering, and to take note of Swachh Bharat Abhiyan. The exploratory design has been used to unveil the real waste issues in the city and identify the social processes involved in poor segregation and the causes of littering. The perceptions of the city dwellers were also explored regarding waste issues of the city to locate the challenges faced in household waste handling and to understand their assessment of the government policy, such as Swachh Bharat Abhiyan. Their opinion on how municipal solid waste issues can be resolved in the city

and result in just and better waste management was solicited.

2.5. Research method and tools applied

The research has used a mixed-method approach. The purpose of using mixed methods is triangulation, where the researcher converges the quantitative and qualitative findings to study the same phenomena (Greene et al., 1989). The rationale for using mixed methods is instrument fidelity, where qualitative and quantitative techniques can be appropriated to enhance significance.

Qualitative analysis resulted in analyzing perceptions from personal experiences and firsthand observations. It provided rich and in-depth data on the issue. The quantitative results helped to supplement the qualitative data. The surveys became meaningful when interpreted considering qualitative information. Statistics were most helpful when compared with interview results. Triangulation, in this respect, leads to a prominent role in qualitative evidence (Jick, 1979). In the mixed method, pragmatism was the philosophical base. The study relied on both primary and secondary sources. The secondary information was collected by reviewing journal articles, books, and reports. Primary data were collected from the field. The study resorted to both qualitative and quantitative data. The quantitative data were captured through survey methods. The survey method used a detailed semi-structured interview schedule. The semi-structured interview schedule was compartmentalized into six parts.

Part -A Identification

Part -B Respondent's profile

Part -C Waste generation

Part -D Waste Segregation and Collection

Part -E Household littering

Part -F Impact on the Neighborhood and the City

Part-G Policies, practices, and Perception

Qualitative data have been collected through both participant and non-participant observation, and ethnography.

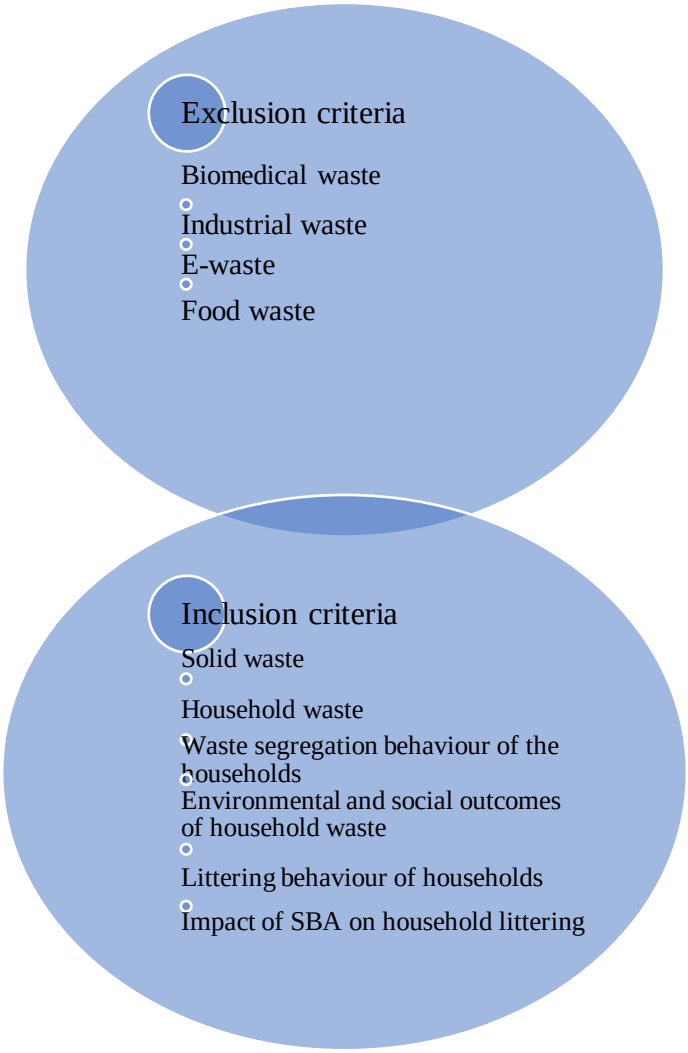
Sampling

In the study, Probability Proportion to Size (PPS) has been used. 'PPS (probability proportionate to size) This refers to a type of multistage cluster sample in which clusters are selected, not with equal probabilities but with probabilities proportionate to their sizes—as measured by the number of units to be subsampled' (Babbie, 2007). Here the cluster sampling units do not have the same number, and a random selection process is used, where the probability of each cluster being included in the sample is proportional to the size of the cluster. For this purpose, we listed the number of elements in each cluster irrespective of the cluster ordering method. Then we took the sample systematically with the appropriate number of elements from the cumulative totals. The actual numbers were selected in this way. They do not refer to individual elements but indicate clusters and how many from the cluster will be selected by simple random sampling (Kothari, 2004). Out of the total of 67 wards, 20 wards were randomly selected. Then, through PPS, particular areas were selected systematically from the selected wards. From the specific areas, households were selected using non-probability sampling. Hence of the large population of the city, a total of 200 households were selected.

Data collection

For the literature review, words such as "waste," "solid waste," "household waste," "household waste segregation," "littering in the city," "Swachh Bharat Abhiyan impact on the city" etc. were searched on JSTOR, google scholar, Science Direct, Research Gate, PubMed Central, Directory of Open Access Journal, Semantic Scholar, RefSeek, and other journal websites. While reviewing, exclusion and inclusion criteria were followed.

Figure 2.2. Exclusion and inclusion criteria



The study adopted exclusion and inclusion criteria for the literature review. It excluded literature on biomedical waste, industrial waste, E- waste, and food waste and focused only on municipal solid waste. The study included literature on household solid waste, waste segregation behaviour of the households, environmental and social impact of household waste, littering behaviour of households and impact of Swachh Bharat Ahiyan on household littering. After several iterations, a semi-structured interview schedule was prepared based on the objectives. Those were sent to the experts for their reviews, who gave their valuable input. The experts' reviews helped modify the questions and bring more relevance and validity. Before

starting the fieldwork, we obtained permission from Bhubaneswar Municipal Corporation (BMC) office to interview local people. The research also got approval from the Institutional Ethics Committee for Human Research of the National Institute of Science Education and Research at Bhubaneswar. During that phase, the official data on waste produced by various government sources, particularly regarding Bhubaneswar were studied.

The pilot study:

The COVID-19 pandemic affected every researcher. The data collection was not done as planned due to the nationwide lockdown and the city's rapid spread of the COVID-19 virus. Somehow the a few telephonic interviews were undertaken during the pandemic. After those interviews, the questions were further moulded and reshaped, and the final data collection process began.

A detailed account of the research tools used in the study has been mentioned below.

- Observation method: The researcher observes the surroundings and seeks the information without asking the respondent. In this study, both participant and non-participant observation were used to obtain data. The researcher became a member of the urban community as she stayed in the city for two years. The community experience with household waste handling, segregation, and littering practices was observed.
- Interview: In the interview, an interviewer asks questions to the respondent. It may be conducted face-to-face or by telephone (Babbie, 2007). Telephonic interviews were conducted during the pilot study, but face-to-face interviews were conducted to collect accurate data from 200 households.
- Survey: In the survey, large numbers of people are asked questions about their behaviors, attitudes, and opinions with the help of a questionnaire (Cohen & Lea, 2005). Data were collected from two hundred households.

- Ethnography: In ethnography, there is a detailed and accurate description of social life rather than an explanation. (Babbie, 2007). As the research intended to study the problems, people face concerning waste in Bhubaneswar in an in-depth manner. An ethnographic study was conducted from March 2020 to April 2022. Semi-structured interviews and participant observations helped to gain insight. The *Badu Sahi* (ward No. 54) and *Sriram Nagar* (ward No. 59) near the world-famous *Lingaraj Temple* were randomly chosen as setting for our study. The research objectives were explained to the 20 participants, and interviews were conducted at mutually convenient times. Albeit semi-structured, the questions were designed carefully to investigate the problem of littering, its causes, people's waste segregation behavior, and the impact of the *Swachh Bharat Abhiyan* (Clean India Mission launched by the Government of India in 2014) on the littering behavior of the residents.

Data Analysis

In qualitative analysis, 'there is nonnumerical examination and interpretation of observations, to discover underlying meanings and patterns of relationships' (Babbie, 2007, p. 394). On the other hand, in quantitative analysis, 'there is the numerical representation and manipulation of observations to describe and explain the phenomena that those observations reflect' (Babbie, 2007, p. 422)

The interviews were undertaken in the households. Every evening, each schedule was scanned to look for the incomplete part. They were filled up during the subsequent meeting with the sample. The observations were positioned within and outside the household and in the lanes and colonies. The collected information was put into an Excel sheet. From them, calculations were made and put into composite tables, which were later used for analysis to derive research inferences and insight. On the part of quantitative analysis, descriptive statistics have been used.

Qualitative analysis was undertaken to penetrate the city's sociocultural and environmental context of waste management. The interviews and discussions were conducted, transcribed, and analyzed qualitatively. The analysis included keyword analysis (Russel, 2011), development of common themes, categories, and appropriate thematic inferences. The social groups involved and their interests and perspectives were mapped to understand views, conflicts, resolutions, and intentions (Meltzoff, 2013).

2.6. Scope of the Study

The study is confined to Bhubaneswar, the capital city of Odisha. The study focused on the households in the city. The academic scope of the present study relates broadly to Waste Studies, Urban Studies, Political Ecology of Waste, Sociology of Environment, and Urban Sociology. An academic endeavor is geared to identify the household waste segregation activities of the households in society and analyze the social causes of their littering behavior. Further, an attempt is made to locate the policy impact of Swachh Bharat Abhiyan on the littering practices of the households in the city.

Implication logic:

The study starts with the notion of waste as a social phenomenon. The area has remained unexamined in Social Sciences. The study's rationale is to find out the existing power dynamics in waste management in the city. Being a multifaceted issue, the waste problem certainly has repercussions on the everyday lives of the city dwellers and all the stakeholders. Political and ecological analysis has helped in finding out the existing networks, interwoven issues, and changing relationship of humans with waste. Further, the study has tried to explain how government policy has successfully curbed or has been unsuccessful in reducing high waste generation and littering in the city. Here the major social causes of littering in the city have been highlighted to find the remedial measures to make the city clean and sustainable.

Chapter 3

Theoretical framework

3.1. Introduction

The problem of waste is not simply a problem for the scientific community which needs to be solved scientifically. The surface reality of social phenomena is different than that of the underlying hidden reality. Through the research process and empirical measurement, different layers of reality can be discovered. This has been categorically described as peeling the layers of the onion to find out the hidden 'real' structure (Bhaskar, 1975). Sometimes, the issue of waste is said to be socially constructed but the existence of social problem associated with waste is evident through multiple examples like the precarious condition of waste pickers, poor health of animals and birds, and inherent inequalities in the waste management process itself. All types of waste have both visible and invisible impacts. The visible impacts include environmental pollution, greenhouse gas emission, the spread of diseases, loss of lives, etc. whereas the invisible aspects include the power relationship among different stakeholders, the network of relationships, and the social group getting the benefit out of the mismanagement of waste, etc. These impacts remain disguised and are given different labels by social actors such as scientists, industrialists, politicians, journalists, and environmental activists. The entire issue gets socially constructed like the environmental issues. Their political and economic interests are hidden. There is a need for an investigation into the power relations between nature and the society exhibited through various social institutions, knowledge, and the life-world of people (Leff, 2012). As per Actor-Nework Theory (ANT), the power structure and inequality in the waste

and waste management system can be discovered through an understanding of the networks between different actors both human and non-human. Beyond the visible problems, exists the power structure, institutional arrangements, administrative pitfalls, linkages, and many more that will be exposed with careful application of the political ecology and ANT.

General universal theories explaining waste-related issues are not that popular in the social sciences. Not many researchers and scholars have attempted to do so. Even the social science researchers try to have a basic explanation of waste-related issues, like littering, lack of segregation, high level of waste generation, poor recycling services, etc. There have been multiple studies on the linkage between the socio-demographic profile of the citizens with the high level of waste generation and segregation behaviour such as Rame et al. (2022), Afroz et al. (2017), Sujauddin et al. (2008), and Mukui (2013). The theories explaining the waste management behaviour of the respondents are limited to some psychological theories such as the focus theory of normative conduct, integrative behaviour model, theory of planned behaviour, etc. If the social aspect of waste, the power dynamics, and networks cannot be understood, then waste management will forever remain a mystery. The grand social processes working through the micro-world of individuals cannot be uncovered. This necessitates a full-fledged study on waste using theories. The question is: can waste-related problems be understood and solved or not? There is a huge gap in this regard in waste studies across the world. If this is the age of Anthropocene, then it is mandatory to study waste which is the result of human action. There is no doubt why humans cannot change such actions.

While analysing the existing power dynamics, political ecology will broaden its explanation by adding biophysical dimensions in the study of the system and network. Along with all these, the type of connection such as positive or negative, terms of connection, the strength of the connection, the structure of the network, and the position of the actor in the network need to be explained. The belief behind such analysis lies in the socio-ecological network between

structure and agency due to the continuous interaction between human and non-human entities. The world has been networked as always (Rocheleau & Roth, 2007). These networked relationships will shed the light on the required actions at the policy level. If we take the example of the urban areas which are mostly engulfed with the dilemma of handling and sustainably disposing of waste, then they need to be studied in a different context and space. The policies need to be carefully formulated for the genuine and efficient management of waste because a sustainable society depends on a coherent and competent waste management system. While doing a political-ecological analysis of waste and implementing environmental policies, the role played by the natural forces and complex ecosystem dynamics must be considered (Nygren & Rikoon, 2008).

3.2. The need for theoretical integration

In political ecology, the environmental issues can be explained by focusing more on the political structures, and in actor-network theory, the movement of networks between the actors can be analysed to reveal the power dynamics—both of which can provide a holistic picture of the issue. In the case of political ecology, these political structures affect the uneven distribution of resources that, in turn, result in inaccessibility to environmental facilities and impoverishment of people. Such a case has been highlighted by Pelling (2003) in his study of urban floods. He also argued that unwillingness of the politicians to help people and the non-adoption of different strategies to improve the situation further made it worse. These factors led to social, economic inequality and detoriorarion of environment. Heynen et al. (2006) outlined the importance of including social and political issues related to environmental problems while studying it. When the problems are analysed with political and social issues involved, it empowers the researchers to provide better alternatives to solve real-world problems.

Because waste is a complex object, a single ontological and epistemological orientation will

never solve the purpose. Thus there is a need for using multiple ontologies, which may be referred to as a plural ontology. As there will be plural ontology, plural epistemology, and plural methodology will be applied to properly study and understand waste. Here, there has been an attempt to integrate both idealist and realist ontologies. A pragmatic philosophical orientation, where there is acceptance of multiple standpoints and the focus is on practicality, is appropriate in the context of waste. In the state of affairs of waste, some may view it as indispensable to society and some others may consider it a social problem. The interpretation and understanding do not end here;, the complex system of waste needs to be expressed. For that, to use the lens of ANT and political ecology, the researchers need to take up a research problem related to waste management which could be waste segregation or volume of waste generation, or appropriateness of waste management practices. Then they need to be ready to adopt certain concepts from both the theories while framing research questions. Data, then, can be collected using qualitative and quantitative techniques or both as demanded by the nature of the research problem and methodological convenience. It is important to take into account all the relevant stakeholders associated with the problem at hand. The collected data can be analysed with the help of a chain of explanations and due consideration of available concepts in both theories like ‘metabolic rift’, ‘entanglement’, etc.

3.3. Why political ecology and actor-network theory?

Environmental Sociology as the sub-discipline of sociology also has a relationship with geography, political science, anthropology, psychology, science and technology studies, biology, environmental studies, etc. In addition to relationships with various disciplines, there are debates and discussions about various theories and methodologies that lead to new ideas and concepts that further enrich environmental sociology. In some cases, environmental sociology accepts ideas from other disciplines and subjects but before their usage, they are

critically analysed (Lidskog et al., 2015). Similarly, the waste issue can be better understood by engaging with multiple disciplines. In the present era of globalisation, global environmental sociology is the need of the hour. There is always a close link between local and global. This particularly is studied by both political ecology and ANT. It adds a cosmopolitan perspective to general sociology as well (Beck, 2009). Castells (2009) noted the need for the place- and flow-based sociological analyses in a globalised world. A better understanding of the emergence of context and the impact of contextual approaches in local and global approaches can help in getting new findings, concepts, and theories and may help other sub-disciplines as well.

3.4.Political ecology

Bertrand Jouvenel (1957) coined the term 'ecology politique' in French, whereas Eric R. Wolf (1972) coined it in English. Political ecology is critical in nature and views every phenomenon in a dialectical way. This dialectical tradition has been borrowed from Marx and Hegel. Not only does it criticise the environmental and social issues and existing conflicting relationship between social groups, it also provides alternatives for the solution to such issues. Other than being largely eco-centric, it studies the ecological and human conflict by understanding human actions and interests (Brant & Bailey, 1997). Blaikie and Brookfield (1987) define political ecology as an approach that 'combines the concerns of ecology with a broadly defined political economy'. Though it owes its genesis to the academic discipline of Geography, it has significant relevance for anthropology and sociology.

Kropotkin (1902) was the first researcher in political ecology who talked about the inherent relationship between man and nature. He further argued that all types of social inequality are not at all natural but man-made. Humboldt (1814), Reclus (1890), Wallace (1870), and Sommerville (1848) are worth mentioning in the context of holding similar views. With the use

of political history, they have demonstrated the existing underdevelopment and inequality (Robbins, 2012). There is a Marxian orientation in political ecology and the explanation of all environmental issues is mostly based on uncovering the power structure (Forsyth, 2008). The waste-related issues are depicted as a result of political processes. There is cost and benefit inherent in waste and waste management issues. Political ecology analyses these but puts more importance on the political aspect of the issues which is the only cause of all other social problems (Bryant & Bailey, 1997). In political ecology, as nonhuman objects such as waste are intertwined with humans, they are also assumed to be political. The complex relationship between humans and waste can be discovered through a dialectic analysis by determining the winning and the losing party, by considering the historicity of a waste-related issue, and by a chain of explanations in waste management. The historicity of ecological processes takes a pivotal role in such analysis (Robbins, 2012). In other words, every kind of social issue and injustice associated has a historical cause. It is not only a result of human interference but has a historical process involved in it.

There is indeed theoretical fluidity in the political ecology framework (Khan, 2013). Political ecologists, with the use of case studies, participant observation, surveys and ethnographic methods, aim at finding out the political economy affecting the local activities and the environment through the social network. In addition, researchers sometimes use time series analysis, remote sensing, archival research, and network analysis of various actors, which are analysed both quantitatively and qualitatively (Robbins, 2012). Political ecology offers leverage to analyse waste with its relationship to the actors and institutions with all these tools, techniques and methods. When marginalised social groups such as the women and children endure suffering due to improper waste management, political ecology advances a step further to understand that inequality and suggests the needed change. The very fact that waste management and all types of waste such as solid waste, hazardous waste, construction and

demolition waste, electronic waste, and biodegradable waste, are political with the involvement of human actors, makes it essential to investigate that political relationship across spatial and temporal scales of analysis. For example, suppose a city faces solid waste related issues, that can be analysed over a decade or a century with more focus on the actors involved in taking decisions in the waste management of that city, the groups which get the maximum benefit or those who suffer due to the decisions made, the way solid waste management process has changed over the time, why and how there is a struggle for the waste resources among the waste pickers or the community dependent on the waste picking. Along with these, the knowledge production relating to solid waste, policies, the role of the stakeholders such as scientists, social activists, and the concern of the vulnerable sections of the society in the waste handling processes are taken care of here. To get a better picture, the use of direct observation and other qualitative methods are being used. A better understanding of the environment emerges from the critique of everyday life (Loftus, 2012). As it is impossible to separate humans from the natural world, nothing can be understood without understanding the socio-natural relationship. The consciousness about such a relationship emerges through everyday interaction with nature (Loftus, 2012). Multiple events are occurring simultaneously in the environment, and in political ecology, these problems are the result of the hybridisation process. The continuous influx of material and energy inside the social system is producing more waste-related problems in terms of greenhouse gas emissions, high levels of waste creation, social inequalities, social injustice, etc. In political ecology, these problems are the result of the hybridisation process. Similarly, the problem of the high volume of waste is a hybrid one, where multiple factors and processes are involved, making the issue more complex. Many scholars have used political ecology in studying different problems of waste in different countries, such as Cornea et al. (2017) who used political ecology to study the urban political ecology of solid waste in West Bengal and investigated the issues in the implementation of segregation at the source project.

Again the relationship between consumption pattern and waste generation has been established through political ecology (Pearson, 2010) and the political ecology of food waste has been studied by Gascon (2018). These studies have delineated the hidden power structure in the waste management process.

3.5.Actor-network theory

For actor-network theory, world is a network (Law, 1992). In this network, humans, objects, ideas, and concepts are networked. These are viewed as actors and the theory searches for the network among all these actors (Latour, 2005). Thus, not only humans but also nonhumans and objects are included in the analysis. The kind of network they create results in some sort of power and inequality in society (Law, 1992). According to Latour (1996), society can only be explained in the form of network, not through system, structure, categories, or layers. The network refers to the movement of things or actors. Latour focused on the movement of actors and the way movement is recorded in ANT. The society and nature distinction is superseded in network theory. Every actor in the network, their characteristics, distribution of properties, connections, and circulation of such connections are subject to the theory. The theory studies the relational aspects of the phenomena. Here the reality becomes a reality, only when there is the interaction among actors and the interplay among them goes on (Cordella & Saikh, 2006). Likewise, all types of waste are not external to individual actors, rather, waste is associated and networked with them. This can be explained with a simple example of the waste management of a city, where all are actors including the waste objects that are continuously shaping the lives of each other.

The relational dimension of the waste can be studied with it. Thus, in waste issues, there can be an in-depth study on the properties of the relationship between waste and people and how this relationship becomes very dynamic and evolving. It is not simply the effect of waste on people or the effect of humans on waste but more than that. Multiple studies that used ANT in their

analysis of waste issues are Gille (2010) who used ANT to analyse the interface between waste and society, Lepawsky and Mather (2011), who applied ANT to study electronic waste issues in Bangladesh and Canada. Wastewater issues in the UK were studied by Bowler (1999), and ANT has also been used in the case study of waste management on university campuses (Fazardo & Gonzalez, 2014).

The concept of human versus nature is flawed because we are part of nature. Humans and nature can be differentiated on the basis of the capacity of humans to change their environment and no other species is capable of doing the same. Humans are capable of changing nature. This is purely anthropocentric but the only difference is how it can be used. It looks more into how the actors are connected, disconnected, and reconnected in society. This theory has more potential to offer how and why the interconnections are established and such associations are transformed continuously over time (Latour, 2005). If we take some temporal data on the quantity of waste generated in a state, the theory is capable of explaining the reasons for such an increase in waste quantity other than simple socio-demographic factors, increased population, and growth of urbanisation. And yet, if the governing body is not doing enough to deal with such issues, then it is due to a lack of availability of material benefits and power. The emerging new startups related to waste such as recycling and segregation are more interested in serving the state just because there is an availability of power and material benefit in that process. The inequality evident in the society in the waste management process is explained not as the impact of the structure or system but rather as the impact of the networks. If the network is big, there is gain, if the network is small, there is loss. The type of network determines the social aspect of waste. The networks play a big role in shaping waste-related issues in society. In the waste management process, the most powerful group is the one that knows, and that knowledge is very much linked with already established scientists who are part of the big networks. The whole discourse revolves around the claim of these groups related to science and knowledge

and here the actors with the limited network have a little role to play. The actors are rational and they work consistently to maximise their benefits which may result in inequality.

3.6.An overview of the linkage between political ecology and ANT and their application in understanding waste

The theory of political ecology emerged in the discipline of Geography and the ANT emerged in the discipline of science and technology, but both the theories can be harmonised in social science perspective in the study of waste. Scholars have identified the linkage and similarities between the two theories. Holifield (2009) posited ANT as an alternative to political ecology. Political ecology and ANT emerged in the 1970s and 1980s respectively and both have an amazing application in waste studies. For political ecology, the human-nature relationship is viewed as if humans and nature are different conceptually but have a dialectical relationship, and, on the other hand, in ANT, relationships between humans are mediated by non-human entities or nature. Likewise, the relationship between humans and waste is dialectical, and waste and waste management determine the relationship between the stakeholders of the society. In political ecology, the forces of social-ecological change are understood as environmental problems associated with political interest. However in ANT, the interaction between the actors and object and their movement in the network act as the forces of social-ecological changes. That being the case, while studying waste-related issues, the existence of interaction between the waste and humans and the movement of both the actors shaped by that interaction is acknowledged.

In political ecology, those who are benefited and those who lost in the due course of the environmental problems are undertaken as the units of analysis. In ANT, actors, humans, nonhumans, and networks are all undertaken as units of analysis. Similarly in waste studies, not only the actors who gained and lost from mismanagement of waste are studied but all kinds of networks can be studied between waste, government bodies and the public. The interconnection

between actors and networks and existing political relationships in the waste management process are dismantled by using both theories. Scholars of political ecology have already exhibited the possible linkage between political ecology with ANT in their studies such as Swyngedouw's concept of the hydro-social cycle (2004), Robbin's American lawn culture (2007), Sarah Whatmore's hybrid analysis (1999) and (2002).

Both theories provide an integrative explanation of the local and global. For example, this linkage between all the actors will help in explaining the types and causes of waste-related problems like poor segregation practices, and unsafe disposal of the waste in a local context that will have an impact on the entire state as also at the global level. As the theories aim at finding out the causes of the issue rather than the basic characteristics of the issue, not only the basic nature of the waste issues like related environmental impacts, and socio-demographic linkages but also the inherent structural inequalities and power relations causing such impacts will be revealed.

In political ecology, there has been an analysis of the 'assemblages' of both humans and nonhumans which make the world. It accepts the fact that both man and nature have a close relationship and they both affect each other (Murdoch, 1997). Similarly in ANT, both the human and nonhuman entities are taken together to study the network between them. Waste though seems politically neutral or *apolitical*, can be explained in a political-ecological way, where the engagement of multiple stakeholders who have manipulated the process of waste generation, disposal, and management, can be unearthed. The hidden economic and political benefits and the political dimension of waste issues across all the spaces of the world can be revealed.

To understand every issue, researchers need a chain of explanations, not a single explanation. Social phenomena or problems never occur due to a single cause, as multiple stakeholders are included in the process, it is essential to identify the stakeholders and their roles and relationship with the other existing stakeholders. Waste issues in a city cannot be dealt with by changing

government bodies and their policies, rather other causes of illegal dumping and people's lack of concern for the environment, poor implementation of the waste management laws need to be unraveled. Political ecology and ANT propose the existence of multiple actors, stakeholders, and processes in every kind of complex social problem. All kinds of issues associated with waste do not simply originate due to the particular pattern in the behaviour of the people. It also results from poor implementation of waste management rules, poor handling of waste by private entities who try to sort and recycle it. The policies associated with waste to make the city clean can be analysed better with the help of these theories. For example, Swachh Bharat Abhiyan and various local government policies are implemented but in that implementation process, in the delivery of waste-related services, the power structure is involved. Also at the national and international level, multiple actors shape the flow of waste and its management. This can be uncovered with adequate analysis of the linkages.

3.7.Conclusion

To study the nature and culture divide, often there is the need to integrate all the disciplines of social science and reduce their epistemological and institutional gap. To understand this nature and culture dichotomy, a continuous interaction must exist between them to study the human-environment relationship. Such kind of interaction requires paradigmatic changes in scientific practice at the epistemological, methodological, and institutional levels (Little, 2006). As propounded by Barnes and Bloor (1982), to get a complete picture of reality, we need to have "epistemological symmetry" and only then can we understand the cause of a particular phenomenon that is emerging from both the natural and the social worlds. Thus, all the disciplines need each other's help to expand their analysis. For example, while researching air pollution, the human element or anthropogenic forces in the analysis can be incorporated. To do so, the social science researcher can add the main biophysical forces like the geological features of an area, the biological evolution of the flora and fauna, and the air quality index

along with the human factors, such as the transportation and communication system, household activities, industrial air emission discharged in the environment. Besides looking at both the causes, the researcher also needs to identify the 'socio-environmental realities emerging from the interactions between the biophysical and the social worlds' (Barnes & Bloor, 1982). With a transdisciplinary approach, waste and waste management can be explained better.

Political ecology already has a multidisciplinary approach as it has included concepts, methods, and disciplines like anthropology, human ecology, geography, medicine, political economy, botany, and history. Both the theories of political ecology and ANT highlight the ongoing conflicts on waste problems, and the involved socio-environmental actors, revealing oft-ignored connections and relations of power. In the field of waste and waste management, there is not much work on the political-economic aspect, and the power structure appropriated by a few groups through the waste management process. Globally such investigations are scanty and no specific interventions have been adopted by any country to deal with the challenges posed by waste management. If the understanding of the aforesaid issues will be made public through established research with a definite integrative theoretical approach, some positive changes can be made by the governing bodies. This, in turn, can be appropriated by the social science researchers and help them question existing public policies and propose a new form of action and public policies to bring change in waste management. Such an opportunity to work together must be seized by all the disciplines, where they can act together and tackle real-world problems like a waste. This engagement requires both the scientific institutions and societal actors to acknowledge and promote such transdisciplinary research approaches. The problem lies in the lack of communication, political will, and scientific and governance structures. If such transformative and collaborative research endeavours are not fostered, then the sustainability problems cannot be resolved (Brandt et al., 2013). The scientific and governance structures need to be such that they can adapt to the rapid socio-ecological changes. The theories of

political ecology and ANT seem to corroborate and extend each other on the aspects of analysing the power structure in waste issues, in exploring the changing relationship between waste and people in the globalised world. They tend to transcend the dualism between subject and object, or nature and society.

Chapter 4

Socio-demographic factors

4.1. Introduction

Urban spaces face enumerable environmental, health, and social problems due to the high volume of waste generated daily by the citizens. Though population growth, modern lifestyle, urbanization, and growth of consumerism have impacted this increasing volume of waste, there are speculations about the social and demographic features of the households which may impact the level and amount of municipal solid waste generated. This makes it essential to understand the impact of socio-demographic features of households on the nature and volume of waste generated so that adequate steps can be taken to reduce the high level of waste generation in the city.

The primary cause of the waste problem today is waste generation which is more vital than waste disposal. Hence a better understanding of waste generation can help formulate better policies. The variables affecting waste generation and demography influencing waste generation must be understood first. This again makes it essential to study public behavior and attitudes that can further help in waste reduction and better waste management (Hockett et al., 1995). When we come to demography, we come to people who play an essential role in the generation, separation, storage, collection, recycling, and disposal of waste in the entire waste management process of the cities (Babaei et al., 2015). People dump waste due to unavailability of dustbins, poor knowledge of recycling and disposal, negative attitudes toward waste disposal, and poor waste collection. For them, it is not their responsibility to manage waste. They regard disposing of waste as a shameful act during the day. The perception of separating waste seems negative, as the segregation activity is considered unclean, messy, and useless (Hammed et al.,

2016). Food habits, living standards, commercial activities, and season impact municipal solid waste's physical and chemical composition. Though certain studies claim that household size, income, and education level are related to waste generation, developing countries lack historical records on waste generation attributes (Kolekar et al., 2016).

Solid waste management has become an emerging issue in all the developing countries, including India. Rapid population growth, urbanization, and industrial growth are believed to be the causes of such issues. These causes have altered the lifestyle and the composition of waste generated in the cities. The nature of municipal solid waste is linked to food habits, cultural traditions, climate, lifestyle, etc. The families' income is the primary determinant of the quality and quantity of waste generated. Scarce land resources this has made it difficult to dispose of the high waste generated in the cities (Grover & Singh, 2014). The same has been affirmed by Birhanu & Berisa (2015), who have mentioned that rapid population growth and urbanization have contributed to the generation of a high amount of solid waste, leading to environmental degradation in developing countries. In the case of India, rapid urbanization and population growth have led to an increase in waste generation (Balasubramanian, 2015). In such a scenario, inadequate waste management policies lead to environmental and health-related problems.

Waste management has evolved as a complex problem as many scientific, technical, economic, and social factors are associated. The waste management process becomes unsuccessful due to a lack of financial resources, institutional weakness, improper selection of technology, transportation systems, and disposal options, and social problems associated with lethargy towards environmental cleanliness and sanitation (Birhanu & Berisa, 2015**).** The components of solid waste management include collection, transportation, and disposal. If we look at the first part, the collection, the average collection coverage in India is 50% to 90% (CPCB) (Balasubramanian, 2018). The local bodies are responsible for providing daily waste collection

services. Only some of the wards in the city get such services regularly. The door-to-door collection is there but in certain wards. BMC workers clean important roads and markets. The reasons for high waste generation in the cities are population growth, migration, and economic growth (Sharholy et al., 2005).

If we think about why we need to be worried about solid waste management, we need to understand that solid waste management impacts all. On the negative side of poor waste management, the vulnerable section loses lives and homes due to the landslides caused due to waste dumps. People working in precarious conditions to pick up the waste also suffer from multiple health impacts. Not to ignore the impact of poor waste management on the environment, the plastic waste generation in the world was 242 million tonnes in 2016, of which 12 percent was municipal solid waste. Plastic waste has a significant portion of the total municipal solid waste generated due to the high-level consumption of plastics. The same year, 1.6 billion tonnes of carbon dioxide–equivalent (CO_2-equivalent) greenhouse gas emissions were generated from solid waste management. It constitutes 5 percent of the total global emissions. It has been estimated that the world may emit 2.6 billion tonnes of CO_2- equivalent by 2050 (Kaza et al., 2018). Not only is there a high level of solid waste generation, but the environment is harmed due to population growth, large households, the age structure of the population, and urbanization. The consumption culture of the citizens in terms of high energy, water use, and waste generation are also causing environmental degradation, change in the landscape, loss of biodiversity, etc (Lakshmana, 2015). If we talk about India, the Government of India has estimated the total quantity of municipal solid waste generation to be 115,000 MT daily, and per capita waste generation varies from 0.2 kg to 0.6 kg per day depending on the population size (GoI, 2009). CPCB reported biodegradable waste to be 52.32 percent and has the highest share. Developing countries like India generate more biodegradable waste that could be recycled (Balasubramanian, 2018). Solid waste no doubt leads to environmental degradation

and adverse economic condition. Insufficient waste collection, poor disposal, and inadequate facilities at the local levels lead to more environmental and health hazards. Also, at the global level, solid waste leads to climate change and all types of pollution (Kaza et al., 2018)

Waste management must be prioritized first as the waste management system and data to manage the changed composition of waste have yet to be developed even if the cities and countries have developed. The current situation makes it essential to have adequate waste management data to have planning and policies accordingly at the local levels. When there is data, the whole scenario can be understood better, like the amount and type of waste generated, and suitable planning methods and systems can be devised to deal with them. This enables the governing bodies to plan the waste management process with an adequate number of vehicles, decide efficient routes, track progress, and create an adaptable waste management process per the changing nature of waste. This also helps in allocating an adequate budget, deciding the use of technologies, and selecting private and non-governmental partners to enable better delivery of services.

The current study excluded those households whose waste mixes with waste generated from commercial use such as shops, markets, salons, schools, clinics, etc., and industrial use. The survey included different parameters such as socio-demographic profiles like caste, gender, income, marital status, religion, etc. and total waste generated, storage facilities, disposal methods, segregation behavior, the practice of littering, awareness about national and state-level cleanliness programs, etc. The study faced the problem of data on waste generation, ward-wise waste generation, average per capita waste generation, the total amount of waste sent for recycling, etc. Even after visiting the Bhubaneswar Municipal Corporation Office multiple times with official approval, data could not be availed. There is the problem of lack of availability of data and the reluctance on the part of the municipal corporation and government to keep records about waste. Accurate data on the quantity of waste generated, the composition

of municipal solid waste, landfill information, and the cost of municipal solid waste management should have been included. Even at all India levels, among the states, no time-series data and panel data are available (Balasubramanian, 2015).

Table 4.1. Wards selected for the study

Sl. No.	Ward	Total households	Total population	Male population	Female population
1	25	3207	13508	7068	6440
2	50	2698	11795	6379	5416
3	63	2979	12241	6458	5783
4	2	2708	13482	7743	5739
5	8	3575	13529	7172	6357
6	1	517	12378	7745	4633
7	4	3476	16185	8183	8002
8	5	3298	13637	7318	6319
9	55	2944	11398	5904	5494
10	38	2912	11916	6118	5798
11	12	3227	13243	7454	5789
12	8	3575	13529	7172	6357
13	35	3422	14130	7436	6694
14	54	2539	13318	7032	6286
15	43	3241	13773	7265	6508
16	48	2767	11369	5855	5514
17	42	3438	13272	6951	6321

18	17	2786	12238	6334	5904
19	8	3575	13529	7172	6357
20	52	2791	10805	5668	5137

Socio-demographic profile of the city

Table 4.2. Socio-demographic Profile

Variable	*Sub-group*	*Frequency*	*Percentage*
Age	15-30	51	26%
	31-44	66	33%
	45-55	47	24%
	Over 55	36	18%
Gender	Male	45	23%
	Female	155	78%
Religion	Hindu	191	96%
	Muslim	8	4%
	Christian	1	1%
Education	Below primary	16	8%
	Primary	16	8%
	Secondary	17	9%
	Matriculate	46	23%
	Intermediate	14	7%
	Graduate and above	59	30%
	Others	3	2%

	Illiterate	29	15%
Social category	General	104	52%
	SEBC	15	8%
	OBC	55	28%
	SC	15	8%
	ST	5	3%
	I do not want to specify	1	1%
	No response	5	3%
Marital status	Married	178	89%
	Unmarried	19	10%
	Separated	0	0%
	Widowed	2	1%
Head of the household	Male	177	89%
	Female	21	11%
	Joint	0	0%
Number of family members	1-5	157	79%
	6-10	33	17%
	11-15	8	4%
	More than 15	1	1%
The primary source of livelihood	Business	40	20%
	Govt. job	53	27%
	NGO	1	1%
	Private job	94	47%
	Others	6	3%

	Unemployed	6	3%
Monthly income	20000 and below	106	53%
	20000-40000	46	23%
	41000-60000	21	11%
	61000-80000	11	6%
	81000-100000	5	3%
	More than 100000	4	2%
	No response	2	1%
	Cannot say	5	3%

Out of the total respondents, 26% belonged to the age group of 15-30 years, 33% belonged to 31-44 years, 24% belonged to 45-55 years, and 18% belonged to over 55 years. 23% of the respondents were male, and 78% were female. 96% of the respondents were Hindu, 4% were Muslim, and 1% were Christian. 8% of the respondents studied below primary, 9% in secondary education, 23% matriculate, 7% intermediate, 30% graduate and above, 15% were illiterate, and 2% studied others. In the social category, 52% were general, 8% were SEBC, 28% were OBC, 8% were SC, and 3% were ST. 1% did not specify their social category, and 3% did not respond.

89% were married, 10% were unmarried, and 1% were divorced. 89% of the households had male heads, and 11% had female heads. 79% had 1-5 family members, 17% had 6-10 members, 4% had 11-15 members, and 1% of the households had more than 15 family members. 27% of the households had govt jobs as the primary source of livelihood, 20% had business, 1% had NGO works, and 47% had private jobs as the primary source of livelihood. 3% were unemployed, and 3% had other livelihood sources. 53% of the households had monthly income of 20000 and below, 23% had 20000-40000, 11% had 41000-60000, 6% had 61000-80000, and

3% had 81000-100000 monthly income. 1% of them made no response, and 3% could not say about monthly income.

4.2.Nature and volume of waste generated

Categories of household waste:

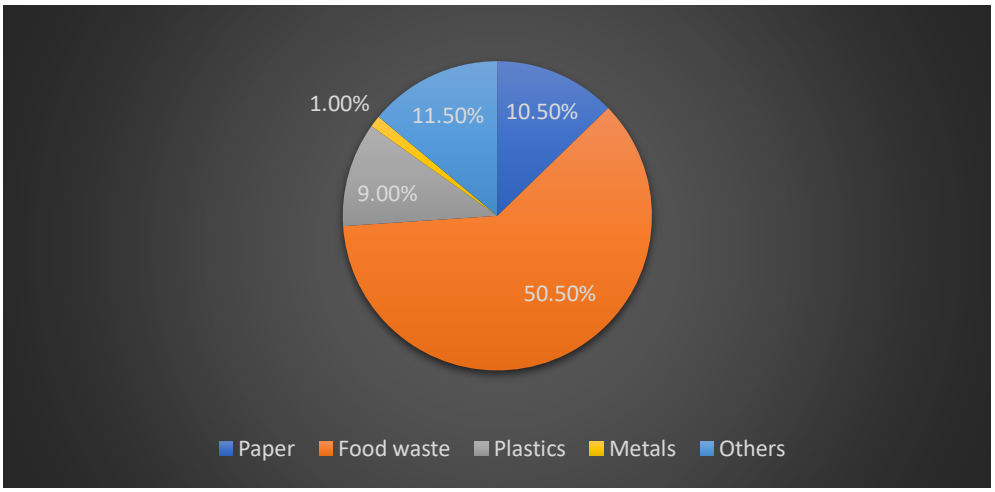
Kitchen waste such as discarded vegetables, food waste, discarded food, seeds, etc

Paper – scraps, packing papers, discarded papers from student bags, etc.

Plastic – plastic articles, polythene, and other items made primarily of plastic.

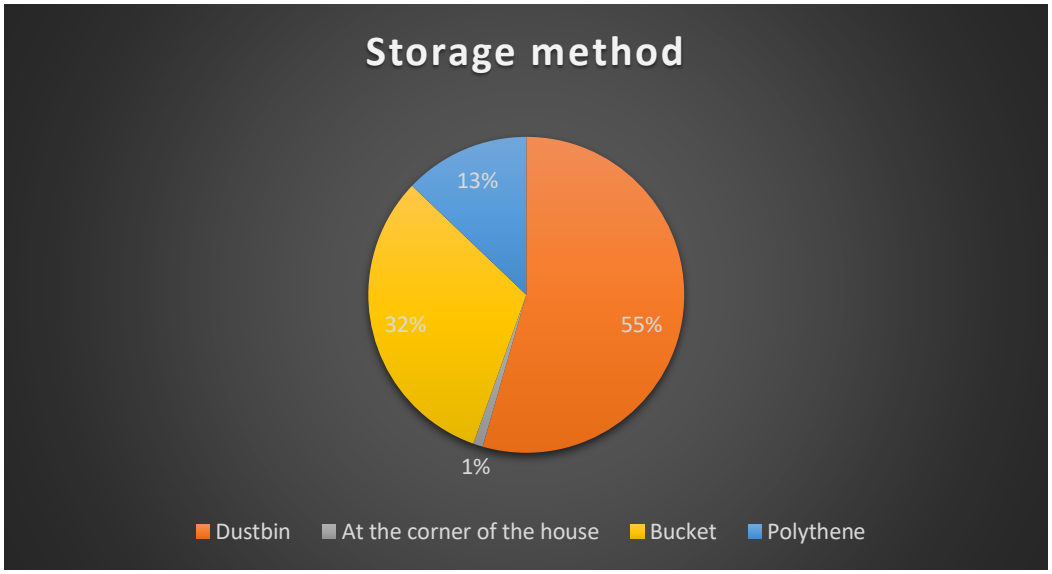
Glass – a scrap of glass, bottles, glass containers, broken kitchen articles made of glass and ceramics, etc.

Figure 4.1. Composition of waste generated



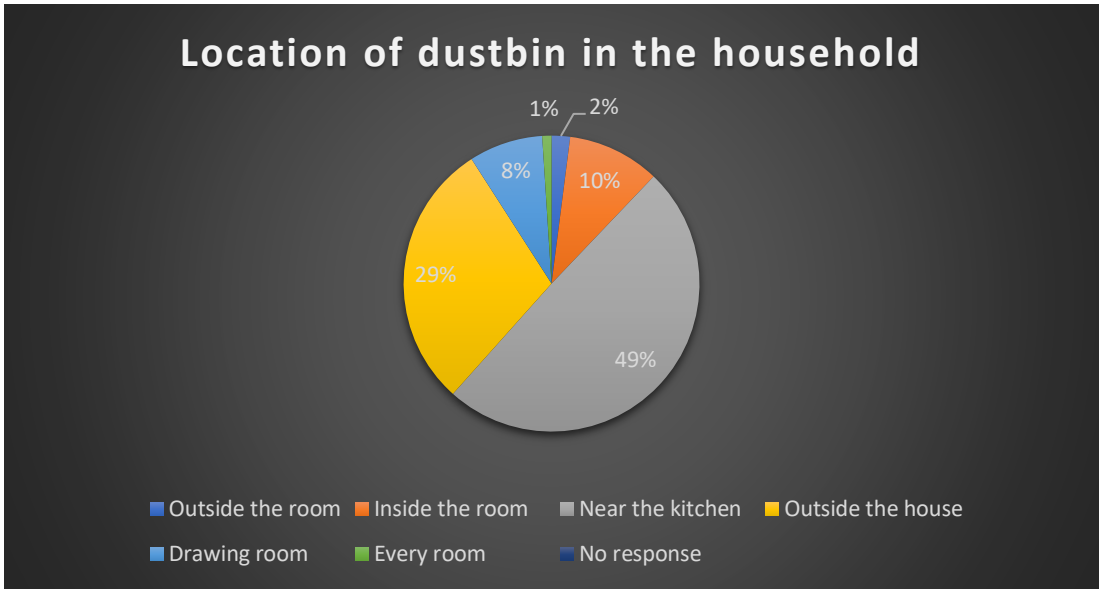
The composition of the municipal solid waste in the city occurred peculiarly, where food waste comprised 50.50 percent, plastics nine percent, paper 10.50 percent, Metals one percent, and mixed 11.50 percent.

Figure 4.2. Type of storage in households



Out of all the respondents, only 55 percent of the households used dustbins, 32 percent used buckets to keep their household waste, thirteen percent used polythene, and one percent did not use any storage to keep their waste inside the household.

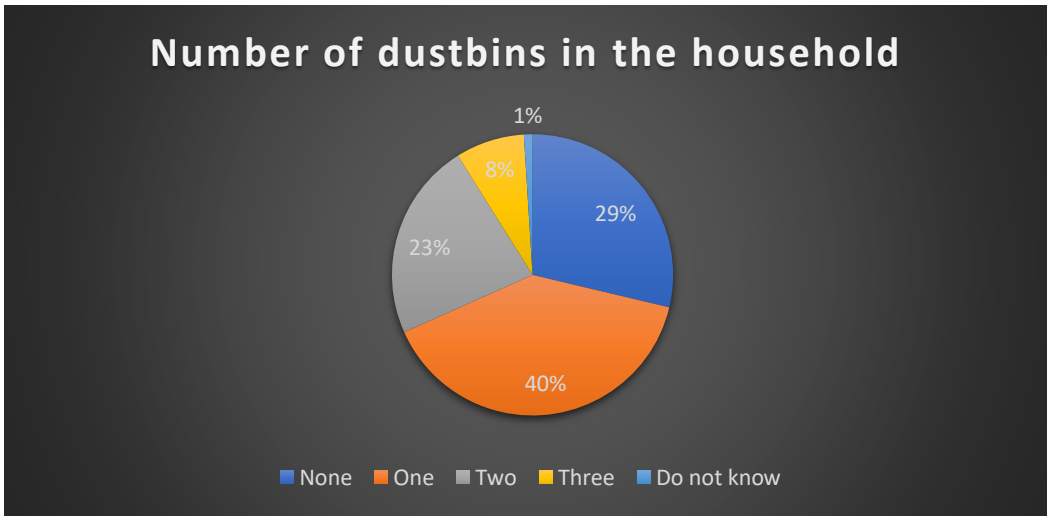
Figure 4.3. Location of dustbins in the household



A majority that is 49 percent of the households kept the waste stored in the kitchen. Twenty-nine percent of the households kept them outside the house, only 10 percent of them kept

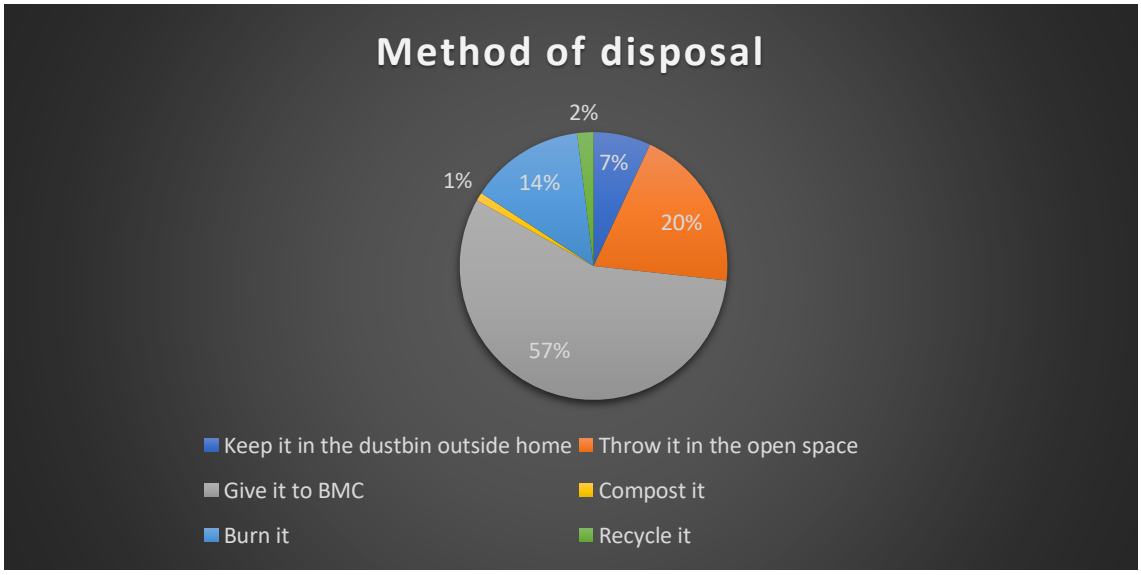
dustbins inside the room, eight percent of the respondents kept them in the drawing room, two percent kept them outside the room, only one percent of the respondents kept the dustbin in every room of the houses and other three percent had no response to this question.

Figure 4.4. Number of dustbins in the household



Most of the respondents had only one dustbin (40%), 29 percent of them had no dustbin, 23 percent of them had two dustbins, eight percent of them had three dustbins, and one percent of the respondents did not know about the number of the dustbins at their houses.

Figure 4. 5. Method of waste disposal in the households:



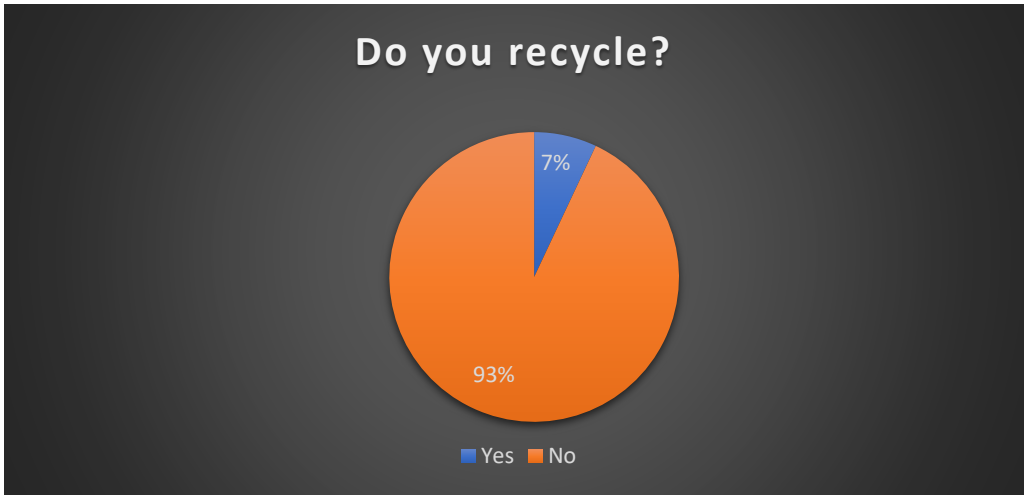
The method of waste disposal varied to a greater extent in the city. Fifty-seven percent of the

city of the respondents gave their waste to BMC, seven percent kept the waste in the dustbin situated outside the home, 20 percent threw waste in the open spaces, one percent composted it, 14 percent burnt their waste, and two percent recycled their waste in order to dispose of it.

Figure 4.6. Activity producing more waste

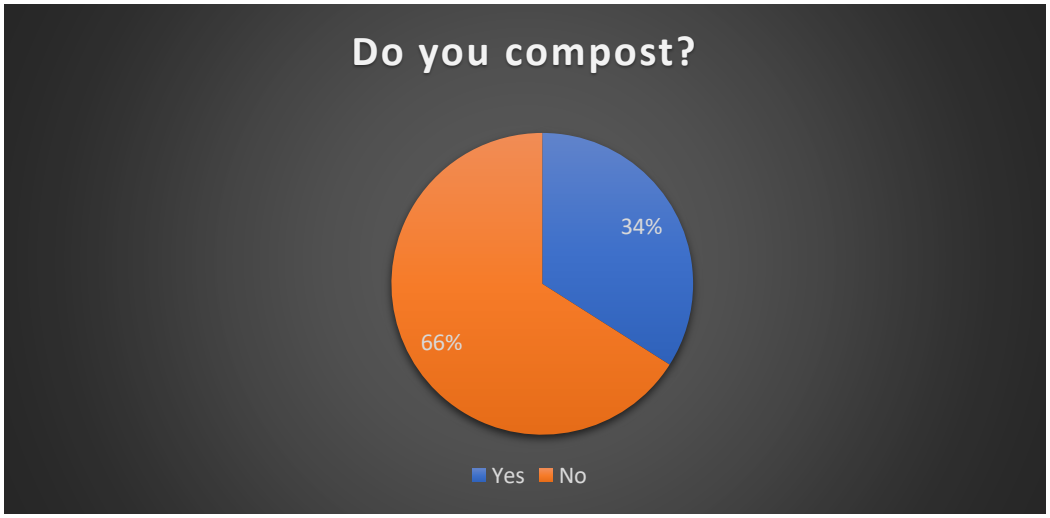
Out of all the daily activities of the city dwellers, cooking activity created the maximum amount of waste in the households for 23 percent of them; cleaning created more amount of waste for 10 percent of the respondents, gardening generated more waste for eight percent of children's play generated more waste, for six percent shopping generated more amount of waste and for one percent, all, of the above activities generated waste equally.

Figure 4.7. Recycling data



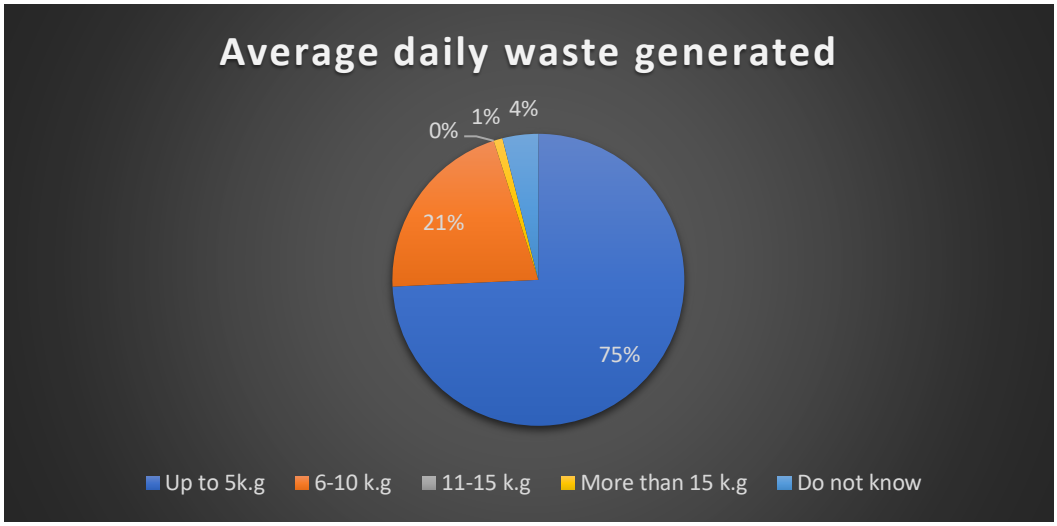
Only seven percent of the respondents recycled their waste, and the rest, 93 percent, did not.

Figure 4.8. Composting data



Out of the total 200 respondents, only 34 percent of them composted the waste, whereas the rest, 66 percent, never composted.

Figure 4.9. Average daily waste generated



When asked about the average amount of waste generated per day by the households, 75 percent of the respondents responded that their average per day waste generation was up to 5 kg. Twenty-one percent of them had 6 to 10 kg average per day waste generation, only one percent of the households had more than 15 kg of average per day waste generation, and the rest four percent of the respondents were unaware of the per day average waste generation of their households.

4.3.The linkage between socio-demographic profile and nature, the volume of waste generated

The above sections show the difference in daily waste generation, segregation, composition of waste generated, storage method, and disposal method. Such variabilities in waste management practices have emerged because of the different socio-demographic backgrounds of the respondents. For example, the storage method of the households denotes the economic condition and ability and willingness to use dustbins to store waste. When 32 percent of the respondents used buckets, thirteen percent used polythene, and one percent did not use any

storage to keep their waste inside the household, their monthly income was comparatively lower than those 55 percent of the population who used dustbins to store waste.

To quote Smita 37 years woman,

'We do not have dustbins to store different types of waste. We generate very little waste. Hence, we do not use dustbins but rather use polythenes'.

The location of the dustbins or waste storage in the household tells a lot about the individuals' waste disposal and littering practices. Forty-nine percent of the households kept the waste stored in the kitchen. As 78 percent of the respondents were women, 53% of the respondents answered cooking, and 23 percent that cleaning activities generate more waste. Twenty-nine percent of the households kept them outside the house, and only 10 percent kept dustbins inside the room. This gives the gendered picture of household waste management, where women primarily manage, store, and dispose of waste. All the other members have little role to play.

Forty percent of the respondents used only one dustbin in the household. This expresses the poor waste segregation behavior and willingness to use more than one dustbin in the household. This willingness to use more than one dustbin emerges from the availability and access to resources and sound economic conditions, so they bought and were eager to use more than one dustbin for waste, which all other households conventionally ignore.

Now, coming to waste disposal, Fifty-seven percent of the respondents gave their waste to BMC, seven percent kept it in the dustbin outside the home, 20 percent threw it in the open spaces, one percent composted it, and 14 percent burnt their waste. If the local governing body provided waste collection services to all the city's areas, why has such a discrepancy emerged in waste disposal in the city?

Only seven percent of the respondents recycled their waste, and 34 percent composted it. Few respondents composted kitchen waste for the plants. They could not afford to raise plants and compost waste because of low economic conditions, lower income, and small living space. The

respondents could not afford better housing and did not think about composting and recycling. To quote Santosh, 47 years old,

'I have nine members in my family, and we all live in two rooms in the rented house. We do not have access to more spaces and better homes, so how can we consider raising plants and compost waste for them? Hence, we give all our waste to BMC waste collectors, and if they do not come to collect it, we throw it away.

In the current study, there is a linkage between the socio-demographic features of the households and the nature and volume of waste generated. The linkage is not uniform and is subject to various social, economic, and political factors that make these linkages vary across time and space. The empirical findings connect with the high-level social processes in the city. While going beyond the socio-demographic profile, it has been found that the people's actions are involved in the grand social processes that not only result in the conflict and inequality between various social groups but also refer to the engagement of different actors in the waste generation and management process.

There have been enormous studies on how the socio-demographic profile of the people has impacted overall waste generation. On waste generation, age, gender, type of family head, occupation, education, and the number of family members had an impact, but income showed a more significant effect than other factors (Rame et al., 2022**).** Another study that established the linkage was based on the confirmation that people who are elder, educated, and with high income tend to be engaged more in waste management at the household level and joined in various campaigns related to this and vice versa. Hence when people are made aware of recycling and waste management, they engage more in such activities. Educating people about waste management will help build positive attitudes among people and contribute better to the waste management process (Afroz et al., 2016).

Further, Ramachandra et al. (2018) found that socio-economic factors such as household size,

income, employment status, and education status impact the quantity of waste generated and the management of the generated waste. Again, education and employment status are related more to the food habit pattern, consumption pattern, and the type of waste to be generated. Sujauddin et al. (2008) viewed that not exactly income but the family size and high education were strongly related to waste generation. As per the study by Kaza et al. (2018), waste generation and income level are linked. Higher-income leads to higher waste generation and vice versa.

Similarly, Hameed et al. (2016) established that age is associated with the time of disposal, frequency of disposal, reuse, recycling behavior, and attitude toward waste disposal. The level of education is also linked with storage practices. The type of occupation and marital status were linked to the frequency of waste disposal, but no relationship between sex and waste management practices was found. Most importantly, the economic factor is related to household solid waste management because, with a high-income level, people have better access to suitable housing and better facilities for waste management, like regular collection and disposal. The study found no significant and proper solid waste management practices across the households, which required the households to be included in the waste management at the planning level so that all the plans could be implemented properly (Mukui, 2013).

Now talking about gender, it has no linkage with the level of knowledge on waste management. Instead, it is the age that has the linkage. Older people have more knowledge of such issues, and their behavior is positive. Income has a more significant impact on the knowledge of waste problems and attitudes. So, when people have more income and education, they automatically gain more knowledge on waste management (Seng et al., 2018). As per the study of Ali et al. (2013), the knowledge regarding waste management varied across age and gender categories as older adults were more knowledgeable than younger ones, and so also females than males. This knowledge level about waste minimization was more among professional occupational groups

than among the laborer workers. The married status also correlated with the degree of knowledge, as single parents showed more knowledge than married couples (Ali et al., 2013). The factors associated with waste generation are surface area, homeownership, income, building type, and education. The study found that people with low education and low income sort their waste more than those with high-income and highly educated people (Zakianis & Djaja, 2017)**.**

Studies have found no necessary linkage between the socio-demographic feature of the population and waste generation. The study found a poor correlation between age, education, gender, and occupation with waste generation (Babaei et al., 2015). The study by Rybová & Slavik (2016) supported this argument, finding that the average household size and average waste production per person decreased daily. The waste production rate is not that different across different age groups. However, waste production is more to do with average household size, percentage of people with tertiary education, and sex ratio. It is not that gender and age and any other socio-demographic variable are related to waste generation, awareness, and involvement in waste prevention; instead, it is more about the personal experience of people that had a more significant impact on awareness and engagement to prevent waste (Smith, 2018).

4.4. Discussion

The composition of municipal solid waste is more dependent on the cultural habits of people, the economic condition of the residents, the urban structure, the density of the population, the climate, and the extent of commercial activities (Singh & Grover, 2014). It is again essential to understand the composition of MSW that will facilitate the selection of equipment, and facilities for processing waste, figuring out energy and resource recovery, and designing waste disposal. In the entire municipal solid waste management process, household waste and its physical components play an essential role. This needs to be researched well. In Bhubaneswar, there is

a high level of organic components in municipal solid waste, which needs to be collected regularly and composted. The magnitude of household waste issues differs across cities, even with the same income levels. The generation of food, paper, plastic, metal, and glass waste goes up due to the increasing income of households.

In contrast, the generation of polythene reduces due to increased income (Singh & Grover, 2014). High solid waste generation is linked to high consumption, production, and improper disposal. As the living standard in low-income countries improves, this leads to more per capita consumption of goods and a high level of waste generation (Pebley, 1998). Not population size but population density and high GDP is related to a high level of waste generation (Monzambe et al. (2019).

The primary factor for inadequate household waste management was dependent on the head of the household, his education, perception of living conditions, the performance of the institution involved in waste management, engagement with organizations and having such social networks, using IT (Information technology), internet, the housing conditions. This affects the behavior of the households in waste management a lot. There is also the need to be more awareness about protecting the environment and recycling; ultimately, education plays a significant role here. The household members should know enough about waste management, handling waste, and efforts to reduce waste generation and its impact on the environment and health. If the socio-economic class of the households is high and better, then there is more effort to reduce waste and handle waste in a better way. People belonging to the lower economic class and their behavior towards waste management, including generation and segregation, are determined using the internet, membership in an environmentalist organization, level of education of the head of the household, and homeownership. This makes it clear that there should be more investment in the social infrastructure of the cities with more priority on education among the masses, affordable housing policies, and providing internet access to

people belonging to the marginalized and poor socio-economic class. This can change people's attitudes toward waste management, like recycling, segregating, and disposing of waste properly (Padilla &Trujillo, 2017). There is a linkage between a country's infrastructure and its waste-related issues. The better the economic and social infrastructure, the better the waste management works.

The socio-demographic factors influence the waste generation pattern in urban areas and mould the power relations between the various human groups, which further influence the relationship between humans and their environment (Paulson et al., 2003). When this relationship is understood, it will be easy to change the existing knowledge of the environmental problems in urban areas. A new approach can be undertaken to manage those socio-environmental issues in urban areas. The environmental issues need to be researched in different contexts and scales using different methodologies to discover the existing relationships, differences, and power structures that will help understand the connection among the different factors. Those connections are not linear but are multidirectional and dialectical (Paulson et al., 2003).

In Bhubaneswar, socio-demographic factors such as income level and gender influenced waste generation, disposal, segregation, recycling and composting behaviour of the city dwellers giving waste issues a class and gender dimension. As the impact varied from locality to locality in the city, it is difficult to determine the intensity of the impact in the city.

4. 5. Conclusion

Generation and management of waste are more dependent on people and their behavior which is influenced by multiple social factors. Those behavior need to be shaped by adding more to that list of social factors. The households need to know about managing waste in the household, like separating waste, having environmental concerns, etc. People should be given waste management counseling. Community-based solid waste management should be practiced in every municipality, and collaboration between government and international organizations is

required to boost such efforts. It will, in turn, reduce environmental pollution and adverse health outcomes due to waste (Sujauddin et al., 2008).

Households play an essential role in sustainable waste management. People's behavior toward waste management is complex, requiring social science researchers to understand that and formulate policies to change the behavior. Campaigns need to sensitize people about managing waste properly at the household level. Solid waste minimization can be increased through various strategies; i) Public education to enhance environmental awareness; ii) Promotion of waste minimization (4Rs) at the source of generation; iii) Separation of Waste at the Source of Generation (Ali et al., 2017).

The waste generated by society should be considered a resource as it has multiple potentials inherent in it. Hence waste management should be more based on the ideas of sustainable development. There should be adequate solid waste management facilities, infrastructure, protected landscapes, high-value ecological sites in urban areas, and multiple advanced technologies to solve waste management issues locally because issues vary as per the density of population, income, and locations**.** Waste management is required to be environmentally sound, and the focus should be more on the characteristics of waste, the efficiency of waste collection from source, necessary processing systems, established emission standards for waste management facilities, and active participation of the community members (Ramachandra et al., 2018).

Understanding impact of socio-demographic profile of the respondents on household waste management behaviour paves the way for more research in the areas of waste segregation, littering and policy impact on household littering in the city. Waste is a mirror to humanity, and it exactly exhibits the impact of climate change and other impacts on geological formations. Humans can never control the result of their actions in waste, even if there is more belief in the anthropocentric ideas to control and impose power on waste and its management. Humans

should not assume they can easily manage waste issues as they are complex and vary across time and space. If we consider wasting a human by-product that needs to be managed rationally, waste is not simply a non-human being but more than that. Multiple social phenomena influence waste. 'At one scale, our most intimate waste is not ours alone' (Reno, 2015). However, there can be efforts to understand and manage the waste issue by understanding its essence, nature, and factors.

Chapter 5

Waste Segregation and Social and Environmental Outcomes

5.1.Introduction

Cities are the lifelines of every country. In these cities, all the economic and developmental activities go on. A certain amount of waste is generated from all these human activities centered in the city. Over the years, the amount of waste generated by the cities has increased, which has become a subject of concern for the state and local authorities. Solid waste is a significant issue in the cities. The management of municipal solid waste has yet to be satisfactory. The management of municipal solid waste is the biggest challenge faced by communities worldwide (Subramani et al., 2014). Due to the increased amount of waste in the city, public health and lives have suffered. The high volume of solid waste generation is associated with multiple environmental and health problems. India, a developing country, faces enormous challenges in solving the issue of solid waste management in the city and the environmental and health problems caused by it.

Ove time, population growth and rapid economic development have made municipal solid waste management problems this big (Poletto et al., 2016). Further, the increasing rate of solid waste generation is associated with technological development and changes in the lifestyle of people in modern times. The increasing population and purchasing power lead to a high level of solid waste generation (Maskey, 2018). With economic development, the purchasing power of people has improved a lot, enabling them to consume more and, in the process, generate more waste.

In urban areas, households generate more waste, and the families' size and income directly

impact the consumption pattern and quantity of waste produced by the households (Shivakumar & Sugirtharan, 2010). Studying the social and demographic features of the households and their relationship with waste handling practices is required to manage municipal solid waste effectively. It will give insight into the areas which need change. Adopting the needed initiatives allows the high amount of household solid waste to be handled and treated correctly. It requires a change in the current municipal solid waste management system in urban areas (Poletto et al., 2016). This renewal in the approach should be done after adequate findings from the waste management studies of the households.

The economic growth of a country simultaneously leads to a high volume of waste generation. Hence, managing waste properly to reduce environmental risks is essential. The management process involves segregation, handling, transportation, and waste disposal. Lack of segregation and unscientific dumping lead to groundwater pollution and global warming in the long run. Segregation is essential to raise the economic value of waste (Mahesh & Rajesh, 2019). The country's economic growth should continue, but steps should be taken to manage the high amount of waste produced. When waste is treated, reused, and recycled, the economic value will undoubtedly increase, and waste will no longer be viewed as a problem. Waste will emerge as a resource, and it is essential to segregate waste at the source to make waste a resource.

Being a developing country, India has an inadequate waste infrastructure, and the practice of waste dumping is rampant. In such a situation, India must make its waste management sustainable and economically viable. India needs more investment in waste-to-energy facilities and engineered landfills which could ensure more resource extraction from waste and safe disposal of the residues. India faces challenges related to waste policy, waste technology, and the availability of appropriately trained people in the waste management sector. These factors jointly contribute to poor waste management systems and waste's negative impacts on health and the environment (Kumar et al., 2017). Waste management must be done scientifically with

the help of trained personnel, technology, and waste-related infrastructure.

Developing countries face the problem of waste management, but segregating waste at the source can make the entire solid waste management process economical and sustainable. Waste segregation at the source has many benefits. Waste in India has been divided into dry, wet, and hazardous, and the Solid waste management rule of 2016 has made provision for segregating waste at the source. The generators of the waste have been given the responsibility of segregating. In India, there is a lack of awareness about waste segregation among the masses, and solid waste management laws are not adequately implemented. These altogether lead to inadequate solid waste management.

Along with poverty, population growth, and urbanization, the issues become more complicated (Pandey et al., 2019). The segregation at the source also remains undone. People need to be environmentally sensible and segregate waste before disposing of them. Throwing the waste keeps people from thinking about the consequences of their actions**.** If waste can be segregated at the first source, the households and the local bodies can take the process further and do the rest of the work to manage household solid waste (Nigam et al., 2020). The urgent need to segregate waste at the source can always be addressed for a good and enabling waste management process.

Municipal solid waste constitutes a significant portion of the total city waste produced in India. It has created havoc in the waste management process of urban spaces. The cities now have enormous environmental, health, and social problems due to municipal solid waste. As per the previous research on waste management in urban spaces in India, the lack of waste segregation is a prime cause of concern. It has been an unsustainable and uneconomical practice not to segregate waste at the source. The study explores the waste segregation activities of the householders, the conflicts associated with the city of Bhubaneswar, Odisha, India, and the social and environmental outcomes associated with such behavior. The flow of energy and the

metabolism between human and non-human actors are revealed here. The socio-cultural aspects embedded in waste segregation have been uncovered. Based on theoretical pluralism, the study found that the waste issues of the city can be understood better. However, no significant relationship was found between the socio-demographic profile and the waste segregation behavior of the city dweller.

A B

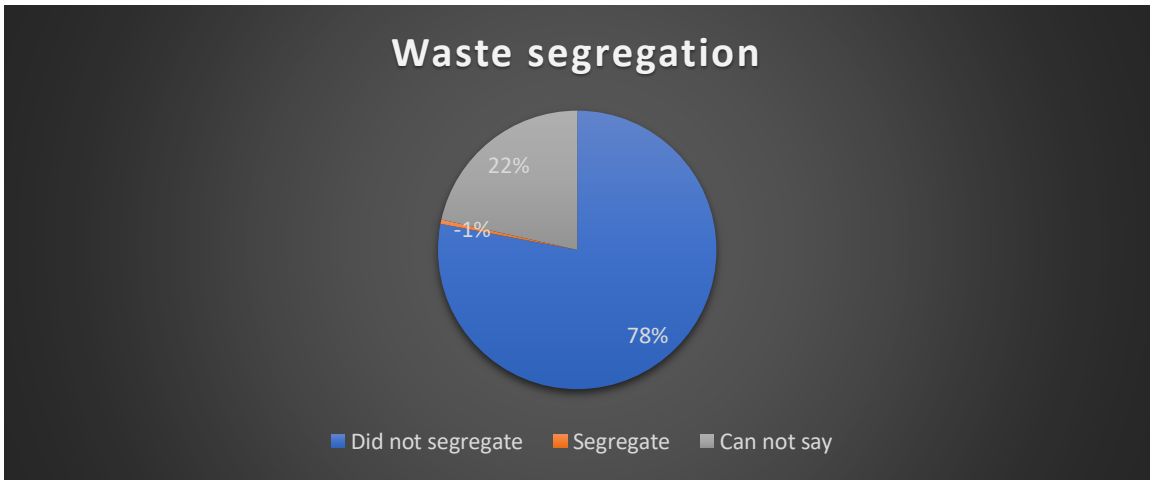
C D

Figure 5.1. (Images showing unsegregated waste problems of the city and services provided by BMC to collect waste. (A) BMC worker carrying waste. (B) Separate dustbins for dry and wet waste in the market building area. (C) *Safei Gadi* collecting both dry and wet waste in Oldtown. (D) An overflowing dustbin in Sri Ram Nagar)

5.2 Waste segregation in the city: A more profound insight

The waste management of the cities revolves around waste segregation by households. The households in the city are rarely involved in the segregation process. The families did not bother segregating waste. They mixed all types of waste and gave it to the waste collector. For example, plastic waste was mixed with food waste; the metals and glass waste were mixed. Most respondents needed to learn about solid waste management and handling waste at the source. Because segregating waste was time and energy-consuming, people never really segregated their waste at the source. Hence, people should know household segregation procedures and the environmental benefits (Shivakumar & Sugirtharan, 2010). It will impact some people who will segregate waste at the source.

Figure 5.2. Waste segregation behavior of the respondents



From the above figure, it is evident that 78% of the respondents did not segregate waste. Only 0.50% of the respondents understood the significance of segregating waste and segregated waste for real. About 21.50% of the respondents did not understand what segregation meant; they lacked awareness about it and could not explain if they were segregated. Very few houses (0.50% of the respondents) had the waste segregation practice due to self-awareness.

Segregation helps reduce the quantity of waste that is discarded. There is an urgent need to

segregate the recyclable waste at the source by the households. Then the segregated waste can go for reusing and recycling. Residents need to be encouraged through awareness programs. The residents must be provided with different dustbins to dispose of segregated waste. The respondents claimed the need for more availability of dustbins in their areas, due to which they are forced to discard waste in the open spaces. If segregated waste is collected, it can be treated well, and if treated and recycled, the quantity of waste generated can be reduced automatically (Das, 2014). Hence there is a relationship between segregation and reduced waste in the city. Better waste management starts at the household level with segregation at the source.

Bhubaneswar Municipal Corporation is responsible for the collection and disposal of waste, but it needs a database on waste management. If waste in the city needs to be managed adequately, there is a need for equipment and receptacles to collect waste from each household. Lack of infrastructure and equipment are the significant challenges in the city. Due to poor infrastructure, and inadequate waste collection, people tend to dispose of waste in an unsustainable way, like throwing waste in the backyard, in open spaces, burning it, dumping it illegally, etc. These issues can be covered by extending coverage of waste collection across all the wards, collecting waste daily, providing receptacles to the residents, and increasing awareness regarding segregation and proper disposal of waste along with the need for waste segregation. Recycling and sustainable waste disposal should be encouraged, and NGO and private actors must be engaged in city waste management (Nyarai et al., 2016). All the waste management practices, such as collection, separation, and disposal methods, must be done correctly. Even today, the residents dump their waste in the open spaces. This disposal method is unscientific and causes environmental problems and other health issues. Local bodies face the problems of low budget, lack of technical facilities, infrastructure, poor enforcement of laws, poor urban planning, and inadequate data on waste (Prakasam & Das, 2016).

The central role of women in waste segregation

It is essential to include households to have an adequate waste management policy. Local government (BMC) has focused on women as the sole responsible agent of household waste segregation. Women not only manage the homes, but they also manage the waste of the family members (Srivastava & Gupta, 2021). Women are crucial in handling the household's waste and can significantly affect waste segregation in the city. In the composition of waste in the city, we found kitchen waste to have the highest proportion. In those households where waste was being segregated, it was found that women were engaged in the waste segregation practice. In an Indian household, it is the women who clean the house, cook, and do the household chores, which is why it is seen as the responsibility of women to segregate waste at the household level. As other family members are not directly responsible for waste handling, they did not involve themselves in waste segregation. However, this implies gender inequality in the city's waste management system. This can be viewed as asymmetrical gender relations in the family leading to social segregation of women (Kreimer, 2004). It adds an extra burden on women and the household chores. There is a gender division of labor in the domestic sphere, where women contribute more to domestic work than men (Baxter, 1992). In a middle-class, educated working family, women are trained to segregate waste and make other household members do the same. This scenario may not apply equally to lower-income and high-income households (Diwakar, 2018). The involvement of women in every household is not a way forward to managing waste systematically. The sexual division of labor is related to the social division of labor, leading to societal occupational stratification (Murgatroyd, 1982). Mies (1981) also established the social origins of the sexual division of labor. Social division of labor and associated hierarchical relations are meant to assign dominant and subordinate positions to men and women (Delphy, 1993).

Housewifization of women's labor (Mies, 2014) in households has further deteriorated the status of women in the households, leading to more inequality.

More women are trained and made aware of segregation at sources through awareness campaigns and training programs. A study by Rakib et al. (2022) claims that encouraging women to segregate waste at the source will indirectly help cities in developing countries reduce the risk of unsegregated and untreated waste. It will positively impact climate change, better waste management, and sustainable development in the long run. However, in reality, this practice has an unjust result on the city's overall development. Targeting women to segregate waste is pointless as this refers to categorizing and approving hierarchy between gender roles. Throughout the study, not a single woman complained about the problem of focusing on gender roles in waste segregation and disposal. It denotes a need for more consciousness among women about equal responsibility for waste disposal. Again, the state has created a gender hierarchy through waste policies and services. Orloff (1996) confirms that states contribute to the social production of gender hierarchies.

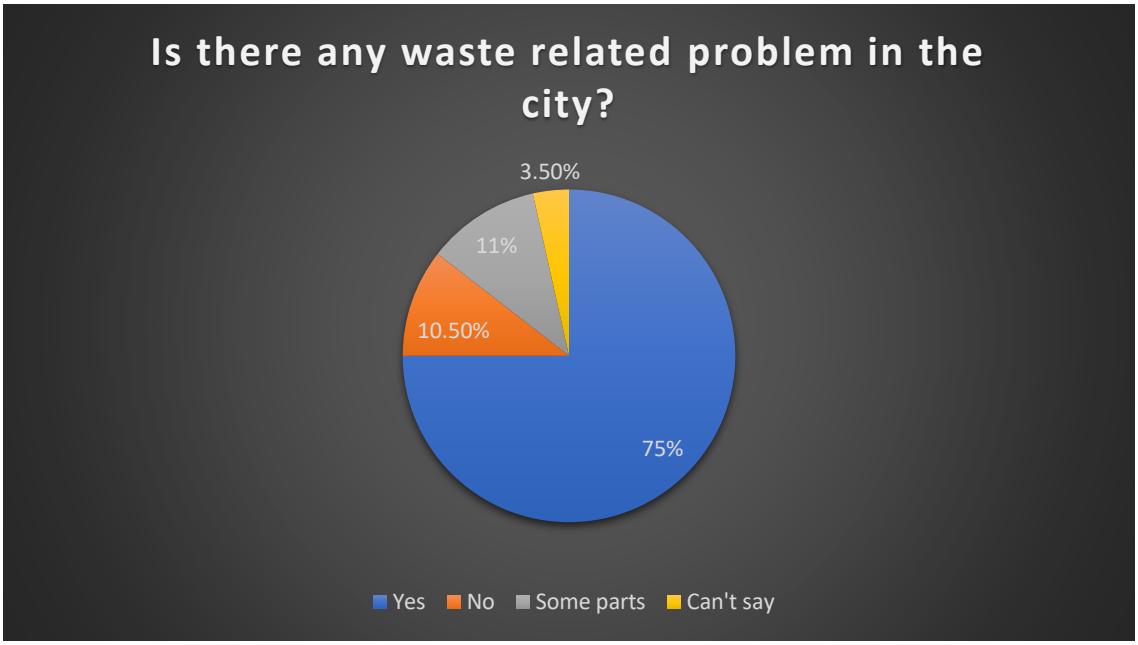
5.3. Environmental and social outcome

Unsegregated waste is associated with multiple impacts on city life. When waste is not segregated, treated, and managed properly, it harms public health and the quality ty of life of people. It leads to air and water pollution and degradation of the resources—all these further cause global warming and climate change in the long run. Improper waste management causes diseases and premature death. When both land and water are polluted with solid wastes used for bathing, irrigation, agriculture, and drinking water, enormous diseases spread, bringing public life to a halt. Respiratory diseases, Plague, Malaria, Dengue, Typhus, and Cholera, are some examples caused by waste (Subramani et al., 2014)**.** Dumping the waste improperly in open spaces and landfills causes contamination of the surface and groundwater supplies. Land resources are also degraded due to this. Too much waste accumulation leads to sewer clogging

and floods the area (Subramani et al., 2014)**.** The open dumping of waste impacts human life, animal and plant life. It generates liquid leachate and contaminates water, harboring disease vectors. It also pollutes land resources and degrades the aesthetic value of the environment (Kumar & Rajesh, 2019).

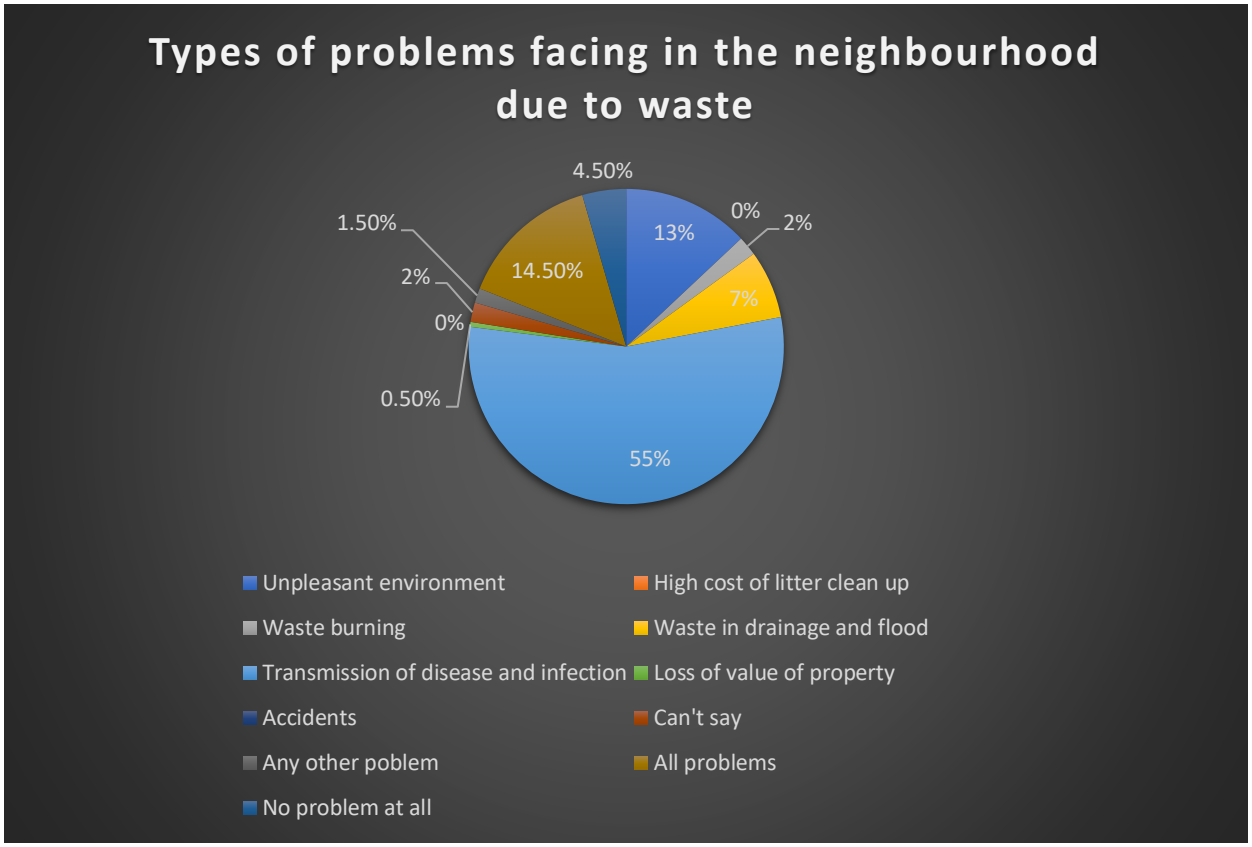
The respondents answered differently when asked if Bhubaneswar City has any waste-related problems.

Figure 5.3. Waste-related problems in the city



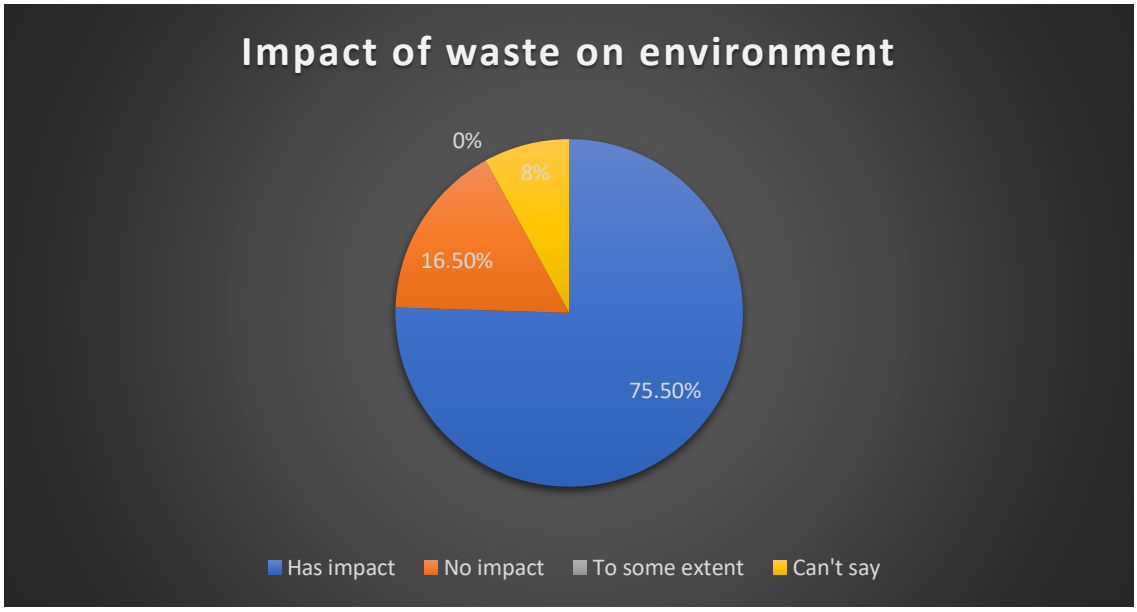
75 percent of the respondents viewed that the city had a waste-related problem, whereas only 10.50 percent of the respondents viewed that the city had no waste-related problem. 11 percent of the respondents viewed that some parts of the city have waste-related issues, but not all parts. Seven percent of the respondents could not answer the question regarding waste issues faced by the city of Bhubaneswar.

Figure 5.4. Problems faced in the neighborhood due to waste



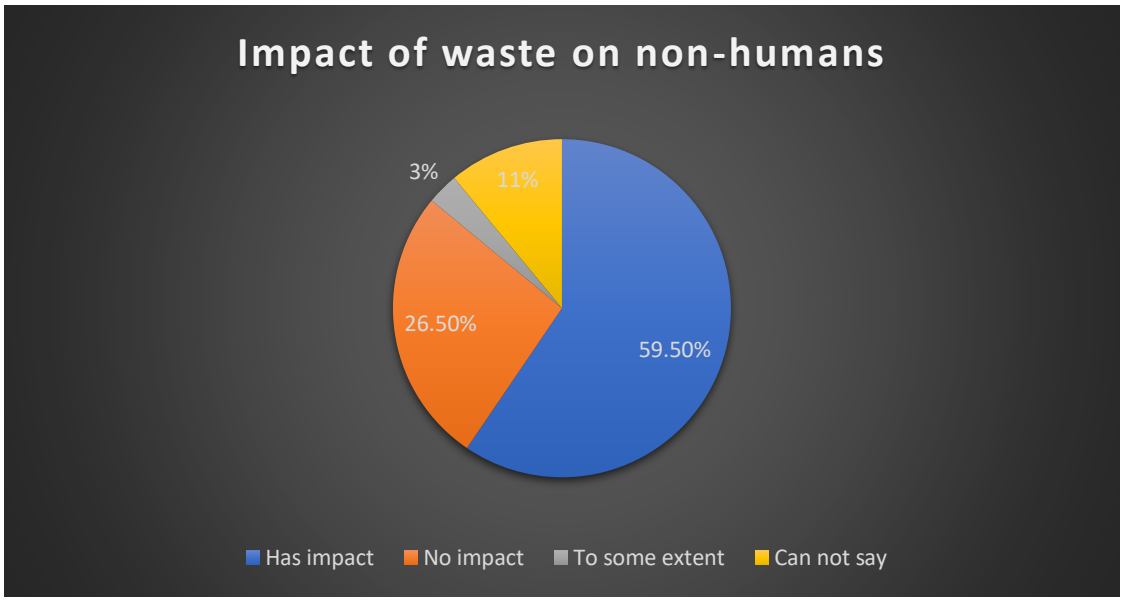
The residents had to face the problem of disease transmission and infection (55%) due to unsafe waste disposal in their neighboring areas. The unpleasant environment was the second most important issue (13%) faced by the respondents. Burning of waste was a problem for two percent of the respondents. Waste in the drainage and flooding due to clogging was a problem for seven percent of the respondents. Two percent of the respondents could not say the problems they faced in their neighborhood. 4.50 percent of the respondents had to face no problems due to waste in their locality. Accidents and high costs of litter cleanup were no problems for the respondents. Loss of property value was a problem for only 0.50 percent of the respondents.14.50 percent of the respondents faced all the above problems due to waste.

Figure 5.5. Impact of Waste on the Environment



75.50 percent of the respondents viewed that waste impacts the environment. 16.50 percent of the respondents viewed waste as having no environmental impact. Eight percent of the respondents could not say if waste is having any impact on the environment or not.

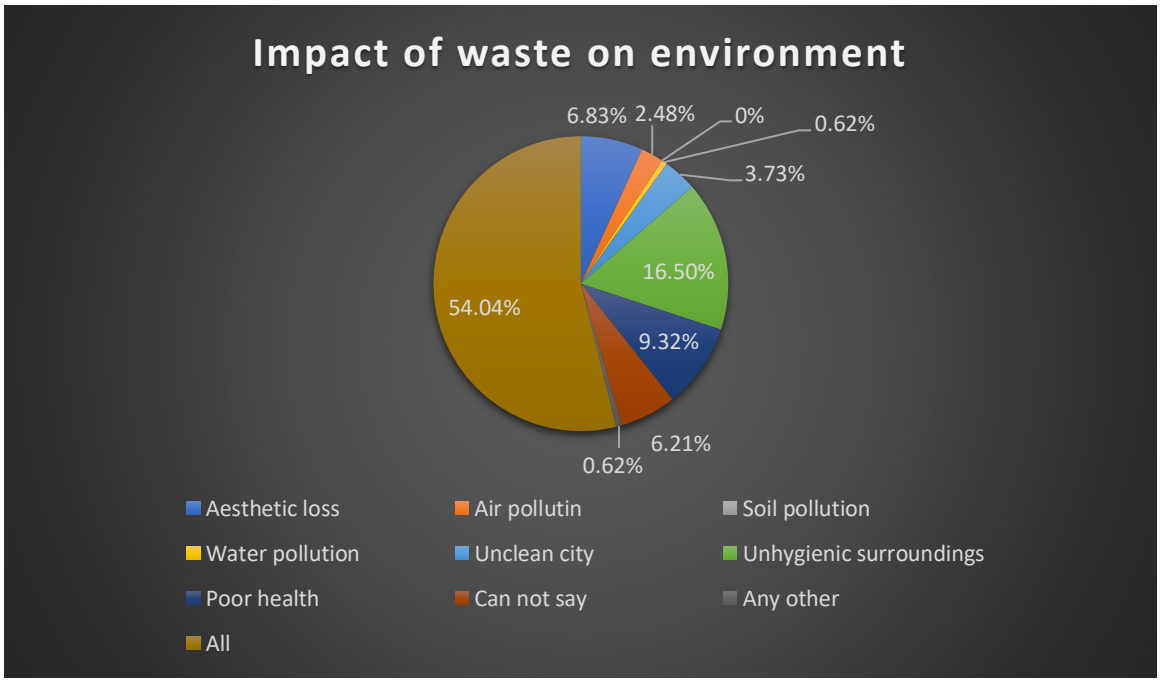
Figure 5.6. Impact of waste on non-humans



When the respondents were asked if the waste has any impact on non-humans like plants,

animals, and others, 59.50 percent said it has an impact, whereas 26.50 percent said it has no impact. Three percent of the respondents opined that waste impacts non-humans to some extent, and 11 percent could not say if it has any impact.

Figure 5.7. Type of environmental issues due to waste



16.15 percent of the respondents said that waste makes the environment unhygienic. 9.32 percent viewed that waste as bad for health. For 6.83 percent of the respondents, waste led to the aesthetic loss of the environment. 2.48 percent viewed that waste caused air pollution, for 3.73 percent of waste caused the city to become unclean. Waste did not cause soil pollution, as per the respondents' views. 0.62 percent of the respondents viewed that waste caused water pollution. 54.04 percent of the respondents responded that waste caused all the above impacts on the environment. Only 6.21 percent of the respondents could not say how much waste impacted the environment. 0.62 percent of the respondents answered another type of impact.

Socio-demographic feature and waste segregation linkage

Table 5.1. Socio-demographic feature and waste segregation linkage

(n=200)

Socio-demographic factors and segregation linkage	Chi-square value	P value
Age group	3.06	0.8 (p>0.05)
Gender	0.30	0.8 (p>0.05)
Education	21.23	0.09 (p.>0.05)
Family size	5.6	0.6 (p>0.05)
Marital status	5.6	0.4 (p>0.05)
Caste	10.9	0.3 (p>0.05)
Religion	4.2	0.3 (p>0.05)

Regarding age and waste segregation correlation, P-value is 0.8, the degree of freedom is 6, and the chi-square value is 3.06. In the gender and waste segregation correlation, the chi-square value is 0.30, the degree of freedom is 3, and the P-value is 0.8. In the education and segregation correlation, the chi-square value is 21.2, the degree of freedom is 14, and the p-value is 0.095; in the family size and segregation correlation, the chi-square value is 5.6, the degree of freedom is 8, and the p-value is 0.6. In marital status and segregation correlation, the chi-square value is 5.6, the degree of freedom is 6, and the p-value is 0.46. In caste and segregation correlation, the chi-square value is 10.9, the degree of freedom is 10, and the p-value is 0.36. In the religion and segregation correlation, the chi-square value is 4.2, the degree of freedom is 4, and the p-

value is 0.36. As the p-value is more significant than 0.05, it shows no significant association between religion, caste, gender, marital status, family size, age group, education of the respondents, and waste segregation behavior.

5. 4. Social perception of waste and waste segregation in the city

The qualitative assessment of the opinion of the city dwellers states that the householders have yet to think about the meaning of waste or what waste means to them. Out of the 200 samples, hardly 20 householders could express what waste means to them. It happened because people never thought deeply about what objects they were discarding, when and how they were discarded, and the impact of such methods.

When the question 'How do you view waste?' was asked, the respondents could not understand it. It was not a matter of language because the interviews were only conducted in the local language—the ignorance and lack of understanding point to waste's hidden meaning and value. Waste is something that no one thinks about anymore. It is not only an unwanted but also an unthought phenomenon. Thinking about waste gives value to waste, and then it is no more waste. Then it becomes useful. If I consider myself an individual researching waste and trying to understand the perception and judgment of people on waste, thinking about waste, and writing about it, then that means waste is not waste for me; its value has multiplied. It is no more an ignored phenomenon or a taboo. Hence because people cannot think about waste, because it is waste and has lost its significance to the people, it even stops appearing in the consciousness and mind of people. So, when the question of waste was asked, 99 percent of the respondents were clueless. They took time to think about it, and even after it; they had no answer. From this, we can understand the importance of "waste" for city dwellers and its role in their lives. Being clueless about an important issue the entire world face speaks volumes about the priorities and concerns of the people. Such perception also denotes a considerable gap in city dwellers' awareness and knowledge.

Of 200 respondents, only a few were able to answer the question about what they meant by waste. Some of the responses are quoted below.

In the words of Swatismita Sahoo,

> *'Waste is unwanted material*.' To answer the question, Smaranika Sahoo replied, *'Waste means which is not of our use anymore, but it is not the same for everyone. For example, all papers are not 'waste'; some people reuse them, and some discard them.'*

Social perception of waste

To obtain better clarity, the respondents were shown several pictures and asked to offer their comments and flag concerns they might have encountered about that particular scenario (Figure 5.8.)

Figure 5.8. A house surrounded by waste.

The respondents felt disgusted after seeing this picture. They quickly expressed dissatisfaction over such a scenario where waste is dumped near the houses. Some even stated the words like "unclean," "unhygienic," etc. All of them were aware of the negative implications of such an environment. They instantly talked about problems they encounter due to such an environment, like many mosquitoes and flies, bad smells, and diseases that these places nurture. Ninety

percent of them stayed in the same environment where they had discarded their waste in their neighborhood instead of giving it to the waste collectors. Still, the responses and comments of the respondents were negative. One of the respondents commented,

> *'Oh my God, such a bad place. It should not be like this. The householders should inform the BMC to clean this place, or they should clean it. Otherwise, it will hurt the health and overall well-being of the residents.'*

Manini Biswal responded,

> *'People should not throw waste near the roadside. It is filthy; if nearby areas of our house are dirty, will we like it? No, we do not like it. We like the clean spaces. The discarded waste must reduce soil fertility, and trees' growth must be hampered. The area looks like a dump yard, and houses near it must have a foul smell as people have thrown their waste there. The city administration should take appropriate action, keep dustbins there, and recycle the recyclable waste.*

Figure 5. 9. Separate dustbins to segregate waste

(Source: www.smartcitiescouncil.com)

In the second picture, there were mixed responses. Even after seeing it clearly, people needed

to be more explicit about the uses of the dustbins. They claimed that they were not provided such dustbins in their areas, and even if provided with the dustbins, they did not need them or did not face any problems due to the lack of dustbins. It indicates the respondents' perception of dustbins, waste segregation, and recycling. Recycling was utterly absent, as none of the respondents reportedly recycled their waste. Only 21.50 percent of the respondents segregated their waste. The rest of the respondents viewed that there was no need for segregation. They found no difference between dry and wet waste and considered their waste to be dry only. It shows the knowledge gap among city dwellers regarding waste segregation. The lack of awareness about segregation at the source is a significant factor for the low level of segregation practices, leading to a low level of recycling and a high level of waste generation. Waste management of the whole city is falling aback due to such poor perception of the city dwellers towards waste and waste segregation.

Some respondents reacted positively to the different dustbins for different types of waste in the pictures. They could recognize the problems in city dwellers' improper use of dustbins. Even with the availability of dustbins, they dumped waste near the dustbin but not in the dustbin. This act of the city dwellers is related to their willingness to keep the environment clean and their perception of the environment and waste.

Sanghamitra Bal replied,

> *'When we put food waste in one dustbin, cows can eat it. In the second dustbin, we can put plastics and even recycle them, which can be used properly. If people can use such dustbins, it will be excellent, and we will not have a significant litter problem around our houses, but dustbins should be provided in our lane. For example, dustbins are available near the city bus stops for dry and wet waste in different dustbins. However, everything depends on people because, in many cases, people do not use dustbins even if they are available.*

Another respondent, D. Sravani, believed that

> *'If we throw our waste in the dustbins in different places, it will be more comfortable. However, the dustbins should have covering lids because stray animals approach open dustbins and unknowingly eat/litter the waste, including the glasses and plastics. Hence it is better to use covered dustbins in my point of view'.*

Figure 5.10. Dog eating from the waste thrown on the roadside

Figure 5.10. puts all the respondents in disgust. They found it nasty and unclean, resulting in a negative response. Few respondents were pleased as they saw the dogs and other animals working as the cleaners of the wastes created by humans. They wanted all the city's dogs to do the same task to reduce the amount of waste which was insane (Figure 5.10.). This idea contradicts animal welfare actions. It is against the value of human-animal coexistence. At the same time, the rest of the respondents were very conscious about the health of the dogs and other animals who could die from consuming polythene, glasses, and other harmful materials. The animals do not have rational minds and cannot differentiate between what is good food for them and what is not. This act of people throwing waste on the road and not segregating them puts the lives of many in danger. Here the city dwellers should take the first step to segregate

their wastes and dispose of them properly or hand them over to the waste collectors appointed by BMC. Some even opined to have separate organizations through the efforts of government, NGOs, and citizens to feed the street dogs, birds, cows, and other animals in search of food. Some of the responses are quoted below. Pritilta Behera says,

> *'I feel bad for the dog, but this situation has arisen because people have littered. It is the fault of the people. That dog will die after eating glasses and other harmful objects. People should not throw waste near the roadside. It is filthy'.*
>
> *'The most important problem created by dogs is the scattering of garbage. In search of food, they scatter everything. They do not know discipline, and they are unaware that the environment and space will be affected badly'*, says Sravani Nayak.

Waste management behavior of the city dwellers

The problem of waste is very dynamic and becoming more and more complex day by day. In the last decade, the nature of the problem was completely different from that of the present day. People have yet to create this large amount and variety of waste before. The waves of urbanization and modernization have no doubt added to the problem. Hence it demands a solution that is unique to time and space. The city is one, but waste handling practices of the households varied considerably across the wards. The city dwellers adopted multiple methods of disposing of the waste. The waste collection services of BMC only reached out to some parts of the city. In such a situation, the households in some wards dump the waste in their backyard. Many burned their waste, composted, and gave it to waste collectors, and many others left it on the road as if they did not know anything about their creation. The time people discard waste, they delink themselves from it.

Inside the houses, it is their waste. However, when the waste comes from the homes, it is not their own. The ownership fades, and the fate of the waste takes it either to the roadside or a dumping yard. The use of a dustbin was rare across the sampled households. However, single

buckets and polythene were used more. It signifies the need for more commitment from city dwellers to handle waste properly at their levels. The lack of dustbins emerged as a significant demand of the respondents. They expect the government to provide them with dustbins in their localities where they can put their waste. The willingness to handle waste carefully, use dustbins, and segregate waste was absent altogether. It is not a matter of time, money, and energy but willingness. Not using a dustbin, not segregating, or handing over household waste to the waste collector have been the habits and practices of the householders, as revealed in the survey.

In many cases, even if the dustbin was available nearby, people hesitated to go near the dustbin to dispose of their waste. It is all about the willingness and perception of the city dwellers about waste. If they can imagine and think about the future negative impact of the waste they have created, they can do all the essential tasks to manage waste effectively at their level. Here culture and socialization come to play a significant role. When city dwellers are sensitized about the proper disposal of waste, they do it all; otherwise, they do not.

Major problems reported during the household survey are as follows:

1. No knowledge of waste segregation.
2. No use of separate dustbins.
3. No use of a dustbin in some households.
4. Improper disposal of waste by throwing it on the roadside or burning it.
5. Recycling and reuse are absent.
6. Composting is only so popular in affluent households.
7. Littering is rampant.
8. Online purchases lead to more waste due to their packaging.
9. Discard lower maintenance items purchased.
10. Fast food delivery leads to the wastage of packages.

11. Use of processed food that comes packaged.
12. Cleaning of the houses done with packaged cleaning products and plastics.
13. Lessening the tendency to donate unwanted items to charities.

The problem of waste is not a subject of deep contemplation on the part of the householders. It shows the false reality that city dwellers have created regarding the waste problem. Their view of waste does not fit the real waste scenario in the city. Even if they agree that Bhubaneswar has a waste problem, they fail to show such behavior, which complies with the increasing waste issues. Instead, the city dwellers put the entire responsibility of cleaning the city and reducing the problem of waste on the shoulders of the government. There can be a solution and way forward if there can be cooperation and support among all the stakeholders. Nothing will be achieved by playing the blame game, and the problem will persist. Joint responsibility and action need to be there.

When city dwellers cannot see the increasing amount of waste as the result of their actions, they cannot picture themselves in the place of the actors who should take steps to reduce the amount of waste. The waste producers must acknowledge and own up to their responsibility and accountability for the deteriorating situation of the city. There is always an error in the description of reality which becomes the basis of the intent and actions of people. These perceptions and judgments shape people's mental state, which in turn influences what people choose to do (Saberwal, 1996). Because of such a widespread perception of waste, the issues are not being addressed, and people continue to generate more waste. Taking part in the throw-away practices hinders the development of the city and the rest of the sections of society, including the weaker and vulnerable ones.

The waste management behavior of the households speaks a lot about the existing hidden aspects of inefficient waste management issues in the city. Despite the imposition of several

rules and guidelines and a regular waste collection system by the civic authorities, burning and dumping waste in the open areas are seen as testimonies to the attitudes and indifference of the city dwellers toward the disposal and management of waste. These behaviors have led to adverse health and environmental impact. The dumping of waste in open areas also clearly shows the inequality prevailing in the city. The dumping sites are often chosen to be on the outskirts of the city where poor people live, such as the slum areas inhabited by people who do not have the voice to speak for their problems (Srinivasan, 2006). It also expresses the discriminatory behavior of high- and middle-income households towards low-income families. The social perception of the city dwellers leads to a distinct culture where high-income households have clean surroundings and poor and low-income households have unclean and dirty surroundings. This sense of inequality is latently passed on to future generations, further aggravating the class conflict linked to waste problems and adversely impacting harmonious living.

Understanding the city dwellers' perception of waste is essential before chalking out any policies and schemes about waste management. The problems will only be fully solved if they consider this. Not all city dwellers understand the need for waste segregation and composting. There is an urgent requirement to campaign about these through government and civil society organizations. There is also a lack of cooperation among the city dwellers because they need to understand the enormity of the problem. Blaming each other for the large volume of waste in the neighborhood has been a common phenomenon in the city. With mutual understanding and knowledge, people will take action to improve their environment. The 'use and throw' practice makes people lose sight of the result of their careless acts, which is a grave concern. As increased consumerism is a personal choice, appropriate civic authorities can adopt measures to persuade and impart knowledge about the harmful impact of mixed and untreated waste on the environment. The government will only fix some things. The government itself consists of

people who should take responsibility for their waste. Waste is a problem for everybody, but the solution can be brought about through continuous and converged efforts of all the stakeholders. Development is inevitable, but there should be no scope for destroying the environment through human activities. Odisha is a developing state in India, and all developing states should be careful about the wasteful practices of the citizens due to the growth of urbanization and consumerism.

Today waste has become a matter of concern in both developing and developed states. Still, by undertaking city-specific research, the problems can be better understood in their respective context and space, and local solutions can be worked out. A one-size-fits-all approach is inapplicable here. The householders of the cities will answer the household waste problems. That requires a deeper insight into the perception of the waste of city dwellers. As city dwellers have viewed waste as something that is not so important and discarded carelessly, the level of destruction and harm it will pose to the future generation is unimaginable—the current situation results from the city dwellers' reckless activities. Still, if waste can be treated more carefully and effectively, urban space can offer better and healthier living conditions. The way city dwellers treat and handle waste needs to be changed. A change in city dwellers' outlook and perception of the waste they generate can bring many positive changes. Waste could become wealthy if appropriately handled, and all the dangers it poses to urban life could eventually vanish quickly.

5.5. Discussion

The study did not find any significant relationship between age, sex, race, education, and waste segregation. Waste segregation is a social practice that comes with accepting individual responsibility. When people acknowledge the need the segregating waste, and it is their responsibility and duty to do so, they do it. People who already practice segregating waste know the benefit of segregating waste and its social, economic, and environmental impact. Those who

never segregate waste do not accept the responsibility of managing and segregating their waste. Instead, they assume waste segregation to be the task of the government and its agencies (Otitoju & Seng, 2014). Segregating waste should not be imposed on individuals; instead, the responsibility should come spontaneously and turn into social practice. From the survey of two hundred households, most never practiced waste segregation; it exhibits a lack of responsibility for the waste generated. Public participation in segregation is also rare. There needs to be more responsibility of the residents towards waste in the community. City's current situation demands a high level of community awareness and changes in people's attitudes towards waste, which is fundamental to developing proper and sustainable waste management systems. (Kumar and Smith et al. 2017). The residents are an integral part of that waste management system, and that mandates them to fulfill their role to segregate waste at the source which they generated in the consumption process.

5.8. Conclusion

Household solid waste will be difficult to manage unless waste segregation is practiced in every household. The residents need to perceive the waste problem in a much more profound way. Households need to be educated by the government about the importance of waste segregation, and necessary training needs to be provided to encourage waste segregation activity in the households (Maskey, 2018). Households are the critical stakeholders in the waste management system of the city. The existing unscientific practices of waste collection and disposal of waste need to be stopped. Waste should be segregated at the source, and residents should be encouraged to separate waste in different dustbins. Awareness and training programs have the potential to bring behavioral change among people and enable more segregation of household solid waste at the source. It is equally essential for people to know about managing waste to be able to segregate waste at the source.

The state, NGOs, and private bodies should encourage household waste segregation as an

essential part of waste management. There is no harm in segregating one's waste. It is an act of great responsibility and awareness and represents a knowledgeable and environmentally active citizen. Being responsible for waste is a conscious act and must be done promptly. Humans and the environment are interrelated and interconnected. They cannot function without each other, and a conscious separation of waste for better waste management will no doubt boost the healthy relationship between humans and the environment.

Chapter 6

The Practice of Littering in the City

6.1. Introduction

Litter has been an unavoidable feature of human society. Individuals deal with litter almost every day, and at the same time, they are responsible for all litter-related issues. Littering is everywhere. From a highly developed country to developing and underdeveloped countries, it has become a significant roadblock in the cities and rural areas' waste management, cleanliness, and sanitation. The cleanliness of a particular area depends on the ability of the citizens, state, and all the stakeholders to handle it. Littering is viewed as a behavioral problem, and is more linked with social and psychological elements. Littering is any piece of misplaced solid waste (Geller, 1982). Litter is also defined as small pieces of refuse (e.g., food wrappers or packaging, paper, plastic bags) in public places of the built environment (Murphy, 2012).

Douglas (1996) perceived litter as a physical disorder used to construct the social order or the "litterers." Litter is not just a physical manifestation but more than that. It goes beyond the physical boundary or limit. People have used it to determine social life and social order. People who litter more are bad for society, and they act as litter who pollute the environment—people who do not litter aim at cleaning the mess created by litterers. Litter is defined by Hansmann and Scholz (2003) as ‘the careless, incorrect disposal of minor amounts of waste’ (p.753). Littering can cause enormous environmental impacts because even if it is not visually significant, it is potentially dangerous. For example, a simple cigarette butt, discarded improperly, can cause a forest fire (Crump et al., 1977). Similarly, even if we cannot see the immediate impact of littering in our surroundings, it has an innumerable impact on all. It makes

the littering act a vital topic to be studied by social scientists.

It is equally vital to understand the factors that lead to the justifiability of littering by people because it is more about the social norms and the social capital of the society which determine them. It is even wiser to investigate the determinants of littering behavior, where the willingness of people to litter or not to litter and act on the environment can be revealed. People and their perceptions are critical to the existing realities in society. Traditionally, psychological, and sociological theories help to a greater extent to determine the factors of littering behavior. There has always been an interaction between different elements or factors at the individual, environmental, and societal levels. The interaction between and among environmental morale, perceived environmental cooperation, and factors that further strengthen these relationships must be understood (Torgler et al., 2012).

Litter and the act of littering are often associated with disorder and chaos in society, which is viewed to be harmful to the social structure and the system in a negative way. Littering had a more negative impact on the economy as it led to the loss of property value, loss of tourists, and ultimately loss of economic development (Wanjohi, 2016). From harm to the environment to human, animal, and plant health, litter is perceived as a significant obstacle to the growth of society. However, it has never been done away with in the history of humanity. Humans and litter codetermine each other and say much about society and its culture. However, very often, it is associated with the vices existing in society, and anything which disturbs the social system and its normal functioning is the subject of scientific studies in social science. Littering is a social construct. Moreover, litter means waste in the wrong place. Littering behavior also is the outcome of the interaction between the items considered littered by the individuals. Hence understanding littering behavior can change the littering problem in society (Wanjohi, 2016).

After observing the social phenomenon of littering, Sibly and Liu (2013) tried to classify it into a few categories. They outlined littering as four types: active littering, active non-littering,

passive littering, and passive non-littering. For them, littering involves two stages. In the first stage, the litter is placed in the proximal location of the environment by the individual, and in the second stage, the individual fails to remove the littering while leaving the place. They added that passive littering is more prevalent than active littering and is more rigid, making it difficult to change. Active littering has been defined as a person leaving the litter while leaving the place, and passive littering is the litter that is not thrown or dropped without leaving the place and is not disposed of while leaving also. On the other hand, in the case of non-littering, the person takes the litter with him/her while leaving the place.

Litter is viewed as a symbol of the existing disorder in society. Physical and social disorders have been linked to littering, expressed through racial and class differentiation and discrimination. It plays a vital role in disrupting society's orderliness. Public utilization of spaces, institutional negligence, municipal constraints, and unequal organizational capacity are the causes of the increasing littering in various areas (Murphy, 2012). Social scientists must remember the rigid and fixed definition of order and disorder. They should be more concerned with studying disorder from the point of view of different social groups in society. It is more important to study and understand the social meaning of the disorder and how people create it through their perceptions of disorders (Harcourt & Bernard, 2001).

Littering behavior is subjective to individuals and varies from person to person. The littering behavior of people varied to a greater extent, subject to different socio-cultural, psychological, and demographic factors. While studying waste, it is equally important to study the littering behavior of people, for this will give a broader picture of the human-led social issues which can be prevented by changing behavior.

6. 2. Littering data of Bhubaneswar

A

B

C

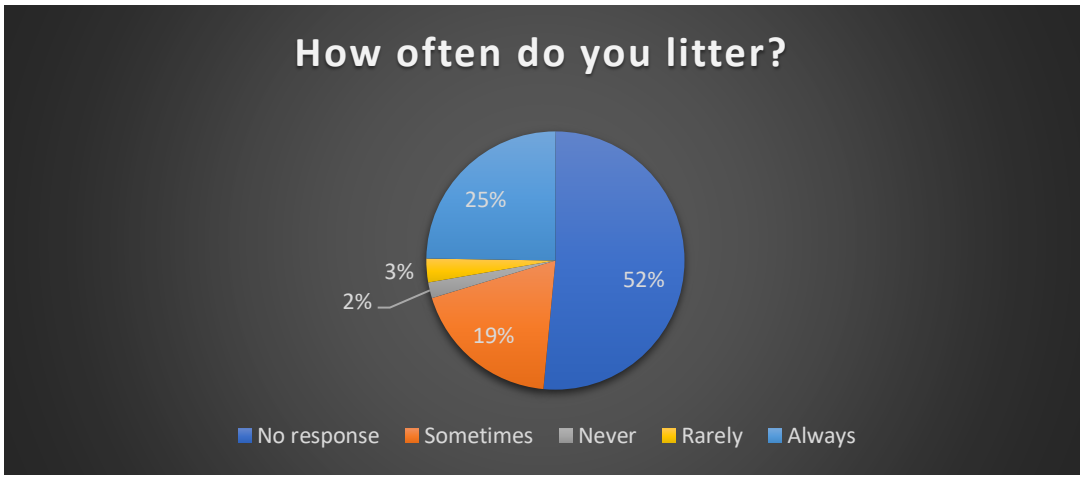
D

Figure 6.1. (Littering in the city (A)Waste lying scattered near a slum area in Bhubaneswar city. (B)A bull eating from litter in Sriram Nagar, Old town. (C) Litter gathered in the city. (D) Littered backyard in Utkal University)

Figure 6.2. Littering percentage

In the above table, it has been seen that 47 percent agreed on the fact that they litter, but 54 percent said they never littered in their life and always disposed of their waste correctly. It was obviously in contrast to what they said. There was a massive difference in what they said and did. The researcher often observed the respondents littering even while the interview continued. Hence this denotes a spontaneousness and unintentional activity of the respondents. Littering has never troubled the person who litters because the person observes littering as expected and accepted behavior in society.

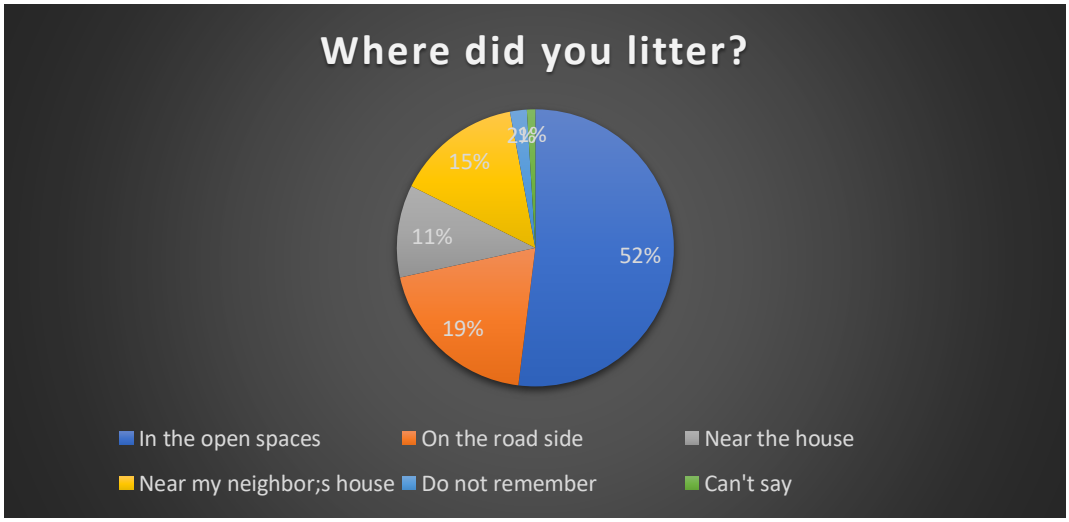
Figure 6.3. Frequency of littering



When the respondents were asked about the frequency of littering, a majority of them that is 52 percent of them, had no response to this question. Nineteen percent said they litter sometimes,

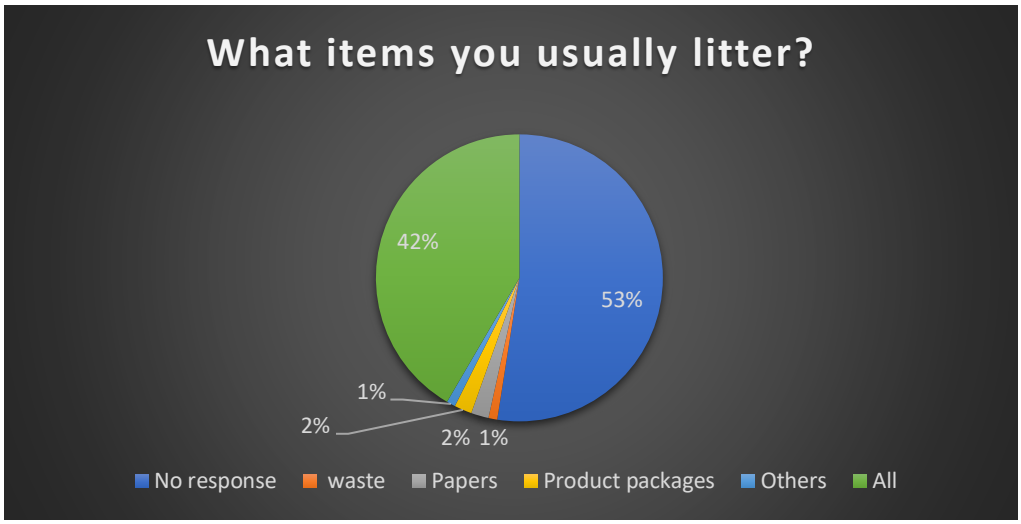
25 percent said they litter invariably, three percent rarely littered, and two percent said they never litter.

Figure 6.4. Place of littering



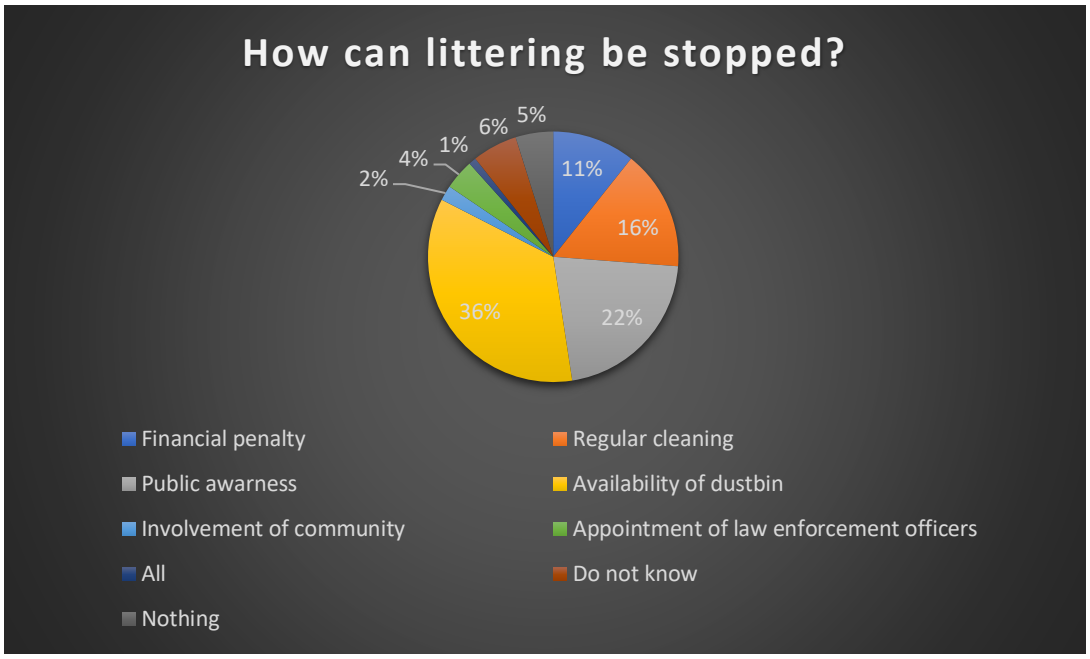
To understand the locations where people littered conveniently, a question was put about the familiar places where they littered, so here 53 percent (a majority) said they littered in the open spaces, 20 percent littered on the roadsides, 11 percent littered near their houses, 15 percent littered near their neighbor's house, two percent of them did not remember the places where they littered, and one percent could not answer to the question.

Figure 6. 5. Items usually littered



What are the items that you usually litter? Fifty-three percent of the respondents did not give a response because they did not want to share the information on the item they usually litter, but 42 percent of them littered all kinds of objects, one percent of them said they litter only food waste, two percent said papers, two percent said packaged products and one percent said others.

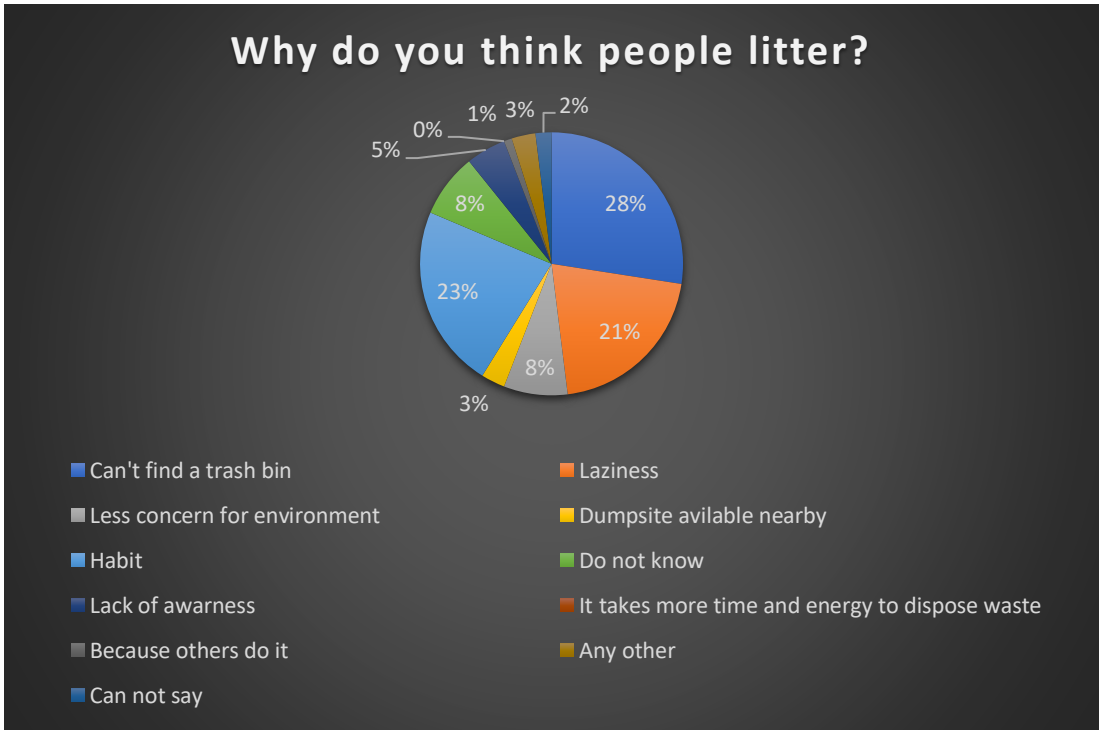
Figure 6.6. The solution to littering



After understanding the littering behavior among people, it is equally important to understand the means of preventing littering as per people's perception. 11 percent of the respondents viewed that financial penalty will help, 16 percent went for regular litter removal and cleaning, 22 percent of them agreed for public awareness, 36 percent of them wanted availability of dustbins, two percent wanted the involvement of the community in cleaning the environment, four percent suggested the appointment of the law enforcement officers, one percent said all of the above options are needed to prevent people from littering, six percent of the respondents said they do not know exactly what can help in preventing littering behavior among people and five percent of the respondents went for others and viewed that none of the above can bring

anti-littering behavior among people.

Figure 6.7. Causes of littering



When the respondents were asked about the reasons for which people keep on littering everywhere, 28 percent of them said it is because they cannot find a dustbin, 21 percent of them said it is because of laziness, eight percent of them said because they do not have concern for the environment, three percent of them said it is due to the existence of dump site nearby, 23 percent of them said it is due to the habit, eight percent of them did not know why people litter, five percent of them said it is because of lack of awareness, one percent of them said people litter because they see others littering, two percent of them said they could not say anything about it and three percent said due to other reasons people litter.

6.3. Causes of Littering

Studies have shown how littering differs across social categories. For instance, Straughan et al. (2011) found students littering more than the adults. Asmui et al. (2017) found age to be linked with littering behavior. Being introverted and extroverted, sociable, friendly, sympathetic, agreeable, and cooperative personality traits are linked to littering behavior differently. Both personality traits and gender as social factors determine littering behavior. Women show more littering prevention behavior than their male counterparts (Opayemi et al., 2020). Age and gender are essential determinants of littering behavior (Torgler et al., 2012). In the case of litter found in urban areas, the majority are plastic wrappers, cans, cigarette butts, and plastic bags dominate the litter. Public places, such as bus stations, cafes, bars, nightclubs, and parking lots, attract more litter than average (Ballatore et al., 2022).

Alternatively, studies have found that individuals' social categories and socio-economic profiles do not determine littering behavior. There is no correlation between age, income, ethnicity, and litter observation density (Ballatore et al., 2022). Even if specific social categories are held responsible for littering in public places, all individuals already participate in littering, irrespective of the social category (Tanyanyiwa, 2015). Maintaining a regular sanitary behavior depends on the individual personality, which further determines the conscious effort of the individuals in littering or non-littering behavior. People who are conscious of their environment go by the norms and values of the environment and take responsibility and maintain the cleanliness, beautification, and aesthetics of the surroundings.

However, the causes of littering, as reported during the survey, give a deeper insight into the issue. Convenience, habit, and laziness were the critical factors in littering. The respondents identified three factors that led them to litter: lack of availability of dustbins, laziness, and habit. People littered every place because they lacked a sense of ownership in those areas like parks and public places. There is a belief that the municipal worker's task is to keep the place clean.

The social demographic factors do not determine littering behavior. There is a positive connection between the availability of dustbins and littering—people who visit a place for the first time litter more than those who visit there frequently.

Littering or putting waste in the dustbin are not evident and ordinary processes; instead, these are more complex than they appear. Some people litter consciously, and some litter unconsciously. Sometimes, people are not even aware of their littering behavior. Studying littering behavior and deciding the litter disposal behavior among people is difficult because of the difference between the attitudes of the people expressed in the interviews and their absolute disposal behavior as noted through observation. Some people even are not aware and do not remember their littering behavior. There was a significant difference in how people reported and described their behavior. Littering prevention behavior was not entirely evident among the respondents. The littering prevention tendency of the individuals is characterized by stopping the litterers from littering, asking litterers to collect their litter, voluntarily picking up the lying litter, educating people against littering, etc. It is more about individual-led behavioral change (Ojedokun, 2015).

Very often, the actors belonging to the political field make and impose claims on the residents about their dwelling practices and sound and harmful use of the land, questioning the moral character of the individuals residing there and the rights and responsibilities of the community members. The act of littering or waste disposal is often undertaken to designate if a person belongs or does not belong to a particular place if they are not participating in the shared ethical life of the community. The 'trash talk' used by the residents and the government officials to make a difference between the orderly and upstanding citizens and those who are disorderly and less deserving is a powerful tactic of land contestation. Litter and disorder are associated with lawlessness, which needs to be ordered. They are reminded of their unequal status with mainstream society, and the dwelling politics continue. Trash talk is a powerful tool as it does

symbolic violence and damages and hurts the poorest in a disguised and subtle way. Such discourses are socially constructed and exhibit the existing hierarchical social relations, which actively shape and impose society's norms of order and cleanliness by doing away with disorder and litter/trash (Mckee, 2015).

6.4. An ethnographic account of littering in Bhubaneswar

Urban spaces cannot be described as clean if they look clean only on the outside. Having clean roads does not make a city clean and devoid of waste. The reality lies in the neighborhoods and the lanes where the residents live their daily lives and deal with waste. The municipal corporation of Bhubaneswar has strived to collect waste daily through door-to-door collection. However, the issue still needs to be solved, as it is linked to the waste-related behavior of the residents. Waste keeps accumulating at multiple sites all the time. Many kinds of solid waste or litter can be seen unattended and unnoticed by the authorities and the people living there.

A large part of the local waste-related problems can be understood by investigating the perception and beliefs of the residents on waste. The *Old Town* is regarded as needing better waste management. Conducting an ethnographic study in *Badu Sahi* and *Sriram Nagar* neighborhoods has helped better understand the underlying problems. The residents have yet to discuss the waste problem in their locality, but when asked, they expressed their views on the issue and related matters. During our study, any effort by the local community members to change the deplorable local living conditions and their waste-related behavior was not observed. The simple, often ignored issues of waste dominate the lives of the residents, who do not seem to be aware that the objects they discard have started taking control of their lives. For them, things no longer helpful need to be turned into waste; yet, simply discarding an object is not the solution as it becomes part of the problem. When asked about their views on waste, some accepted their life with waste; living with waste, surrounded by piles of garbage, has become their way of life. Many seemed unconcerned with this problem. For them, waste is regular; it is

mundane and obvious. The removal and management of waste do not matter to them. They do not think about it.

However, some class-based differences have emerged in the residents' attitudes and the social perception of litter. While wealthy families maintained cleanliness and were more conscious about waste disposal, we did not observe a similar attitude among families belonging to the poorer socio-economic categories. The latter only worried about their food, clothing, and other basic needs. They had no time and luxury to even think about the waste they produced and its management and environmental impact. The very act of maintaining cleanliness and being conscious of the waste generated, we noted, was a source of conflict between wealthy families and low-income families. The former blamed the latter for generating more waste and not maintaining cleanliness in the area. On the other hand, low-income families blamed the wealthy for throwing waste from the top floors in the streets. Interestingly, however, this conflict has developed only in a latent form. Chinamyee, a 37-year-old woman who lives in *Badu Sahi*, remarked:

> *'Nobody likes waste. Nobody wants to see waste. I burn my litter and never throw it in the street. We should ask people not to litter, but who will listen? I do not say anything to litterers. If the BMC waste collectors collected waste daily, the problem could be solved. Waste also creates conflict here, as people quarrel about throwing waste in each other's areas. Everyone should be responsible for cleaning everything. Because of a lack of education, people do not know how to dispose of waste properly. They litter, which harms the environment.'*

The city dwellers' social practices and daily lives strongly determine the City's condition. Rasmita, a woman aged 38 who lives in *Badu Sahi*, said,

> *'I think people litter because they want to litter, and they do such acts according to their will.'*

The living conditions of the residents have degraded considerably. The education of children has been hampered, and economic conditions have deteriorated. There is also a gender dimension in the waste issues that needs attention. Women are expected to dispose of the household waste in the dustbins outside their homes, which are to be emptied by the BMC. Women are expected to do all the disposal-related work even if men participate in waste generation, observe and understand served, and understand us as a problem that may be fine for some local people. In the neighborhood, the views on waste, healthy living conditions, and the level of pollution varied greatly. Despite the visible presence of waste-related problems in the area, when residents were asked about them, some responded that they had never faced any problems. They were okay with the situation there, suggesting that they are accustomed to living in such conditions and, unaware of the existence and ramifications of the waste problem, have no complaints.

In this sense, solid waste has become a hybrid in the urban space. In Bhubaneswar, the impact of solid waste on the lives of the residents is evident. The relationship between the residents and waste exists from the time of its production to the time of its management by the governing bodies. The class conflicts in the City bring out diverse aspects of the metabolism between waste and the city residents. The generated waste functions as a political object as a 'hybrid,' shaping the relationships between various social groups and individuals.

Understanding the residents' needs and problems is essential before formulating a waste management policy. Policy decisions are not democratic if the needs of the residents are not addressed. It is essential to engage the residents in the policy formulation, as such engagement helps to take into account the local socio-cultural environment.

For example, residents complain about people dumping waste near each other's houses. Some living on the top floors discards their waste by throwing it in the street below, soiling the vehicles and the homes below. In some cases, the problem became so severe that tenants had to

leave their homes. Another conflict between owners and tenants involves blaming each other for the unhygienic conditions of the neighborhood. Moreover, a tussle has developed between two well-off classes: the wealthy, who own their homes and are permanent residents, and the middle class, who do not own their houses and are not permanent residents of the City. The ownership of the resources makes a group more powerful, and, as a result, they raise their voice and exert their power.

Leftover food is often disposed of in the street. The wandering cows and stray dogs eat some of it; the BMC waste collector takes the rest away the next day. Despite the foul smell from the heath, the residents ignore the problem as they go about their daily lives. They say that the BMC waste collectors must collect the waste. As there is a scheduled time for waste collection, some believe that for the rest of the time, the residents should take responsibility for keeping their streets clean and disposing of waste properly.

As the relationship between waste and non-humans affects waste management of the city, some additional conditions caused by animals need attention.

The bull. Being a temple city, Bhubaneswar is home to many bulls, especially in the city's oldest area. Bulls are considered sacred in the Hindu faith because a bull is the mount of Lord Shiva. Not seen as polluted, they stand undisturbed near the big dustbins in search of food. We often observed bulls eating the food the residents threw, along with polyethylene and other harmful objects. It reminds us of the interdependency between different species in the urban ecosystem. It underlines the concept of waste as a hybrid phenomenon that affects not only humans but also animals and other creatures living in that system.

The dog. Dogs are the only creature about which all the residents complained. They felt disgusted by undomesticated, stray dogs eating from a trash can but would not generally do anything about it. They could do two things: feed the dogs or dispose of their waste correctly, away from the dogs' sight and reach; yet, we did not see people doing either. Of course, dogs

were not responsible for the waste generated locally; their only fault was to search for food in the trash cans. However, as they roamed the areas in large numbers, they were deemed entirely responsible for scattering the waste around and making it unclean. The residents, who would not touch them out of fear of infection, associate pollution with these dogs. It does not apply to bulls and cows, which also scatter waste in the City; they are regarded as purer than dogs and are not accused of polluting the City. While the residents often beat dogs, this does not happen with bulls and cows. This link between purity and pollution, living beings and non-humans, and sacred and profane suggests that the hierarchy created by humans in their lives and the associated meanings extend to animals.

The bird. Birds are believed to be the most innocent creatures populating this area. Although pigeons and crows are often spotted near garbage piles, moving slowly, collecting food, and flying away, they are the local animals least affected by human discrimination. They are exempt from the opposition between purity and pollution. Being small, it is believed, they cannot scatter the waste. Not only do they remain outside the human-animal conflict, but they seem well adapted; for instance, during the fieldwork, we observed that birds were well adapted to the urban setting, finding their home on light posts instead of trees.

The rat. Rats troubled the residents the most. They live near the waste mounds, close to the human settlements. Rats are associated with filth, disease, disgust, and poor living condition. However, there was no action to address the rat menace.

While residents recognized the problems caused by the animals living in their ecosystem, they seemed powerless to control the animals' behavior. Samprati, a 61-year-old woman who lives in *Badu Sahi*, said,

> *'Solid waste is not at all good for our environment. There is a foul smell due to this. The dogs pollute more. There is the breeding of mosquitoes and flies, causing*

diseases. They are dangerous to us. Moreover, waste does not look good. Dogs eat badly disposed waste and die because it contains harmful materials. Cows and bulls get their tongue cut while chewing food. Most of the time, glass objects harmful to animals are thrown out. Polythene and other plastic materials have also caused harm to all these animals. The dogs, bulls, and cows feel great pain and die when eating these things as their belly swells.'

As we have mentioned, during the study, we observed that many residents were unaware of the import of the local waste problems and did not consider these problems important. We also noticed some women throwing household waste near the *Bindusagar Lake* situated near *Badu Sahi*. The lake needed to be adequately cleaned. On several occasions, we noticed giant rats in that dump yard. The residents complained about the mosquitoes and the rats but did nothing to address the problem.

Although the waste collectors of the BMC worked regularly in the area,[1] The collection could have been more effective as some residents would forget to hand over their waste to them and did not bother about the cleanliness of their neighborhood. The collectors also needed to collect waste door-to-door. Some residents said that the sweepers did not do a proper job; others complained about irregular waste collection, yet, we saw waste collectors doing their job every day. This contradiction reflects residents' general dissatisfaction with government service providers. Food waste from the entire locality was being given as food to the cows, and plastic and other types of waste were thrown in the lanes.

There needed to be more public dustbins to help things. Sila Rani, a 54-year-old woman who lives in *Sri Ram Nagar*, stated,

'There is no dustbin in our locality. Even if dustbins are provided, people will throw waste

[1] Generally, waste collectors are male, while sweepers are female.

outside, not inside the dustbin. They are lazy'. In the absence of dustbins in the locality, residents kept their waste in buckets and polyethylene containers. Even when waste items are kept separate, once people hand their waste over to the collectors to be carried away, the latter mixes all types of waste. While residents would not admit they litter, they would litter before us. However, they needed to recognize the inconsistency between what they said and did.

6.5.Discussion

Litter piles near specific places due to some structural reasons. For example, places where poor people live in most Indian urban areas it is the slums. It further leads to the development of the theory that the poor and unprivileged sections of society litter more. Particularly in the urban areas, the blame for littering falls on the people who live in rented houses. The city dwellers or the rentiers claim themselves as the insiders of the city who are moral and maintain cleanliness and litter rarely. On the contrary, the people living in rented houses do not even pick up their litter, which is regarded as disrespectful and a lack of respect for the community's values and order. Hence, this is another way for the City's long-term residents to perceive the litter and the litterers and accuse the other social groups of generating social disorder through the litter.

Littering has increased due to capitalistic and consumeristic economic growth in the city. The impact of littering is uneven across the classes in the city as it affects different classes differently. Littering and the class dynamics in the city are essential aspects. The lower-class residents are segregated socially through geographical segregation as they are blamed for carrying the litter, disease, and disorder with them. They are excluded from the development agenda, followed by the governing authorities. For being associated with waste and uncleanliness, they are left behind. Non-humans are also included in the 'urban metabolism' in

the city. Without having an agency, they suffer the most. A networked relationship among city dwellers, governing authorities, non-humans, and waste is evident.

6.6.Conclusion

When there is a penalty for littering, the frequency of littering decreases, and where there is no penalty, people go on littering. To discourage people from littering, there should be adequate provision of waste baskets along with the provision of financial penalties. If a penalty cannot be imposed, there should be public criticism of people who litter. If the formal institutions need to be more active in implementing the following penalties, then informal institutions can take the lead. It should be part of the social norms and peer effect. If littering is to be controlled, then both the formal and informal institutions need to take the steps because the socio-demographic factors that influence littering to a greater extent are impossible to be controlled (Khawaja & Shah, 2013)

There is a need for the cooperation and engagement of the stakeholders, such as the policymakers, public and private bodies, individuals, and marketing experts who can work together. They can encourage people to have anti-littering behavior, use trash cans, redesign environmental management, etc. The most important thing is that there is a need for strong communication among all these stakeholders. Along with that, more efforts should be made to improve the socio-economic condition of people and provide them with better life choices.

The problem is not with a single piece of litter on the ground. Instead, the problem arises when the litter is gathered every time, and at that time, it has a more considerable impact on the environment. So, the choice left is to stop this littering of a single piece of litter. There has always been an interaction between different elements or factors at the individual, environmental, and societal levels. An understanding of environmental morale and perceived environmental cooperation may help to have better environmental outcome in the long run. (Torgler et al. 2012).

Chapter 7

Impact of Swachh Bharat Abhiyan on household littering

7.1. Introduction

India, has practices of ritual purity and pollution that often collide with the scientific understanding of waste, dirt, sanitation, and hygiene (Doron & Jefferey, 2018). Also, sometimes the perception of India has been negative concerning cleanliness practices and policy implications. India is not filthy, and the perception of filthiness has been wrongly put. If we look at other countries like London and the USA, they also faced the problems of waste and diseases associated with it in the past. It is not true that humans were aware of cleanliness and associated practices from the beginning. Only through the good practices learned over the decades and centuries, they gained knowledge of cleanliness and hygiene.

India emphasized economic growth and New Economic Policy (NEP) was introduced in 1991, after which there were massive industrialization, urbanization, and consumer capitalism. It further increased the waste of factories, industries, mines, and cities. It led to dumping of all kinds of waste in the water bodies like seas, rivers, and lakes. When the situation deteriorated, the pollution level was high; Solid Waste Management Rules were formulated in 2000 to establish specific codes for managing the waste generated. Even after that, waste management has become complicated with an increase in population, growth of the economy, consumerism, and cultural prejudices about caste, class, and gender (Doron & Jefferey, 2018). Hence the problem of waste is a social issue in India. It has been entangled with other social phenomena such as caste, class, gender, etc.

Many social reformers, political leaders, and religious leaders have put forward the notion of cleanliness before independence. For instance, Sant Gadge Maharaj of Maharashtra worked

towards cleanliness. Mahatma Gandhi had already put emphasis on cleanliness. He associated cleanliness with godliness. Dr. B. R. Ambedkar encouraged Dalit communities to adopt a path to dignity by maintaining good health and cleanliness. He urged Dalits to cease animal sacrifice as part of religious rituals and campaigned against vices such as alcoholism (Jadhav, 2017)

The notion of purity and pollution is linked more to the notion of the sacred and profane and the idea of inclusion and exclusion. In 'Homo Hiierarchus,' Dumont (1980) demonstrates the way caste is linked to the purity-pollution binary. The *savarna jatis*, or the higher caste people, are involved in non-polluting occupations and practice vegetarianism. The lower castes are nonvegetarian and consume alcohol. Therefore, the *Shudras* are deemed inferior regarding their capacity. In the works of Srinivas (2003), the process of Sanskritisation denotes the movement of individuals from the realm of 'polluting' to one of 'purity.' The individuals gradually, over some time, sometimes over generations, adopt practices of commensality, clothing/dressing, and other cultural codes of the upper caste. This, over time, provides the potential for 'passing off' as a *savarna*. The term *Swachh* etymology is found in Sanskrit words ('*swa'* means self, and '*ahh*' means goodness). This meaning of Swachh may include multiple meanings. It could mean cleanliness from the body to the soul/mind. It could mean the end of corrupt practices. It could also mean a clean environment (Jadhav, 2017).

The policy's success largely depends on its implementation and acceptance by the citizens. As India faces multiple waste-related issues, policy is needed to solve them. In India, Swachh Bharat Abhiyan has been a central policy in ensuring cleanliness and proper waste management with citizen participation since 2014. Swachh Bharat Abhiyan has been implemented in rural and urban areas to ensure that India is Swachh. This is a grand policy of the central government to transform India and make it cleaner and healthier. The studies on the impact of the policy have shown mixed results. Hence the research was conducted to study its impact on the behavioral aspect of the population. This chapter solely focuses on Swachh Bharat Abhiyan and

its impact on littering in the urban space of Bhubaneswar. It has been almost eight years, and it is essential to map the impact of SBA on littering in the city. The chapter attempts to navigate into the awareness, perception, and practices adopted by city dwellers on SBA. The study also attempted to build knowledge on the impact of SBA on littering practices by householders.

History of sanitation program in India

Central Rural Sanitation Programme (CRSP) was the first central government plan launched in 1986 to accelerate sanitation coverage in rural areas. The CRSP was restructured into the 'Total Sanitation Campaign' in 1999, and there was a paradigm shift to a 'community-led' and 'people-centered' approach. The program was revamped as Nirmal Bharat Abhiyan (NBA) in 2012 and aimed to accelerate sanitation coverage in rural areas to achieve the vision of 'Nirmal' Bharat by 2022. Finally, on 2nd October 2014, Swachh Bharat Abhiyan (SBA) was launched, and it became the most extensive sanitation program by the country's government to date (Kaul, 2015).

Swachh Bharat Abhiyan Urban

As United Nations Sustainable Development Goal 6 (SDG6) aims to "achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations," the government of India initiated the policy of Swachh Bharat Abhiyan to adhere to the SDG 6 target. The Indian government also attempts to fulfill public health needs, ending open defecation and unsafe sanitation in rural and urban areas.

The Swachh Bharat Mission has the following objectives:

- Elimination of open defecation
- Eradication of Manual Scavenging
- Modern and Scientific Municipal Solid Waste Management
- To effect behavioral change regarding healthy sanitation practices

- Capacity Augmentation for Urban Local Bodies (ULBs)
- To create an enabling environment for private sector participation in Capex (capital expenditure) and Opex (operation and maintenance).
- Generate awareness about sanitation and its linkage with public health - Intensive Information Education Communication (IEC) campaign for awareness generation and health education to create a need for personal, household, and environmental sanitation facilities.
- 9. Setting up sanitary marts
- 10. Building up solid urban local bodies to design, execute and operate all systems related to cleanliness
- 11. Facilitating Corporate Social Responsibility (CSR)

Amongst all its objectives, the current study only looks at the effect of behavioral change regarding healthy sanitation practices and modern and scientific municipal solid waste management. The most significant stakeholders in the policy were the prime minister's office and the Ministry of Drinking Water and Sanitation. As there was the goal to build toilets for 100% of households, it was purely a political motive because there was a strong political will to focus on 100% toilets, and the budget allocation for this was really high and even higher than the annual budget from many countries of the world. The key stakeholders who participated in the sanitation campaign included 1. Key development partners who drove the design of the campaign: the World Bank, the Bill & Melinda Gates Foundation, the Water and Sanitation Collaboration Council, and UNICEF. 2. State officials responsible for implementing SBM-G. 3. District officials who are part of an exclusive water and sanitation management cell (as seen in Maharashtra) or other departments responsible for implementing SBM-G. At the district level, there was a dedicated deputy chief executive officer, known as the head of the department for WASH, who reported to the district magistrate, executive engineers, and the district water

and sanitation mission cell. 4. Block resource coordinators and cluster-level resource coordinators. 5. Village secretaries and gram pradhans; self-help groups retired army people; teachers, religious heads, and other key decision makers – these were critical stakeholders who would have the power to influence the community and were therefore brought into the scheme during implementation. 6. Political leaders at the grassroots, block, and district levels. 7. The organizations of youth, women, weaker sections, scheduled caste, and scheduled tribe people's associations. 8. Material suppliers, contractors, masons, and others. 9. Corporate social responsibility-inspired investment resulting from the mandate given by the prime minister's office. These initiatives constructed school toilets and others, but there was no effort to change behavior. There was also no effort in the operation and maintenance of the toilets constructed. (Mehrotra, 2021)

SBM campaign has been different from other campaigns in many aspects. There was 1. Investment in human resources at the district level to ensure timely implementation and roll-out of the program. 2. Flexibility at the field level regarding incentives, payments, and installments and adapting to the ground realities. There was scope for customizing implementation per the state's specific needs. For example, in Punjab, additional incentives were sanctioned by the state government to construct a bathroom and toilet. There was the flexibility to hire vehicles, teams, and personnel to speed up the processes and meet the demand in a particular place. 3. Continuous leadership and encouragement through capacity-building workshops, conferences, and interaction with other state and district teams to learn from one another and to be inspired by experiences (Mehrotra, 2021).

Role of BMC in SBA

In the city, BMC undertook the Swachh Bhubaneswar Campaign (launched on 2 October 2014) to clean public places. Its tagline is Clean BMC-Green BMC. The program ensures access to sanitation facilities and a safe and adequate drinking water supply for every person. A team of

experts has been stationed at BMC. They aim at eliminating open defection, eradicating manual scavenging, municipal solid waste management, and bringing behavioral change through awareness campaigns. Special teams are commissioned to supervise ward sanitation activities. However, the real impact can be better grasped through the experiences and perceptions of the city dwellers.

7.3. Perception of the study respondents on SBA

The study respondents have a mixed response and perception toward Swachh Bharat Abhiyan. However, the fact is that only some of the respondents were completely aware of the policy. Even after so many campaigns regarding sanitation and cleanliness through the policy, they have only heard about the name of the policy and need to remember the tagline; they need to be made aware of the priorities and effectiveness of the policy in the city. Few respondents applauded the state for doing much more for sanitation as they understood that it is the duty and task of the citizens who live in the cities to make their surroundings clean. The state can only provide accessible toilets and encourage them to adopt good sanitary practices for better health and life. However, it can only somewhat transform the habits and perception of sanitation and littering. All other uncleanliness and littering in the city are occurring due to the lazy habits of the city dwellers who do not understand to take care of their waste and discard them haphazardly on the roadside and other inappropriate places that degrade the aesthetic and environment of that locality.

To quote Mira, a resident of Badu Sahi,

> *'There is a terrible smell everywhere as the waste has been scattered everywhere by the dogs. We face problems while commuting. We do not have facilities to dispose of our waste in our area, so we dispose of them near our place. We do not go out to dispose of our waste. Instead, we ask our maids to do so. Other residents also throw their waste*

near our gate. We have asked them not to do that, but they have never listened. The current situation has deteriorated because of the habits of the residents. They are not aware and conscious and litter all the time. All the residents are responsible for maintaining cleanliness and are not doing it. They are habituated to throwing waste here and there.

To quote Anita, a resident of Badu Sahi

'SBA has no impact. I do not feel or see any changes. My neighbors still dump waste. You can see the whole sahi and see how uncleaned the area is. The areas are full of rats and mosquitoes. I have always maintained cleanliness. I am not too fond of uncleanliness, but the other residents are doing it. Neither the children nor adults maintain cleanliness and dispose of waste properly. There should be stricter rules for punishing the litterers. Everyone should understand and work for it together. Even if few of us say and try to clean, the situation will not change. I cannot say anything to the litterers. If I say, they tell us not to be bothered about the litter and ask me about the reasons for asking them to stop littering. I have often asked owners to ask tenants to clean houses and use dustbins properly, but they need to listen. The owners leave the houses and live somewhere else, and the tenants stay here, generate more waste, and dump them in front of the houses. Nobody can say anything to them. The owners stay in the apartment, and tenants do everything as per their wishes. How much will one do and clean surroundings? if we say there will be a quarrel'.

Other respondents found lacunas in the government policy. They blamed the government for being irresponsible and not doing enough for the city dwellers' cleanliness, sanitation, and overall betterment. They complained that there had been only big names of the policy of Swachh Bharat Abhiyan, but there is nothing swachh (clean) about it. All the higher-class members of the city, such as the MLAs, MPs, and celebrities, just come, click the photos with

a broom in their hand, and clean the roads and lanes. After the photos are clicked, the Abhiyan is stopped at that moment, and everyone leaves that place. Nobody cares about the cleanliness of the state and the betterment of the poor people who belong to the lower class in the city. The higher-class members only show off such acts of cleanliness for their popularity. The next day those photos are published in the local dailies, and they get recognition for doing social service. To quote a resident of Sriram Nagar Abinash

> '*SBA has no impact on people. Whatever I used to see on the road in the last 5 to 6 years, the situation is the same till now. I cannot see any change. Rules are needed to be stricter. The city needs a healthy environment, and we must adjust to the environment and climate. So there should be more awareness along with strict rule implementation. SBA is ineffective because everything is only in pen and paper. Packaging should be reduced with plastics; for example, the most dangerous is gutka packets, which are small but more harmful. As it is being produced, it is being sold, so the production should be banned entirely.*

Only some other respondents gave a mixed responses. For them, people are gradually changing their behavior rather than littering in their localities as the policy and its awareness campaigns influence them. The scenario is changing gradually. The state has successfully installed awareness and sanitation consciousness among city dwellers. The change is in a positive direction.

To quote Niranjan of Chandrasekharpur,

> *'I have heard about SBA. We must clean our surroundings; otherwise, who will do it? The most important thing is that we should not make our locality dirty. Mothers should be educated and made aware so children will adopt the good habits of not littering and learn waste disposal behavior. There are many instances where the throw-away culture of residents is visible. They usually throw it even if it is a Kurkure wrapper or anything.*

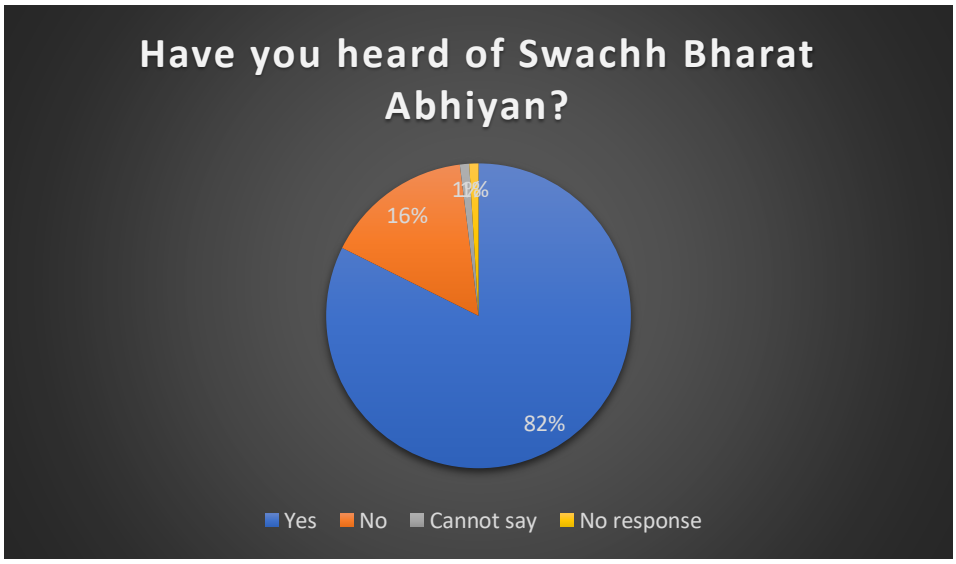
Even the women or the mothers who comb their hair throw the fallen hair outside. SBA has no impact on people in my neighborhood. Last night they had a feast, but they threw the leftovers on the roadside near my home, and the cows, bulls, and dogs ate from that and scattered'.

To quote resident Bilash of Hanspal,

'I have heard of SBA. My neighbors have become aware and are not littering more. The laws can be stricter so that they will change people's behavior in every city. I think SBA is effective to some extent. More awareness can make SBA more successful'.

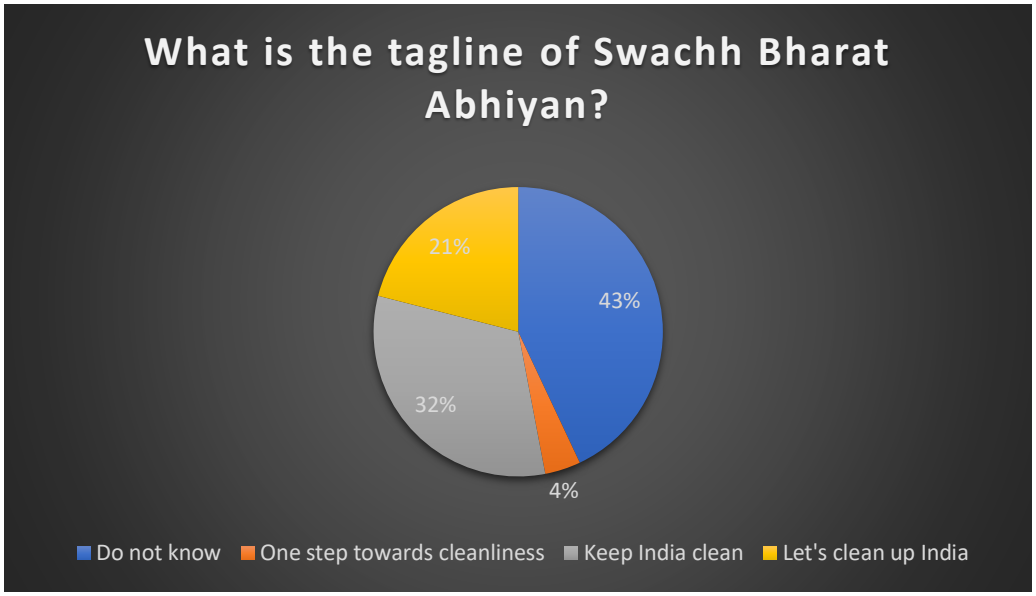
7.4. Impact of SBA on the city dwellers

Figure 7.1. Knowledge of Swachh Bharat Abhiyan



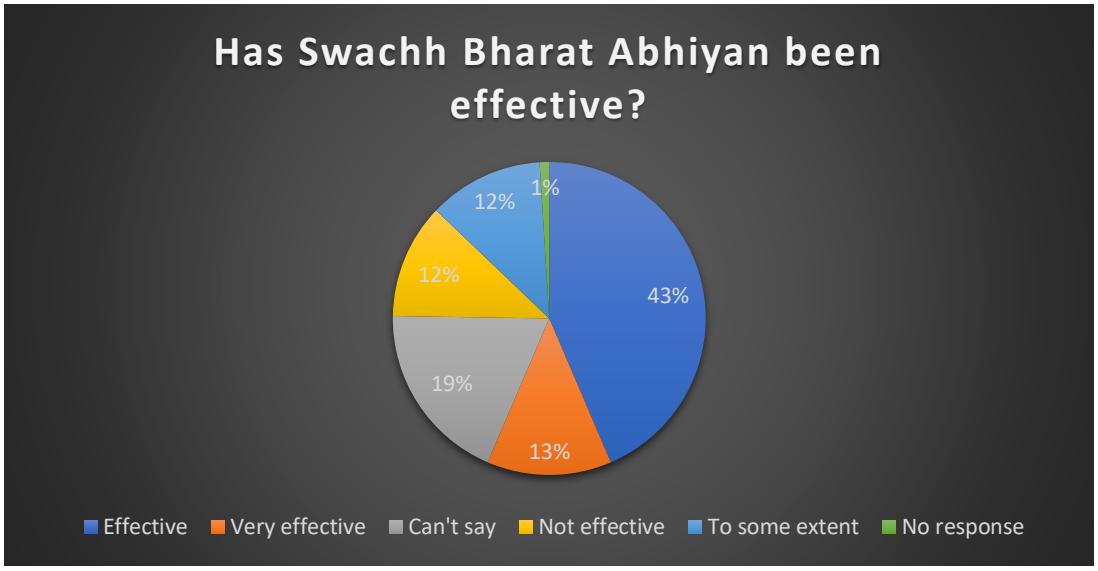
Eighty-four percent of the respondents had heard about Swachh Bharat Abhiyan, whereas 16 percent had never heard about SBA. One percent said they could not say anything about it, and one percent made no response to this question.

Figure 7.2. Knowledge of the tagline of SBA



When asked about the tagline of Swachh Bharat Abhiyan to know knowledge of the respondents regarding Swachh Bharat Abhiyan, 43 percent answered they did not know about the tagline of Swachh Bharat Abhiyan. Four percent said the tagline is 'One step towards cleanliness,' 32 percent of the respondents said the tagline is 'Keep India clean,' 21 percent of them answered 'Let's Clean up India.'

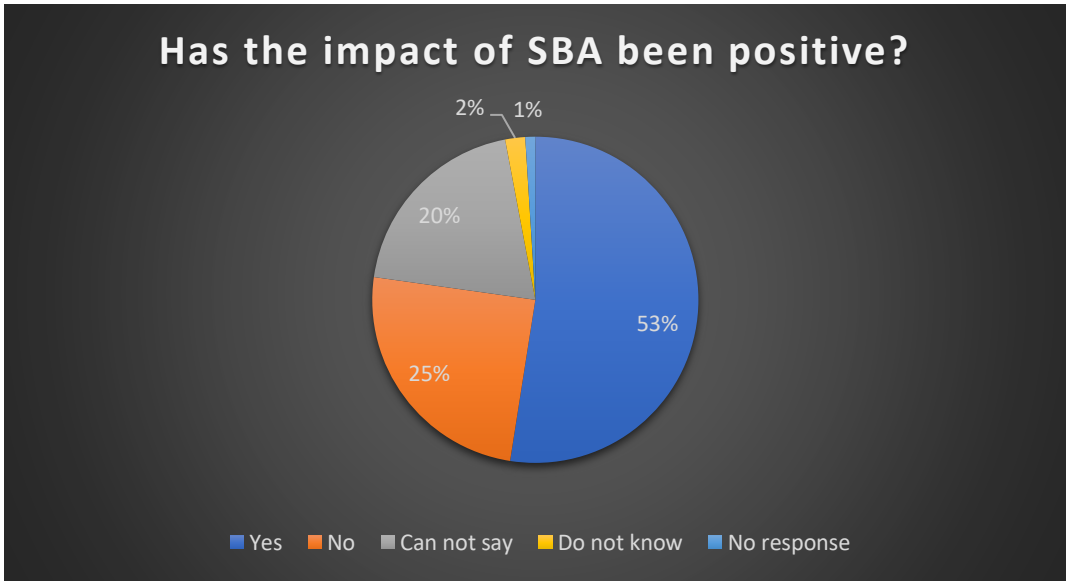
Figure 7.3. Effectiveness of SBA



The respondents were asked about the effectiveness of Swachh Bharat Abhiyan in their locality.

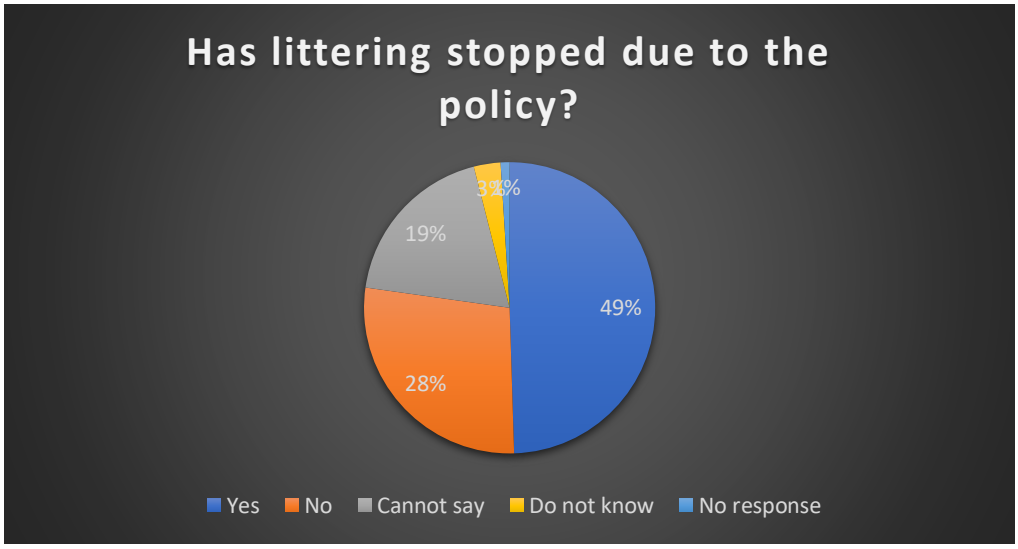
Forty-four percent of them replied that the policy has been effective in reducing littering in their locality, 13 percent of them answered that it has been very effective, and 19 percent said they could not say about the effectiveness of the policy in their locality. Twelve percent said it has not been effective in reducing littering in their area, 12 percent answered that the policy has been effective only to some extent, and only one percent of the respondents had yet to respond.

Figure 7.4. The positive impact of SBA



When asked if the policy has resulted in a positive impact in the locality of the respondents, 53 percent answered that there had been a positive impact in their locality. Twenty-five percent of the respondents said the policy has no positive impact in their locality. Twenty percent said they could not answer this question, and two percent said they did not know if the policy positively impacted the city. Only one percent of the respondents had yet to respond to this question.

Figure 7.5. Impact of SBA on littering

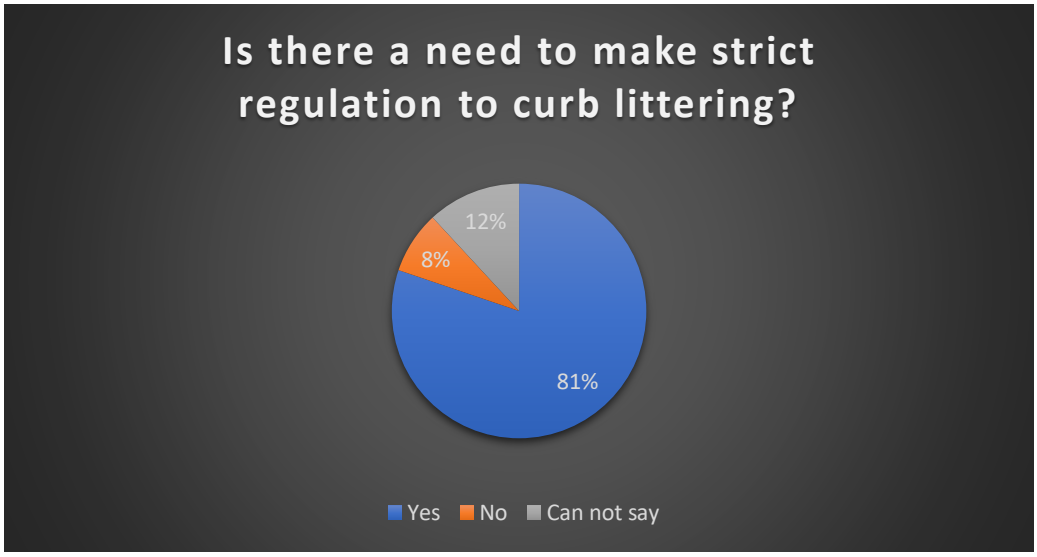


When asked if littering has stopped in the city due to the impact of Swachh Bharat Abhiyan, 50 percent answered that littering has stopped, 28 percent said littering has not stopped in the city, and 19 percent of them said they could not say anything about it. Three percent said they do not know if the littering has stopped in the city due to Swachh Bharat Abhiyan, and only one percent of the respondents had yet to respond to this question.

Figure 7.6. Ways and means of impact

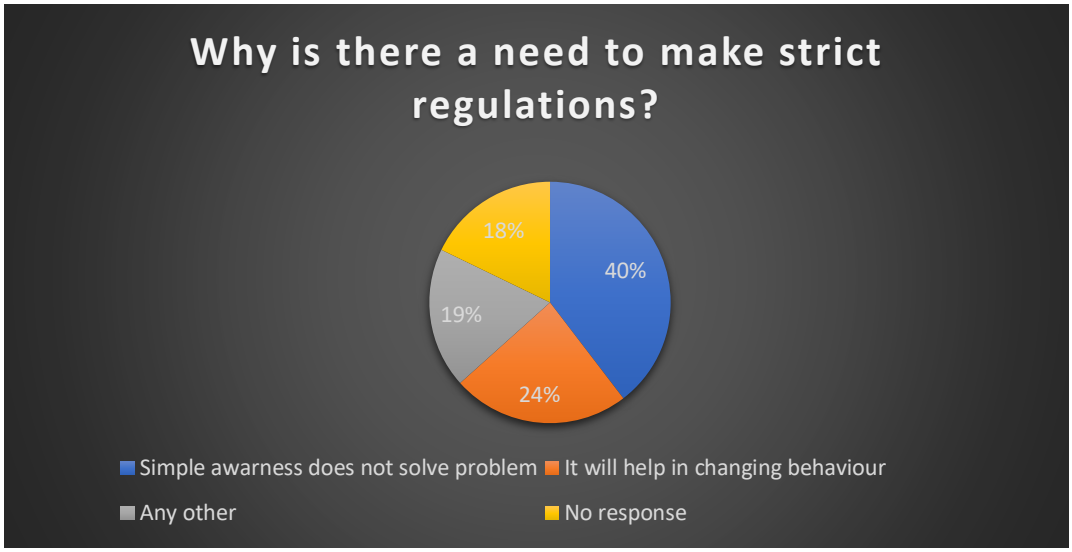
When the respondents were asked about how there has been a positive impact in their locality due to the policy, 50 percent of them answered that people have stopped littering, 10 percent of them said authorities have been cleaning the locality regularly and properly, only one percent of them said there has been the high-level engagement of the community in cleaning the neighborhood. Moreover, 40 percent of the respondents had not responded to this question.

Figure 7.7. Need for strict regulation



When asked about the need to make strict regulations to reduce the littering behavior of city dwellers, 81 percent of the respondents said the city needs stricter regulations to curb littering. Eight percent said there is no need to make the laws stricter to curb littering because that will not work. Only 12 percent of them answered that they are still determining if there is a need for stricter regulations to curb littering in the city.

Figure 7.8. Reasons for the need for strict regulations



Of those respondents who answered that there is a need for stricter regulations to curb littering, 40 percent of them answered that because only awareness will not be fruitful, 24 percent of them said the imposition of stricter regulation would help in changing the behavior of people and only 19 percent of them answered that the other reasons are there to make stricter regulations that will help in curbing littering.

When the respondents were asked, 'Which part of the city is the most littered?' the answer differed significantly among the respondents. There was no uniformity, and due to significant variation in the response, no conclusion was drawn. It shows the precarious condition of the city. Almost all the areas of the city were considered to be the most littered by the residents.

The disposal of solid waste was the primary concern of the urban community members. Hence the primary focus of Swachh Bharat Abhiyan (SBA) should be Municipal Solid Waste Management (Mavila & Francis, 2019). Nevertheless, this has yet to be found in the city, even after the primary focus on municipal solid waste management, which is mainly insufficient and denotes a loophole in the policy of Swachh Bharat Abhiyan.

Many studies have found positive impact of the policy as there has been an increase in toilet usage, automatically reducing people's exposure to pathogens. More toilets have been

constructed. More political will, finance, partnerships, and participation of people have led to the success of the most extensive sanitation program in the world, India. Whatever goals were put forward at the beginning of the policy have been achieved by the policy through its successful implementation in line with Sustainable Development Goal (SDG) 6. (Dandabathula et al., 2019)

It is also a fact that there have been growing success stories, but sanitation coverage in the country still needs to be improved. Individuals and households of underprivileged communities are still suffering. The problems of female-headed households, landless people, migrant laborers, and disabled people are yet to be heard. They still need access to toilets, and serving those left out in the development process is equally important. Access to sanitation is a human right that should never be denied to anybody. These underprivileged individuals, households, and communities must be supported and helped to have a healthy and safe life. Sanitation practices at educational institutions, child-care centers, hospitals, and other government facilities must be developed further. There should also be an effort to include the missed out sanitation data of the underprivileged section of society (Behera et al., 2021)

The campaign has succeeded primarily due to ambitious target setups, modern communication and monitoring technology, and employee reward and recognition provision (Curtis, 2019). To make it more successful, there is a need to create favorable working conditions for civil servants and provide them with all the required opportunities. The impact of SBA is significantly associated with the socio-economic status of the population (Mavila & Francis, 2019). Suppose the socio-economic condition of the population is improved. In that case, the policy will be successful in bringing change. If the socio-economic could be better, then the policy implementation is complex, which makes the policy unsuccessful. The massive inequality in the city population is visible through the ineffective implementation of SBA.

7.5. An ethnographic insight on SBA

The study did not register any significant impact of the central government's awareness program *Swachh Bharat Abhiyan*. Residents opined that government policies made no impact on people's behavior. It was found, however, that people's economic background played a role in determining their opinions, voices, and perspectives on waste management, littering, and government policies. Aparajit, a 42-year-old man living in *Sri Ram Nagar*, said:

> *'Bhubaneswar has a waste problem. We face the problem of dogs scattering waste all around. Walking on the road takes much work. Even after the BMC workers clean the roads, people still litter and throw waste. Our Sahi (colony) is the most polluted. People are not concerned. Children suffer from water-borne diseases due to unhygienic living conditions. The pipes leak. Sewage water mixes with drinking water. There are skin diseases as well. The BMC is getting benefits from utilizing waste. Through privatization, the BMC and private bodies involved in waste handling are getting the benefit. What are they giving people in return? Waste has many benefits and is very useful. If recycled properly, it gives many benefits. The rag pickers make a living out of selling the water bottles. Without any investment, they are making a profit.*

Urban production and consumption lead to changes in spatial formation and point to the urban metabolic force (Smith, 2006), conflicts, and struggles. The interplay among people, urban space, and things (Heynen, 2013) breaks the dualistic view of urban space and the power relations between different social groups and between nature and social groups.

As an indication of the political aspect of waste collection in Bhubaneswar, during the fieldwork, the researcher observed a change in household waste collection immediately after the local election and the subsequent appointment of corporators in the various wards. Initially,

the BMC waste collectors carried a cart and collected waste from door to door in the early morning; they would blow sirens to signal the residents that they should hand over their waste. This practice changed after the election, as the BMC workers were replaced by '*Saphei Gadi'* (waste collection vehicles). While the song '*Mu Saphei Bala…*' (I am the cleaning person) played on loudspeakers, four to five men collected the waste in two separate places designated as collection points for 'wet waste' and 'dry waste.' The song reminded the residents to hand their waste to the collectors daily. Ironically, the '*Saphei gadi*' existed before the election but was not used to collect waste. Then, only a few lanes were serviced, and individual workers would collect the waste.

During the fieldwork, the researcher collected information on individuals' perceptions and waste-related awareness. Knowledge of the local cultural significance of waste, public perceptions of rubbish, and current waste-disposal practices was gained. From the respondents, the researcher gained a view of the role of political ecology in the prevalence of interest groups related to the management of waste in the city. Many negative perspectives also came to the fore. As the researcher was not considered foreign to the city, respondents could express themselves fully, bringing out their accurate perceptions, practices, and beliefs regarding waste production and management. The community was concerned with the health and well-being of its members but did little to address the issue. The separation of dry and wet waste was generally absent, as most local people needed to learn about dry and wet waste and threw away the waste indiscriminately.

The researcher also registered a need for more cooperation and coordination among the residents and, in some cases, a latent conflict in dealing with the waste problem. Nobody likes waste. People recognize the existence of waste-related issues and that the presence of waste in the surroundings could be better. However, they want to avoid being identified with their generated waste. Here, the association of humans with waste is evident but needs to be

acknowledged by the respondents, which prevents the residents from taking action and even discussing waste. It is worth repeating that even if a willingness to resolve the issues was there, no action was taken, and there were no shout-outs, strikes, or social movements.

Local people generally hesitate to speak about waste, which helps to explain why most respondents continue those who litter or improperly dispose of waste. So, the blame game goes on, and the problem remains unresolved. Meanwhile, ordinary people live with the consequences of this situation, pointing to the importance of integrating an understanding of the local socio-cultural context into the waste management plan to make it more effective (Fruitema, 2015). The existing conflict is evident from the statements reported below.

Sila Rani Makaddam, a 54-year-old woman living in *Badu Sahi,* said:

> *'We always ask children to dispose of waste properly but do not ask this of the neighbors and the outsiders.*'

Chinmayee Makaddam, a 54-year-old woman living in *Badu Sahi*, said:

> *'Everyone takes photos, but there is no serious attempt to clean the city. Swachh Bharat means to make India clean, but there will be no waste if all is cleaned seriously. People are keener on being acknowledged as social workers than meaningfully contributing to the cause. If every individual does their duty of cleaning the areas, then there will be no waste problem. We create all the problems. The temple nearby has been made dirty. The residents throw waste on temples.'*

Some families did not consider waste as a problem in that area. They say they do not need the dustbins to separate the dry and wet waste.

Charulata, aged 57, living in *Badu Sahi*, said:

'We do not separate the waste. We will not do so. We throw all the waste. We do not need dustbins as we produce less waste than others […] We do not have any problem due to waste. We do not litter. We are permanent settlers; we have lived here for a generation. We are priests of lord Lingaraj, and we do not have any problem. We do not say anything to those who litter because the spaces and areas belong to all. Tenants have the problem of waste, which we do not have.'

The city residents believe that the policies formulated by the central government and the state governments, such as those of Swachh Bharat Abhiyan and Swachh Bhubaneswar Abhiyan, have been ineffective. Local people note they may have served to gain political mileage but have not contributed to the city's betterment. They say their effect has been cosmetic, as residents have temporarily cleaned their surroundings to take photographs and share them on social media.

These social processes contribute to the production of hybrids in this urban setting and are evident through the actors' vulnerability, interests, actions, strategies, and power relations. The study found that low-income families are more vulnerable to the impacts of waste in terms of poor health, hygiene, and sanitation. They lack the resources to reduce their vulnerabilities. On the other hand, wealthy families have better access to resources, which they use to avoid (and ignore) the immediate impact of the generated waste; yet, they are unable to root out the problem of the metabolic process between waste and people affects every individual living in the city.

The blame game goes on between different social groups, who refuse to accept responsibility for waste production and its safe disposal and are in conflict with each other (for example, the relationship between the tenants and owners). In such a situation, political parties benefit from managing waste conveniently.

7.6. Discussion

Political will and social pressure significantly impact individuals, which influences their demand and choices for sanitation facilities and ultimately has a bearing on the sanitation policy of the country (O'Reilly & Elizabeth, 2014). When choosing individuals for sanitation facilities, they choose durable goods over them, such as motorcycles, refrigerators, TV (Banerjee et al., 2017). These factors altogether lead to the failure of the policy. Hence it has been suggested to focus more on education and awareness of women on sanitation practices to help make sanitation policy successful (Kedia, 2022).

Many deficiencies in Swachh Bharat Mission (SBM)'s policy goals have also been identified. Maintaining cleanliness is difficult for underprivileged households. There are issues such as lack of land availability, homelessness, lack of access to water, gender inequality, poverty, migration, etc., which hinder the progress towards the goal of SBA. The policy has been designed to focus on finance and information rather than organization and regulation. Though the demand for sanitation goods and services has increased through financial incentives, a fundamental change in the behavior is yet to happen. The citizens have the task of acquiring land, building a toilet, procuring water, maintaining a toilet, etc. SBA must be better designed and act only as a cash transfer scheme without solving the real issue (Kedia, 2022).

Sanitation as a collective action problem requires a collective solution. Most Individuals have yet to internalize the positive externalities and internalities of proper sanitation, but even if they internalize them, they lack the necessary resources to continue sanitation practices. Therefore, governments need to have context-based and achievable policy goals. After deciding the policy goals, public policy frameworks should be used to evaluate the tools available to achieve the chosen goals (Kedia, 2022)

Sanitation is not a private action problem but a collective one. Public sanitation infrastructure is a better option, as it is easy to maintain and serves the most vulnerable population, such as

people without homes and easily migrated people. It would have shown the government's commitment to public welfare and motivated people to change their behavior in the long run. It would have helped the government with the few resources to monitor and enforce sanitation laws and regulations. (Kedia, 2022)

The demographic factors such as income, age, education, gender are essential in communicating the SBA campaign in rural and urban areas because they influence the level of awareness, their interest in adopting change, and their actions. Communication programs can focus on the demographic variables of the population, and a positive reaction can emerge from the population. Moreover, the campaign can become successful. It also needs to be noted that there is a difference in the demographic variables in the population. Hence the message should be communicated as per the need of the specific demographic category. The females, adults, professionals, and the educated determine a lot about the campaign's success. They should be used in assessing the success of the campaign. When this group participates effectively, change is bound to come. Peer groups and celebrities need to be used as messengers in the communication process. There should be diffusion of the message to the targeted population at all levels. Along with that, it is equally important to include the population in the formulation and execution of the programs under the policy to ensure better waste management in the locality (Agyeman et al., 2017)

The reach of the policy has been far and wide, but it still needs to be completed. Even the awareness level in the population is not one hundred percent. Campaigns and media announcements need to generate more awareness among the masses. Even urban Indian family members practice open defecation. Girls and women have been suffering from risks of humiliation, diseases, infection, and insect bites. It has been very tough to change this behavior which has become a habit. Sometimes, toilets were opined to be more unhygienic than the open-defecation. There has a lot of misinformation on sanitation that needs to be corrected (Barclay

et al., 2020)

Non-involvement of women in sanitation decision-making has proved that the reason lies in their low socio-economic status and inability to influence the household's financial decisions. There needs to be more confident to make decisions independently among women dependent on their spouse or other male family members for most decisions. The studies found power hierarchies and dynamics within households, which constrained female's participation in decision-making processes regarding sanitation (Routray et al., 2017). Hence sanitation policies need to be strengthened, and more focus should be on the practical implementation of these policies at all levels to address gender power relations and household relationships.

There were also signs of the success of the policy. The Swachh Bharat Mission had the goal of making India Swachh by 2019. There was high importance on toilet coverage and behavioral change. With political support and exemplary leadership, there were psychological changes on the part of the district officials. These have helped in bringing change in the behavior of the people. Mass media was used to raise awareness and inform and motivate people to adopt good sanitation behavior. The leaders also demonstrated ethical behavior, and one by one, goals such as open defecation-free villages and urban areas, high toilet coverage, and behavioral change were achieved (Curtis, 2019)

In Indian society, the caste system still acts as an important social institution and influences the performance of SBA. Caste inequalities deprive the unprivileged of the facilities provided by the government through SBA. Caste truly influences individual access to sanitation, and ultimately, community sanitation behavior is determined by it. Caste as a central institution has been neglected by the policymakers while formulating the policies like SBA and other developmental programs that lead to severe consequences and, ultimately, the failure of the policy and the program. The policymakers and the government need to understand the interplay between development and caste, and the same in the case of sanitation and caste. The caste

guides access to sanitation, water, and basic needs. Sanitation is primarily controlled by the caste even today in the 21st century, post-modern era. The inequality is evident when the higher caste members have access to sanitation facilities and water and the members of the marginal caste are denied access to water and basic sanitation facilities by the higher caste (Thakkar, 2016)

In urban areas, even now, marginal castes, and women, carry out functions related to sanitation. They have been functioning as sweepers and scavengers, creating a niche for them in the urban areas. Even after urbanization, and industrialization, people who were engaged in the occupation of scavenging, rag-picking, and sanitary work have been given a new identity in the urban society and are being named safai karamcharis, which sounds more secular and caste nuclear. However, the relationship of the marginal caste with the "unclean occupations" has not changed significantly. Traditionally engagement of marginal caste in sanitation work has been the primary reason for the practice of untouchability in India. However, caste relations and the practice of untouchability and stigmas associated with the marginal caste are still visible in urban India. (D'souza, 2016)

7.7. Conclusion

Swachh Bharat Abhiyan has much potential to bring positive change in the city, its waste management and promote anti-littering practices. The policy should be strengthened by adding more awareness and participation from all sections of the population. Caste, class, gender, and other inequalities should be taken care of, and the state should take more active steps the civil society to change the city. Waste has always been there, but the ways of handling and managing waste can be better with the help of policies and their practical implementation. Rather than using the policy to get more fame and vote banks, the political agency should be actively involved in making the city a better place to live for all without any discrimination and inequality.

Chapter 8

Theoretical Analysis

Waste and wasting are more related to power with the ability to classify, differentiate and eradicate while serving the interests of few. Waste is not something good or bad. Waste and wasting can be viewed as a technique of power. Here, “power” does not necessarily mean domination and coercion. Instead, things seem authentic, natural, and sound, and meanings are reproduced to fulfill interests (Liboiron & Lepawsky, 2022)**.** In quote Michel Foucault (1977), "Power produces; it produces reality; it produces domains of objects and rituals of truth" (194). Empirical research must examine popularly, expected, and familiar narratives about waste and wasting **(**Liboiron & Lepawsky, 2022). In this paper, we attempt to deconstruct the popular and shared narratives of household waste in Bhubaneswar, India.

The high level of municipal solid waste generation is a significant problem in Bhubaneswar. The issues are technical and involve political and 'social' aspects. Subsequent sections are based on the study's findings on the municipal solid waste issues in the city.

Waste issues in the city

The city dwellers face the problem of waste in the city. These issues range from improper disposal to piling waste on the streets and neighborhoods for weeks. These hampered the daily lives and health of the city dwellers due to the unpleasant environment and the spread of diseases. The nature of problems varied from every lane and area due to the varied socio-economic conditions of people. The city dwellers complained of irregular waste collection by the local governing authority and the lack of availability of dustbins in their localities. They expected the government to provide dustbins and regular waste collection services in this case.

City dwellers littered because of the lack of availability of dustbins. There was also a disparity in waste collection in the city as some of the wards and slums did not receive the service. In that case, they either burned or threw waste in the open space. There is a linkage between government efforts in waste management-related service delivery and citizen waste disposal behavior. The study also found the problem of poor segregation by the city dwellers, which led to lesser practices of composting and recycling.

To avoid any conflict with the neighbors, people restrained themselves from stopping people from littering. The problem of not accepting environmental responsibility leads to more waste generation through household littering and improper waste disposal. Ignoring human-non-human relationships is another factor of waste issues in the city. Non-humans (animals, birds, and rodents) are often blamed for creating nuisances in the city by spreading diseases and pollution. Lack of awareness of the cleanliness drive and government policies is another factor leading to waste issues. Here, both the state and the citizens are the causes for the failure of policy to bring behavioral change in the city.

8.1. Political, ecological analysis of waste issues in the city

Waste is not apolitical

In the city, waste-related issues have emerged due to political processes. The political process involves city dwellers, waste, non-human actors, and governing bodies. Here, non-humans are beings other than humans, including animals (dogs, cows, bulls), birds (crows and other bird species), and rodents who play significant roles in the city's waste management system. They are essential to be mentioned here as not only humans but non-humans were affected by poor waste disposal and management of waste. During interviews, the city dwellers often complained about the troubles caused by dogs, cows, bulls, and rodents.

To quote a respondent Priti a woman aged 43:

'Dogs are creating more problems for people in the lane. As they scatter waste already disposed of by people, the environment becomes further polluted. Even the touch of the dogs causes pollution. I stay away from them.

Rodents are everywhere. They cause a lot of trouble at my home. They eat vegetables and grains, making the entire house unclean with droppings. I have tried to catch them several times and kill them. Despite many attempts, they keep coming at night and trouble my family.

We worship cows and bulls. However, they cause problems to the city's environment by spreading waste while eating from it. This harms them as they die from ingesting plastics, polythenes, and other harmful objects discarded by humans. I feel sorry watching them eat from waste as there are no facilities for food and shelter for most of the cows and bulls in the city.'

Households generate waste from all the household activities such as cooking, cleaning, gardening, and shopping. Amongst all the activities, more amount of waste is generated from cooking. Hence, organic waste comprises a considerable portion of the total waste generated. The composition of the municipal solid waste in the city occurred peculiarly, where food waste comprised 50.50 percent, plastics nine percent, paper 10.50 percent, Metals one percent, and mixed 11.50 percent.

The method of waste disposal varied to a greater extent in the city. Fifty-seven percent of the city of the respondents gave their waste to BMC, seven percent kept the waste in the dustbin situated outside the home, 20 percent threw waste in the open spaces, one percent composted it, 14 percent burnt their waste, and two percent recycled their waste in order to dispose of it. Only seven percent of the respondents recycled their waste, and the rest, 93 percent, did not. Out of the total 200 respondents, only 34 percent of them composted the waste, whereas the rest, 66 percent, never composted.

Waste is not apolitical. Its presence in human society makes it political. The study used dialectical analysis to determine the winning and the losing party. Underprivileged sections of society with no access to resources are the losing party, and privileged sections of society, including higher-income families and politically empowered groups, receive the benefits of the waste management process in the city. There is the production of knowledge relating to solid waste through the policies. Here the role of the stakeholders, such as scientists, social activists, politicians, and citizens, is prominent. A better understanding of the environment emerges from the critique of everyday life (Loftus, 2012). The study studied the waste management behavior of households in their daily lives and analyzed the waste issues accordingly.

The centrality of municipal solid waste management to urban life means that its politicization is always more than service delivery. It is vital to the production of urban politics itself. How different actors see waste-related issues is a basis for understanding its relation to politics. Questions of issues relating to municipal solid waste are inseparable from the question of caste, class, gender, and social segregation. With social segregation, there is the reorganization of urban space. The lower class, the lower caste groups, and women as social groups face social segregation. The political ecology of waste brings the question of equality and urban social justice. How do different groups understand waste-related issues in the urban space? What solutions do they identify and why? These key actors include the state, women, lower class and caste population, and non-humans. The state tries to provide waste management facilities to city dwellers through door-to-door waste collection to improve awareness through awareness programs. However, due to evident inequality in the city, there is a low proportion of waste segregation at the household level, and waste collection is not one hundred percent, as some wards remain uncovered.

The lower class, the lower caste groups, and women as social groups face social segregation.

There is a latent conflict between higher- and lower-class city dwellers in the class group. As they both blame each other for the issue of waste, higher-class households have the upper hand as they can mitigate the problems because of access to resources. In contrast, the lower-class families suffer the most without the access to resources to change their conditions. Similarly, in the case of the caste, lower caste people were engaged in cleaning activities and worked as BMC workers to collect waste and clean roads. This shows the impact of caste on the urban sanitation and waste management system, where lower caste people are the sufferers of discrimination, leading to an unequal urban system.

Women face the issue of inequality in the household, as the burden of segregating and managing waste falls on their shoulders only. Even state authorities motivate women to segregate and participate in cleanliness drives organized by them. They demand equality at the household level. Similarly, non-humans face the atrocities of humans by being the silent sufferers. They face health issues and even death because of disposed unsegregated waste. As they do not have an agency, their roles in the urban ecosystem are ignored, and they are made invisible in the waste-related issues of the city. The study locates new trajectories for contestation and struggles for urban justice, new understandings of the urban condition, and new ways politics is forged. (McFarlane and Silver, 2017)

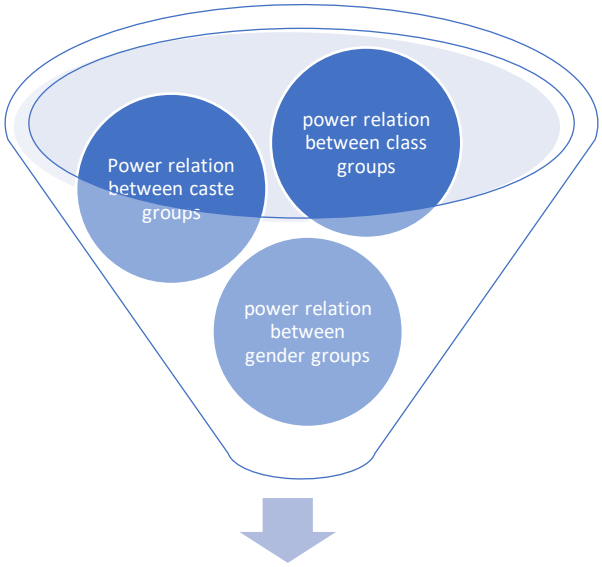
Marginalization and inequality

The political economy plays a vital role in society as it influences local activities and the environment through the social network. A division has been created in the urban space for waste management activities. Marginalized social groups such as women, lower caste, and lower class suffer due to improper waste management. These are shreds of evidence of inequality in the city. Only some actors are involved in making decisions in the city's waste management. Equal participation is absent. This creates a problematic situation for underprivileged communities who struggle for the resources to solve their problems.

There is the interplay of caste, class, gender, humans, non-humans, and waste. The consciousness of inequality has yet to develop among different social categories. The victims of discrimination have not yet identified the problem. Of course, this will take a long time to develop. However, the policymakers and governing authorities need to note these social aspects of municipal solid waste in the city and engage the social groups in decision-making accordingly.

Urban metabolism

Figure 8.1. Urban metabolism



Humans and their natural world are closely related to each other. The severity of municipal solid waste issues expresses that it is a hybrid (Latour, 1993), and the entire city undergoes the hybridization process. There is a continuous influx of material and energy inside the urban social system, which is producing more waste-related problems not only in terms of environmental issues, such as greenhouse gas emissions and high levels of waste creation, but also in terms of social issues, such as social inequalities, social injustice, etc. This process has

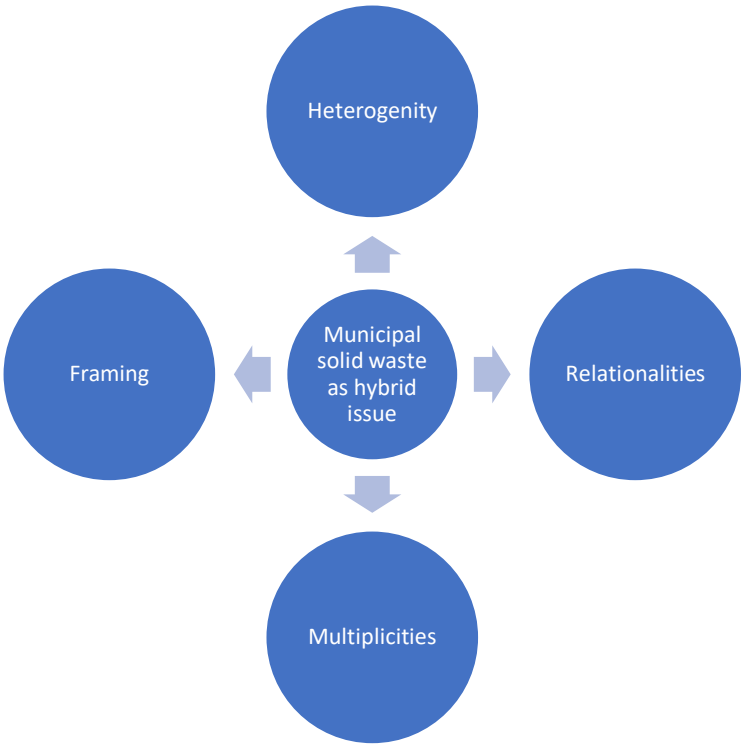
been identified as ‘urban metabolism’ (Swyngedouw,1996).

The real problem starts when the citizens and the urban local bodies, including other stakeholders, fail to identify the problem of municipal solid waste in the city. Not acknowledging the ownership of waste has led to the externalization of responsibility for waste management which worsens the situation. The study also finds that non-cooperation between the citizens and the governing bodies negatively impacts urban governance. The nature of urban life is politically complex, making it difficult to address risks and challenges through planning and policy intervention (Sclar & N. Volavka-Close, 2011)

8.2. Actor-network theory analysis of waste issues

Municipal solid waste is not external to individual actors but is associated and networked with them. This can be explained with a simple example of a city's waste management, where all actors, including the waste objects, are continuously shaping the lives of each other. There is a relationship between waste and city dwellers that is constantly evolving. The interconnectedness and association between the stakeholders are analyzed to reveal the concentration and distribution of power. The power is unevenly distributed because of inequality and the impact of the network. More extensive networks yield more gain and minor network yield loss. In the entire network, actors with more knowledge of the waste management process are the most powerful. The actors with limited knowledge are less powerful. This happens because the actors behave rationally and work consistently to maximize their benefits, which results in inequality. In order to explain the complex process involved in the 'social' aspect of waste in the city through (1) heterogeneity; (2) relationality; (3) multiplicity, and (4) framing (Law & Singleton, 2014).

Figure 8.2. Hybrid issue of municipal solid waste



Heterogeneity:

The physical and social aspects of waste denote the heterogeneous nature of waste-related issues in different locations of the city. It brings the nature/culture debate back into the discourse of waste. Waste-related issues are neither wholly natural nor entirely social. These aspects are difficult to be mapped, which makes it undoubtedly heterogeneous. In Bhubaneswar, there is no single cause of waste-related issues. State, city dwellers, and non-humans all give rise to multiple social factors of poor waste management. As a result, the city experiences urban flood, environmental pollution, social inequality, and injustice.

Relationality:

The practices of waste handling, disposal, and management, policy formulation all indicate the social dimension of waste issues. The relationality aspect of municipal solid waste refers to the association with the actors due to multiple factors. For example, in Bhubaneswar, poor

segregation of household waste is considered a significant obstacle to efficient waste management. Inadequate segregation is linked with the failure of policies as well.

(1). *Poor segregation*: Waste generated at the household level was not segregated efficiently, resulting in waste mixing, poor recycling, and reuse. In the city, only 0.50% of the respondents segregated waste, 78% did not segregate waste, and 21.50% did not understand what segregation meant and could not answer the question. To quote Amit a man aged 35:

> *'I do not have time to segregate waste. I just keep all waste in the single dustbin and give it to waste collectors when they arrive to collect waste'.*

(2). *Inadequate dustbins*: Why did the householders not segregate waste? Because of the unavailability of different dustbins such as one for glass materials, one for food waste, one for metals, one for plastic waste, etc. and, poor awareness level. In the city, all the respondents answered that the unavailability of dustbins was an essential factor in not segregating waste. They even appealed to government bodies to provide more dustbins in every city lane.

To quote Bina, a woman aged 59:

> *'We need a big dustbin near our lane. If the government wants us to segregate, they should give us different dustbins for different types of waste. Forget about different dustbins; we do not have a single dustbin to discard waste.'*

(3). *Lack of awareness*: Understanding the use of different dustbins and their benefits needs awareness among the householders, which was not evident throughout the study. The respondents did not understand why they needed to segregate their waste.

(4). *Inadequate waste collection*: BMC could have collected and treated unsegregated waste, and the service delivery could have been more efficient, but it was absent in some regions located at the periphery.

(5). *Difficulty in segregation and recycling*: When a massive amount of waste remains unsegregated and is collected together, it becomes almost impossible on the part of the service

provider to segregate and recycle or compost them because of the variability of the nature of waste.

(6). *Non-acknowledgement of waste-related issues*: Despite the above difficulties, the householders and the local body never acknowledged the problem of waste. This was done intentionally to showcase the city's cleanliness and efficiency. The residents even tried to blame their neighbors and the lower-class people for disposing of waste improperly and creating chaos in the city. To quote Sunita, a woman aged 32:

> *'I always clean my surroundings, but my neighbors always dump waste in the locality. Whenever I asked them not to do it, there was a quarrel. Hence, I have stopped saying anything to them.*

(7). *Political relation*: The problem of waste remained a problem of the lower class people as it is believed to be emerging from there (like city slums). Waste collection and management are systematically organized in the apartments and duplexes where higher-class families live. The blame for waste generation falls on the lower-class people. Again on the part of the local body, the non-availability of data on waste generation, segregation, recycling, and reuse in the city shows the political interest in manipulating the reality of waste.

(8). *Swachh Bharat Abhiyan* (Clean India Campaign): In the name of the policies to change the behavior of the lower class people, publicity stunts were done by the higher class and privileged groups through Swachh Bharat Abhiyan (Clean India Campaign). This made the policy ineffective, and no fundamental changes were brought to the city and its municipal solid waste problems. In the city, forty-four percent of the respondents replied that the policy was effective in reducing littering in their locality, 13 percent answered that it was very effective, and 19 percent said they could not speak about the effectiveness of the policy in their locality. Twelve percent said it was ineffective in reducing littering in their area, 12 percent answered that the policy was effective only to some extent, and only one percent of the respondents had yet to

respond.

More such associations exist with non-governmental organizations, informal waste recycling centers, and industries, but the network is already heterogeneous. The above network expresses how individual actions, bureaucracy, economy, and politics are interlinked and adds to the political and ecological analysis of the city's waste-related issues. This takes the analysis to an advanced level of understanding of the heterogeneity of city life.

Multiplicities:

ANT in urban space proves that waste management is not at all homogenous. After conducting the ethnographic study, it was found that the government's policy to ensure cleanliness only worked equally in some of the places of the city. Hence, the policy is heterogenous, and a set of heterogeneous practices varied in multiple locations (Law & Singleton, 2014). Through the practices of relationalities, multiple realities have been formed at different times in the city, which denotes 'ontological multiplicity' (Mol, 2002). This means that waste issues are different realities for actors, including householders and local government. It represents the fluidity in reality. For example, caste is the dynamic aspect of modern urban space. Not acknowledging caste is the efficient tool of the privileged upper caste to erase the 'caste system' in Indian society. Caste-based discrimination is essentially a feature of Indian urban space which can not be denied. Removing caste-based inequalities has not been the goal of the urban local government in the city; instead, the existence of caste has been denied by the powerful actors of the city.

Nevertheless, political activities have indeed revived the caste system. Caste-related issues must be included in the city's and state's developmental and waste management policies (Mosse, 2018).

Similarly, the fluidity of class and gender impacts urban space in the modern age. We can relate

such instances to feminist material semiotics, developed by Donna Haraway, where she explores the tensions and political agendas embedded in practices (Haraway 1991a, 1991b, 1997). Even if all these practices are material, they are semiotically inflected, performative, and political. These material-semiotic practices carrying agendas (for instance, of gender, class, and ethnicity) are naturalized and treated as expressions of nature that might be contested. Further, this naturalization conceals the practices' primary political character, associated conflict, and dominating nature. With theoretical analysis, these political natures of the practices are exposed, and alternatives are proposed as solutions, and 'feminist cyborg' is one such example (Haraway, 1991a). In the city, in the context of managing household waste, women are considered the primary actors responsible for doing household chores and segregating and disposing of waste, even if all the household members contribute equally to waste generation. Along with that, governing authorities encourage women to segregate and give waste to the waste collectors early in the morning. To quote Anita, a woman aged 36:

> *'In my family, nobody segregates waste. I am also responsible for discarding waste and giving it to the waste collectors. My husband and in-laws get upset if I do not perform the task'.*

Framing:

Now coming to the policy aspect of the city and the state, to reduce waste-related issues, Swachh Bharat Abhiyan (Clean India Campaign) was introduced, public spaces were cleaned up, and educational and health institutions participated. Political leaders and privileged members of society came up to clean the city's streets with brooms. Awareness campaigns were held to sensitize people to maintain cleanliness in the surroundings. Women were trained to take the responsibility of cleaning. Both the electronic and social media highlighted the progress of the cleanliness campaign by the center and the local government. The research was

conducted, and articles were published on the success and failure of the policy in bringing behavioral and infrastructural change to the city. Because of the notion of a single reality of urban issues, single policies were framed to deal with that. (Law and Singleton, 2014). Cities were declared clean with efficient waste management, yet the problems remained unchanged.

8.3. Conclusion

Educating citizens about the political nature of waste is essential to bring consciousness among them. Knowledge about the issue and waste management in the urban areas will give the citizens of lower socio-economic backgrounds or lower castes an edge over the power holders. Understanding the issues, discrimination, and hierarchy in the urban space is vital. This will empower them, and they can raise their voices against the prevailing inequality. Waste brings gender discrimination when there is no equal sharing of responsibility. If all are engaged in waste generation, then the responsibility of segregating, disposing, and handling waste should not be the sole responsibility of women. Equality starts at home. Hence an equal responsibility should be there. Making lower caste members conscious about their situation and providing them human rights is needed as they have been historically discriminated against and subjugated by the higher caste and the so-called privileged social groups.

Environmental justice is to be delivered through government policies. Policies must be explicitly designed as per the context and nature of the municipal solid waste issues. Heterogeneity, multiplicity, and relationality aspects should be researched well before framing any such policy and implementing that. Waste-related issues should be viewed as something other than technical; their political and social nature should be highlighted through research. Political support is essential for this by increasing funding for awareness of Swachh Bharat Abhiyan and other policies.

In this research paper, both theories have been harmonized from a social science perspective in the waste study. All the actors, including humans, non-humans, and networks, have been undertaken as the units of analysis. The interconnection between actors and networks and existing political relationships in the waste management process have been dismantled using both theories. A special connection between the theories lies in the fact that both of them link local with global. Waste handling and disposal practices of households in a specific area of the city hugely impact the waste management process of the city as it is networked with the other actors and their actions.

Similarly, waste collection services provided by the local bodies and irregularities influence the other actor's behavior and the entire waste management process. With more focus on inequalities and power relations, the theories help understand the hidden realities of the city's waste-related issues. 'There is no such thing as a single reality; (2) realities cannot simply be dreamed up but take work and care (climate change deniers, please note); and (3) realities and politics or normativity are all wrapped up together (Law & Singleton, 2014, p.392)

Analyzing 'assemblages' of humans and non-humans establishes the political nature of waste (Rath &Swain, 2022). There is manipulation involved by the actors for the fulfillment of their interests. There is indeed a chain of explanations for the city's waste problem. The role of the actors, such as households, local bodies, non-governmental organizations, and the informal sector, is prominent. However, all these actors' relationship is the analysis's center. Poor implementation of waste management regulations is not due to poor service delivery by the local bodies; instead, it reveals the vested interest of the higher class groups. These actors shape the flow of waste and its management.

Chapter 9

Conclusion

*Nature can no longer be understood outside of society or society outside of nature. In advanced modernity, a society with all its subsystems of the economy, politics, culture, and the family can no longer be understood as autonomous of nature (*Beck, 1992).

This final section summarizes the findings and comments on what has been learned through the research. The broader implications of the work are also remarked upon. The chapter signs off with paving ways for some areas for further research.

Waste has disguised itself as a complex and hybrid phenomenon in the modern world. It indicates further that waste related issues do not have a single cause, process or result, rather there are varied actors, causes, processes and results involved. The concept of hybrid has been borrowed from Latour (1993) to emphasize the complexities involved and to understand the phenomena in the current world. It also denotes entangling relationship between human, non-human actors with reference to waste and waste management. In the thesis, we attempted to showcase the current social aspect of municipal solid waste in Bhubaneswar. After introducing the methodology in the theoretical perspective chapter, use of political ecology and actor-network theory to study waste-related issues in the urban space was advocated. The fourth chapter discussed the respondents' socio-demographic profile and their linkage with the nature and type of waste generated by the households. The waste segregation pattern among the households and its dynamic was explained in the fifth chapter. In the sixth chapter, littering and its causes in the city with a detailed ethnographic account were discussed. In the seventh chapter, Swachh Bharat Abhiyan's impact on city household littering was mentioned. In the eighth chapter, a theoretical analysis of the research has been provided.

In the thesis, it was argued that waste segregation is low compared to waste generation in the city, making waste management difficult for city administrators and governors. Again, in waste segregation, there is gender, caste, and class aspect. No association was found between socio-demographic features and waste segregation. Waste segregation is a social practice that comes with accepting individual responsibility. However, the state must ensure more segregation and proper waste management. The state need not be gender biased while framing policies or preparing awareness campaigns. Segregation is a task to be done by all, irrespective of gender, caste, class, and age.

The research revealed an association between the socio-demographic profile and the nature and type of municipal solid waste generated by the households. Along with all this association, the empirical findings connect with the macro social processes in the city. The actions of the households are involved in the grand social processes that result in not only conflict and inequality between various social groups but also interconnections, interdependence, and networks. They are active agents in the metabolic process going on in the city.

The causes of littering by people give a deeper insight into the issue. Lack of availability of dustbins, laziness, and habit were the primary causes of littering. Families from lower socio-economic backgrounds are blamed for littering more and creating societal disorder. In the city, slums were perceived as the most littered and uncleaned areas by the residents, which does not provide an accurate picture of the littering problem in the city. Lack of access to resources was a stumbling block on the road to a clean and unlettered city for people from lower socio-economic backgrounds. Along with them, non-humans also suffered accusations and hate for littering the city. Littering caused latent conflict between different social groups.

There has been no significant impact of the SBA policy on the littering behavior of households in the city. The awareness level is also not one hundred percent, as some people do not understand the policy. There is more political aspect to the policy. The socio-economic

background of the city dwellers played a vital role in their awareness level and overall impact. The problem grew robust due to the non-acknowledgment of responsibility for waste generated. Even if the policy was declared effective, the situation remained unchanged.

The research found waste-related issues and the city as a hybrid. The invisible life of a city is made visible because of the constant production of hybrids (Zimmer, 2010). The ethnography that has been discussed has met the point that hybrids are formed by various biological, physical, and cultural factors and by people's social practices and relationships (Swyngedouw et al., 2002; Swyngedouw, 2004). The analysis has contributed to showing how the three essential aspects of hybrids — the material, commodified, and constructivist dimensions — are mediated through human social relations and the relationship of humans with nature (Becker & Jahn, 2006).

Cities are, without doubt, complex centers of cultural and ethnic interactions which establish the ideal setting for achieving sustainable development (Prato & Pardo, 2013). This goal is regarded as central by the United Nations and individual countries and depends on urban policies resulting in peace, justice, and prosperity for all. In many cases, it has been elusive because urban policies have failed to take into account the historical, social, cultural, and political trajectory of the cities under consideration and have consequently failed to address critical issues, including socio-economic disparities, security and severe environmental and health problems issues (Pardo, 2011; Pardo et al., 2020). As shown by Pardo's ethnography on uncollected rubbish in Naples (2022), effective waste management is one of these critical issues. The case of Bhubaneswar exemplifies how this issue is intricately related to better health care, economic and social equality, and the protection of the rights of all citizens. Addressing this interaction and the underlying views, values, and identity of the people on the ground is a priority that qualifies broader policies and governance that respect democratic principles and citizenship rights (Pardo et al., 2020).

To work effectively, a democratic country needs a good relationship between governance, citizenship, and the law. For this to happen, governance and the law must abide by fundamental democratic principles and refrain from following particular interests (Pardo, 2011). We did not participate in the local social conflict during the ethnographic study. Instead, we tried to understand what was going on from the residents' perspective and find out the nature of the waste issue, the associated class conflict, and the connections among the various social groups involved. Ineffective policies must be revisited, and appropriate changes must be made with the resident's participation in the city's development. Negotiation and coordination among all the relevant stakeholders are essential to resolve this issue. Critical actors in this process are the lower-class residents, marginalized gender groups, and lower caste groups without the power to change the waste narrative. The research findings on waste and the associated conflict make visible latent aspects of the waste problem and local power relations that were previously invisible; they may contribute to an understanding of this situation. They may enable policy advocates and social activists to question governmental bodies and other authorities about the effectiveness of their policies and actions.

Why researching the social context of solid waste is essential?

The research has challenged the conventional thinking of natural and social scientists on waste and waste issues in the city. The thesis revises how the problem of municipal solid waste and the entire waste management process can be understood and solved in the present context. The study has the potential to provide insight into the existing political and ecological power dynamics in waste management. Waste segregation behavior and the difference in such behavior across households can help solve the problem of waste generation at the initial stage. The underlying cultural and social influences in littering have been highlighted. It will help to formulate the policies in line with future recommendations. The study also aims to bridge the gap between micro and macro perspectives by linking individual behavior with institutional

policies.

The central findings of the research and their implications in terms of urban life and governance.

The thesis provides a pragmatic way to study waste and waste management issues in the urban space of Bhubaneswar with the combined lens of political ecology and actor-network theory. The theoretical approach to the problem is backed by urban ethnography. The study established relationship among key actors such as city dwellers, state, non-humans, and waste itself. City dwellers through their day-to-day activities and interactions are playing a pivotal role in waste generation in the city. Through the ethnographic study, we tried to understand the residents' perspective and find out the nature of the waste issue, the associated class conflict, and the connections among the various social groups involved. The research findings on waste and the associated conflict make visible latent aspects of the waste problem and local power relations that were previously invisible.

State on the other hand is trying to manage the waste generated by promoting more segregation and formulating policies. These policies of the state do not include the marginalized communities of different class, caste and gender as a result, these are serving the interests of the privileged communities and resulting in further marginalization of the marginalized communities. Non-humans on the other hand are existing without any agency and are the victims of non-inclusive policies and due to the (in)actions of the city dwellers and the civic authorities.

The research has brought new dimensions to understanding waste issues in the urban space. It urges the policy makers and governing bodies to understand the dynamics of urban issues first before formulating any policy to bring positive changes in urban life and governance. There is a need to appoint social scientists who can offer evidence based inputs and help devise more inclusive and appropriate plans to solve the urban problems. Urban life is changing fast, and so

are the urban issues. The problem of waste in the urban space is more complex and hybrid in nature, and the involvement of different stakeholders demands better solutions for all. Negotiation and coordination among all the relevant stakeholders are essential to resolve this issue. Critical actors in this process are the lower-class residents, marginalized gender groups, and lower caste groups without the power to change the waste narrative. A one size fits all approach is not serving the purpose. More focus should be on the need of various stakeholders and their problems. Ineffective policies must be revisited, and appropriate changes must be made with the resident's participation in the city's development.

Theoretical implications

Urban ethnography has helped us incredibly in gaining deeper insights into urban waste problems. Urban dwellers' voices, perceptions, problems, and queries have been understood and narrated. The qualitative approach to the problem has brought excellent results. The study bears testimony to a pragmatic approach to understand urban social problems. Studying waste-related issues through theoretical pluralism has adequately justified the efficacy of urban ethnography as a tool to understand complex urban issues.

Despite more development and growth, equality and justice have not been achieved. Traditionally existing inequality and injustice still prevail even in the area of waste and waste management. The government has framed policies to give an illusion of equality and justice. However, the research has brought to light class-based inequality and political injustice, which are still perpetuated without the knowledge of marginalized communities.

9.1. Contribution of the study

The study extends disciplinary knowledge by contributing to understanding the social aspects of municipal solid waste in Bhubaneswar, which will help further studies in other cities. The modern globalized world and waste as its output can be analyzed through the theoretical lens of political ecology and actor-network theory. The study has also contributed to the literature

on political ecology, urban studies, environmental sociology, and waste studies and suggested ways to improve the situation in the city.

The study has brought up the sociological aspects of waste issues in the urban space, which have largely been understudied. Venturing into a new social problem that has not been studied sociologically before has contributed to the literature on the sociology of waste in India. The study suggests that waste problems can be sociologically analyzed using existing theories. Also, new theories can be built through more grounded research in different urban spaces worldwide. The study also adds to urban sociology, social stratification, hierarchy, inequality, social exclusion, power, politics, and the state.

The ethnography of urban waste contributed to this crucial field by understanding urban political ecology. Waste is an integral part of human life. There is nothing dirty and unclean about waste. Cleanliness and uncleanliness are subjective and culturally idiosyncratic and interdependent concepts. The concept of uncleanliness itself carries within the concept of cleanliness. The pristine state of mind and the clean spaces humans are searching for are there, within the waste, the dirt, the trash, and the rubbish. What may seem like a paradox is a reality.

9.2. Study limitation

- The study cannot be applied to a general population outside Bhubaneswar. The study can be further extended to a larger population.

- The study's findings cannot be generalized to primarily populated cities of India or any city across the globe. As the cities are believed to have peculiar features that vary across the cities, the findings cannot be made applicable to other studies.
- Similarly, the sample size of the current study is only 200, and more studies can be conducted with more sample sizes in cities.
- Future research can also be done using different analysis techniques such as spatial and temporal analysis.
- The research faced time and financial constraints, which could have provided better in-depth results.

9.3. Recommendation for future research:

More research should be carried out in the sociology of waste, where waste should not be viewed merely as an object but as an active actor in the social process or social system of rural or urban communities across the globe. We wish more studies and research are carried out on the social aspect of non-human lives and interaction with human society. Such research will enrich the literature on the sociology of waste, urban studies, and the sociology of the environment. It will help the urban planner and governance system frame better policies and laws for a better future for all. In short, this will give a big push to sustainable development, and issues relating to the environment will be researched sociologically by social scientists. Further research can be done using a large sample across the major cities of India, and comparative analysis can be made regarding the waste network and political ecology.

Policy implications:

- Generating knowledge about power structure inherent in waste management process through more research.
- Making same knowledge accessible to all.

- Empowering underprivileged through education and improving their socio-economic conditions.
- The city government should focus more on efficient service delivery to the citizens. The waste collection should be regular and systematic.
- Citizens should be aware of the emergency of segregating waste at the source.
- Regulation should be strict enough to make people abide by and maintain disciplined and systematic waste management.
- The city government and citizens should be aware of the other non-humans living in the city and ensure that waste-handling practices do not harm them in any way.
- The citizens and the governing bodies in daily activities and the governance system of the city should prioritize humanism and equality.
- Every stakeholder needs to be careful about the sustainability of the urban ecosystem and should ensure that it does not overburden the urban metabolism.
- The state should take care of injustice and inequality in waste management.
- Waste management should not be merely a political agenda; it should include certain ethical practices in daily life.
- The state, NGOs, and private bodies should encourage household waste segregation as an essential part of waste management.
- The environmental issues need to be researched in different contexts and scales using different methodologies to discover the existing relationships, differences, and power structures that will help understand the connection among the different factors. Those connections are not simply linear but are multidirectional and dialectical.
- Swachh Bharat Abhiyan should be strengthened by adding more awareness and participation from all sections of the population.

- Caste, class, gender, and other inequalities should be taken care of, and the state should take more active steps the civil society to bring change in the city.
- State and NGOs should initiate sensitization about waste segregation through education and campaigns.
- The state should provide separate dustbins to promote waste segregation in every locality.
- Political will on the part of the government to bring change in the city's waste management system.
- Financial penalties must be imposed to discourage people from disposing of their waste improperly.
- Community participation in awareness programs should be encouraged.
- Waste collectors should demand to collect segregated waste only.
- There is a need for convergence, coordination, and linkage with other departmental activities to reduce the amount of waste generation.
- The state should promote the use of low-cost and environment-friendly technologies.

A change in the city's current situation is required. However, an issue can be resolved if it can be understood. A person cannot change anything that he/she does not understand. There is a relationship between understanding and change. If humans do not understand impossibility properly, all the technological developments to tackle waste are futile and will help aggravate waste-related issues. 'It is the horrifying specter of disposability – of redundancy, abandonment, rejection, exclusion, wastage- that sends us to seek security in a human embrace' (Bauman, 2004, p. 131)

Humans need to understand waste and the plight of the disposable world and become compassionate to bring change. Waste is simply a mirror of our failures, violence, and

selfishness. It is not the end; the waste also mirrors more opportunities for transformation. Humans should not run away from the reality of waste, but take a step forward to bring appropriate behavioral changes. They need to give up the ideas and values of hierarchies and inequalities, high and low, and make themselves better creatures who understand their fellow beings (Kennedy, 2007). They also do not need to leave this planet; rather, they must be mindful and careful about other beings. Waste presents an opportunity to rethink the perils of our own existential and ontological failures. After we have understood how we have treated other worldly beings, we can realize the importance of harmonious coexistence and a clean and sustainable environment.

References:

3i Network Infrastructure Development Finance Company. (2009). *India Infrastructure Report*. Oxford University Press.

Afroz, R., Rahman, A., Masud, M. M., & Akhtar, R. (2017). The knowledge, awareness, attitude and motivational analysis of plastic waste and household perspective in Malaysia. *Environmental Science and Pollution Research, 24(3),* 2304–2315. https:// doi.org/10.1007/s11356-016-7942-0

Agarwal, B. (1992). The Gender and Environment Debate: Lessons from India. *Feminist Studies. 18(1),* 119–158. https://doi.org/10.2307/3178217

Agarwal, R. Choudhary, M. & Singh, J. (2015). Waste Management Initiative in India for Human Wellbeing. *European Scientific Journal.11,* 105–127.

Agyeman, C. M., Badugu, D., & Amoah-Binfoh, K. (2017). Towards Swachh Bharat; Consumers' Demographic Variables as Catalysts in the Effective Communication of the Campaign. *International Journal of Research in Social Sciences. 7(1),* 350-372.

Ahluwalia, A. and Patel, U. (2018). *Working paper no.356, Solid waste management in India, an assessment of resource recovery and environmental impact.* Indian Council for Research on international economic relations.

Alexander, J. (1993). *In Defense of Garbage*. Praeger.

Ali, N. E., Siong, H. C., Zainol, H., & Mohd Talmizi, N. (2017). Socio-Demographic Influencing Behaviour against Solid Waste Minimisation in Shah Alam City, Malaysia. *Environment-Behaviour Proceedings Journal, 2(6),* 53.

Anderson, C. (2010). Sacred Waste: Ecology, Spirit, and the American Garbage Poem. *Interdisciplinary Studies in Literature and Environment.17(1),* 35–60. https://www.jstor.org/stable/44087623

Appadurai, A. (1986). *The social life of things: Commodities in cultural perspective*. Cambridge University Press. https://doi.org/10.1017/CBO9780511819582

Asmui, M. U., Zaki, S. M., Wahid, S. N. S., Mokhtar, N. M., & Harith, S. S. (2017, May). Association between litterers' profile and littering behavior: A chi-square approach. In *AIP Conference Proceedings.1842(1),* 030003, AIP Publishing LLC.

Ayomoh, M. K. O., Oke, S. A., Adedeji, W. O., & Charles-Owaba, O. E. (2008). An approach to tackling the environmental and health impacts of municipal solid waste disposal in developing countries. *Journal of environmental management*. *88(1),* 108-114.

Babaei, A. A., Alavi, N., Goudarzi, G., Teymouri, P., Ahmadi, K., & Rafiee, M. (2015). Household recycling knowledge, attitudes and practices towards solid waste management. *Resources, Conservation, and Recycling*, *102*, 94–100.

Babbie, E. (2007). *The Practice of Social Research*. Cengage Learning.

Balasubramanian, M. (2015). Economics of Solid Waste in India. *Economic and Political Weekly*, *50(25),* 17–20.

Balasubramanian, M. (2018). Municipal solid waste management in India: status, problems and challenges, *Int. J. Environment and Waste Management*, *21(4*), 253–268.

Ballatore, A., Verhagen, T. J., Li, Z., & Cucurachi, S. (2022). This city is not a bin: Crowd mapping the distribution of urban litter. *Journal of Industrial Ecology*. *26(1),* 197-212. https://doi.org/10.1111/jiec.13164

Banerjee, A. N., Banik, N. and Dalmia, A. (2017). Demand for Household Sanitation in India Using NFHS-3 Data. *Empirical Economics*. *53 (1),* 307–327. doi:10.1007/ s00181-017-1250-5

Barclay, Francis P., Shamala R, Boobalakrishnann & Gouda, Nikhil. (2020). Clean India Campaign: Awareness, Adoption, Usage, and Barriers. *Journal of Media and Communication*. *4(2),* 72–97.

Barnes, B., & Bloor, D. (1982). Relativism, rationalism and the sociology of knowledge. In M. Hollis & S. Lukes (Eds.), *Encyclopedia of scientonomy* (pp. 21–47). MIT Press.

Baudrillard, J. (1998). *The Consumer Society*. Sage Publications.

Bauman, Z. (2004). *Wasted Lives: Modernity and its outcasts*. Polity press.

Baxter, J. (1992). Power attitudes and time: The domestic division of labour. *Journal of Comparative Family Studies*, *23*(2), 165-182.

Beck, U. (1992). *Risk Society, Towards a New Modernity*. Sage.

Beck, U. (2009). Critical theory of world risk society: A cosmopolitan vision. *Constellations, 16(1),* 3–22. https://doi.org/10.1111/j.1467-8675.2009.00534.x

Becker, E. and Jahn, T. (2006). *SozialeÖkologie. GrundzügeeinerWissenschaft von den gesellschaftlichenNaturverhältnissen*. Frankfurt: Campus.

Beede, D. N. & Bloom, D. E. (1995). The Economics of Municipal Solid. *The World Bank Research Observer. 10 (2),* 113–150.

Behera, M. R., Pradhan, H. S., Behera, D., Jena, D., & Satpathy, S. K. (2021). Achievements and challenges of India's sanitation campaign under clean India mission: A commentary. *Journal of Education and Health Promotion*, *10,* 350.

Bhaskar, R. (1975). *A reality theory of science*. Routledge.

Bilitewski, B. (1997). *Waste Management*. Springer.

Birhanu, Y. & Berisa, G. (2015). Assessment of Solid Waste Management Practices and the Role of Public Participation in Jigjiga Town, Somali Regional State, Ethiopia. *International Journal of Environmental Protection and Policy. 3(5),* 153-168**,** doi: 10.11648/j.ijepp.20150305.16.

Blaikie, P., & Brookfield, H. (1987). *Land degradation and society*. Routledge.

Blumberg, L., & Gottlieb, R. (1989). *War on waste: Can America win its battle with garbage?* Island Press.

Bowler, I. R. (1999). Recycling urban waste on farmland: An actor-network interpretation. *Applied Geography, 19(1),* 29–43. https://doi.org/10.1016/S0143-6228(98)00033-2

Braje, T. (2015). Earth Systems, Human Agency, and the Anthropocene: Planet Earth in the Human Age. *Journal of Archaeological Research*. *23(4),* 369-396

Brandt, P., Ernst, A., Gralla, F., Luederitz, C., Lang, D. J., Newig, J., Reinert, F., Abson, D. J., & von Wehrden, H. (2013). A review of transdisciplinary research in sustainability science. *Ecological Economics, 92,* 1–15. https://doi.org/10.1016/j. ecolecon.2013.04.008

Brantlinger, P., & Higgins, R. (2006). Waste and Value: Thorstein Veblen and HG Wells. *Criticism*. *48(4),* 453–475.

Brownell, E. (2011). Negotiating the New Economic Order of Waste. *Environmental History*, *16(2),* 262–289.

Bryant, R. L. &Bailey, S. (1997). Third world political ecology. Routledge.

Burns, R.B. (2000). *Introduction to research methods*. Sage publication.

Castells, M. (2009). *Communication power.* Oxford University Press.

Census of India. (2011). *General Population Table*. Office of the Registrar General & Census Commissioner, India. https://censusindia.gov.in/census.website/data/population-finder

Central Pollution Control Board. (2017). *Consolidated Annual Review Report on Implementation of Solid Wastes Management Rules 2016*. Ministry of Environment, Forest and Climate Change, New Delhi.

Central Pollution Control Board. (2020-21). *Annual Report on Solid Waste Management*. Delhi.

https://www.cpcb.nic.in/uploads/MSW/MSW_AnnualReport_2020-21.pdf

Clemons, J. (1998). Emerging from sewage and waste: a postmodern landscape. *Yearbook of the Association of Pacific Coast Geographers. 60,* 9–21. https://doi.org/10.1353/pcg.1998.0007

Cohen, B. H., & Lea, R. B. (2005). Essentials of Research Design and Methodology, John Wiley & Sons, Inc.

Cordella, A., & Shaikh, M. (2006). *From epistemology to ontology: Challenging the constructed 'truth' of ANT (Working Paper Series no. 143).* London School of Economics. http://doi.org/10.13140/RG.2.1.1546.5367

Cornea, N., Véron, R., & Zimmer, A. (2017). Clean city politics: An urban political ecology of solid waste in a small city in West Bengal, India. *Environment and Planning A: Economy and Space, 49(4),* 728–744. https://doi.org/10.1177/0308518X16682028

CPCB and NEERI. (2004-05). *Waste Generation and Composition*. New Delhi.

CPCB. (2020-21). *Annual Report 2020-21 on Implementation of Solid Waste Management Rules, 2016*.

Crooks, H. (1993). *Giants of Garbage: The rise of the global waste industry and the politics of pollution control*, Lorimer.

Cross, G. (2000). *An all-American century: Why commercialism won in modern America*. Columbia Press.

Crump, S. L., Nunes, D. L., & Crossman, E. K. (1977). The effects of litter on littering behavior in a forest environment. *Environment and Behavior*. *9(1),* 137–146.

Csevár, S. (2021). Voices in the Background: Environmental Degradation and Climate Change as Driving Forces of Violence Against Indigenous Women. *Global Studies Quarterly*. https://doi.org/10.1093/isagsq/ksab018

Curtis, V. (2019). Explaining the outcomes of the cleanthe India'campaign: Institutional behavior and sanitation transformation in India. *BMJ global health*. *4(5)*, e001892.

Dandabathula, G., Bhardwaj, P., Burra, M., Rao, P. V. P., & Rao, S. S. (2019). Impact assessment of India's Swachh Bharat Mission–Clean India Campaign on acute diarrheal disease outbreaks: Yes, there is a positive change. *Journal of family medicine and primary care*. *8(3),* 1202.

Das, S. (2014). Estimation of Municipal Solid Waste Generation and Future Trends in Greater Metropolitan Regions of Kolkata, India. *Journal of Industrial Engineering and Management Innovation*. *1(1),*31–38.

Datta, A., & Satija, S. (2020). Women, Development, Caste, and Violence in rural Bihar, India. *Asian Journal of Women's Studies. 26(2)*, 223-244.

Dauvergne, P. (2008). *The Shadows of Consumption*, MIT Press.

Delphy, C. (1993). Rethinking sex and gender. In *Women's Studies International Forum, 16(1),* 1-9.

Diwakar, Y. (2018). *What drives Segregation of Household Municipal Solid Waste? A Case in Powai*. Course Project as a part of US 603 Course. IIT Bombay.

Donohue, K. (2003). *Freedom from want: American liberalism and the idea of the consumer*. Johns Hopkins University Press.

Doron, A. & Jefferey, R. (2018). *Waste of a Nation: Garbage and Growth in India*. Harvard University Press.

Douglas, M. (1966). *Purity and Danger: An analysis of concepts of pollution and taboo*. Routledge.

D'souza, P. (2016). Clean India, Unclean Indians Beyond the Bhim Yatra. *Economic and Political Weekly*. *51(26/27)*, 22- 25 https://www.jstor.org/stable/44004502

Dumont, L. (1980). *Homo hierarchical: The caste system and its implications*. University of Chicago Press.

Ekbladh, D. (2010). *The Great American Mission: Modernisation and Construction of an American World Order*, Princeton University Press.

Enger, M. (2004). *Designing America's waste landscape,* Johns Hopkins University Press

Escobar, A. (1996). Construction nature, elements for a post-structuralist political ecology. *Futures, 28(4),* 325–343. https://doi.org/10.1016/0016-3287(96)00011-0

Faber, D. (1993). *Environment Under Fire: Imperialism and the Ecological Crisis in Central America*, Monthly Review Press.

Foote, S., & Mazzolini, E. (2012). *Histories of the dustheap: Waste, material cultures, social justice.* MIT Press.

Forsyth, T. (2008). Political ecology and epistemology of social justice. *Geoforum, 39(2),* 756–764. https://doi.org/10.1016/j.geoforum.2006.12.005

Foucault, M. (1977). *Discipline and Punish: The Birth of the Prison*. New York: Vintage

Fruitema, M. L. (2015). *A Political Ecology of Solid Waste Management in Niadub, Panama.* Doctoral Thesis, University of Miami. https://scholarship.miami.edu/discovery/fulldisplay/alma99103147960502976

Gascon, G. (2018). Food waste: A political ecology approach. *Journal of Political Ecology, 25(1),* 587–601. https://doi.org/10.2458/v25i1.23119

Geller, E. S. (1982). *Preserving the environment: New strategies for behavior change*. Pergamon Press.

Gille, Z. (2010). Actor networks, modes of production, and waste regimes: Reassembling the macro-social. *Environment and Planning A: Economy and Space, 42(5),* 1049– 1064. https://doi.org/10.1068/a42122

Girling, R. (2005). *Rubbish! Dirt on our hands and crisis ahead*. Eden Project Books.

Goffman, E. (1959). *The presentation of self in everyday life*. Anchor.

Government of India. (2009). *Position Paper on the Solid Waste Management Sector in India*, Department of Economic Affairs, Ministry of Finance, New Delhi**.**

Government of Odisha. (2023). *Environmental Synthesis report of Odisha*.

Greene, J. C., Caracelli, V. J., & Graham, W.F. (1989). Toward a Conceptual Framework for Mixed-Mehod Evaluation Designs. *Educational Evaluation and Policy Analysis*. *11,* 255–274.

Grover, P., & Singh, P. (2014). An analytical study of the effect of family income and size on per capita household solid waste generation in developing countries. *American Research Institute for Policy Development*, *3(1),* 127–143.

Hammed, T.B., Sridhar, M.K.C., & Wahab, B. (2016). Enhancing Solid waste Collection and Transportation for Sustainable Development in the Ibadan Metropolis, Nigeria. *European Journal of Research in Social Sciences. 4(7),* 23-32.

Hansmann, R. & Scholz, R.W. (2003). A two-step informational strategy for reducing littering behavior in a cinema. *Environment and Behaviour*. *35,* 752-762

Haraway, D.J. (1991a). A cyborg manifesto: Science, technology, and socialist feminism in the late twentieth century. In D.J. Haraway (Eds.), *Simians, cyborgs, and women: the reinvention of nature* (pp. 149-181). Free Association Books.

Haraway, D.J. (1991b). Situated knowledge: The science question in feminism and the privilege of partial perspective. In D.J. Haraway (Eds.*) Simians, cyborgs, and women: the reinvention of nature [online]* (pp. 183-201). Free Association Books.

Haraway, D.J. (1997). *Modest_witness@second_millennium.female_man ©_meets_oncomouse™: feminism and technoscience*. Routledge.

Harcourt & Bernard E. (2001). *The illusion of order*. Harvard University Press.

Harriss-White, B. (2017). Formality and informality in an Indian urban waste economy. *International Journal of Sociology and Social Policy. 37(7/8),* 417-434 DOI 10.1108/IJSSP-07-2016-0084

Hawkins, G. (2006). *The Ethics of Waste: How we relate to rubbish*. Rowman & Littlefield.

Heidegger, M. (1962). *Kant and the Problem of Metaphysics*. Indiana University Press.

Hewer, P. (2014). Thinking waste sociologically. In K. M. Ekstrom (Ed.), *Waste management and sustainable consumption: Reflections on consumer waste* (pp. 52–63). Routledge.

Heynen, N. (2013). Urban Political Ecology I: The Urban Century. *Progress in Human Geography*. *38(4),* 598–604. DOI: 10.1177/0309132513500443

Heynen, N., Perkins, H. A., & Roy, P. (2006). The political ecology of uneven urban green space: The impact of political economy on race and ethnicity in producing environmental inequality in Milwaukee. *Urban Affairs Review, 42(1),* 3–25. https:// doi.org/10.1177/1078087406290729

Hine, T. (1995). *The total Package: the secret history and hidden meanings of boxes, bottles, cans, and other persuasive containers*. Brown, and Company.

Hird, M. J., Lougheed, S., Rowe, R. K., & Kuyvenhoven, C. (2014). Making waste management public (or falling back to sleep). *Social Studies of Science, 44(3),* 441– 465. https://doi.org/10.1177/0306312713518835

Hockett, D., Lober, D.J., & Pilgrim, K. (1995). Determinants of Per Capita Municipal Solid Waste Generation in the Southeastern United States, *Journal of Environmental Management, 45,* 205–217.

Holifield, R. (2009). Actor-network theory as a critical approach to environmental justice: A case against synthesis with urban political ecology. *Antipode, 41(4),* 637–658. https:// doi.org/10.1111/j.1467-8330.2009.00692.x

Houser, H. (2004). *Ecosickness in contemporary U.S. fiction: Environment and affect*. Columbia University Press.

Humboldt, A., & Bonpland, A. (1970). *Relation historique du voyage aux régions équinoxiales du nouveau continent*. F. A. Brockhaus. https://doi.org/10.5962/bhl.title.43910

Humes, E. (2013). *Garbology: Our Dirty Love Affair with Trash*. Penguin Books.

Humphrey, K. (1998). *Shelf life: Supermarkets and the changing cultures of consumption.* Cambridge University Press.

IGES White Paper. (2008). *Urban Organic Waste – From Hazard to Resource, Report Title: Climate Change Policies in the Asia-Pacific: Report Subtitle: Re-uniting Climate Change and Sustainable Development Report*, Institute for Global Environmental Strategies.

Inglis, D. (2001). *A sociological history of excretory experience: Defacatory manners and toiletry technologies*. Edwin Mellen Press.

Jadhav, V. (2017-18). Deconstructing the Narrative 'Swachh Bharat.' *Ideal*. *6(1),* 69–73.

Jick, T. D. (1979). Mixing Quantitative and Qualitative Methods: Triangulation in Action. *Administrative Science Quarterly. 24,* 602–611.

Jouvenel, B. D. (1957). From political economy to political ecology. *Bulletin of the Atomic Scientists, 13(8),* 287–291. https://doi.org/10.1080/00963402.1957.11457581

Kaul, K. (2015). *Social Exclusion in the Context of Swachh Bharat Abhiyan*, Yojna.

Kaza, S., Yao, L. C., Bhada-Tata, P., & Van Woerden, F. (2018). *What a waste 2.0: A global snapshot of solid waste management to 2050.* World Bank. https://openknowledge. worldbank.org/handle/10986/30317

Kedia, M. (2022). Sanitation policy in India – designed to fail? *Policy Design and Practice. 5(3),* 307–325, https://doi.org/10.1080/25741292.2022.2069650

Kennedy, G. (2007). *An ontology of trash, the disposable and its problematic nature,* State University of New York Press.

Khan, M. T. (2013). Theoretical frameworks in political ecology and participatory nature/ forest conservation: The necessity for a heterodox approach and the critical moment. *Journal of Political Ecology, 20(1),* 460–472. https://doi.org/10.2458/v20i1.21757

Khawaja, F. & Shah, A. (2013). Determinants of Littering: An Experimental Analysis. *The Pakistan Development Review. 52(2),* 157-168

Kolekar, K. A., Hazra, T., & Chakrabarty, S. N. (2016). A review on prediction of municipal solid waste generation models. *Procedia Environmental Sciences*, *35*, 238-244.

Kothari, C. R. (2004). *Research methodology, methods, and techniques*. New age international publisher.

Kreimer, M. (2004). Labour market segregation and the gender-based division of labour. *European Journal of Women's Studies*, *11*(2), 223-246.

Kropotkin, P. (1902). *Mutual aid: A factor of evolution*. Heinemann.

Kumar, S., Smith, S. R., Fowler, G., et al. (2017). Challenges and opportunities associated with waste management in India. *Royal Society open science. 4(3),* 160764.http://dx.doi.org/10.1098/rsos.160764

Lakshmana, C. (2015). Demographic Change and the Environment. *Economic and Political Weekly, 50(8),* 15-17 https://www.jstor.org/stable/24481415

Latour, B. (1993). *We have never been modern*. Harvard University Press.

Latour, B. (1996). On actor-network theory: a few clarifications. *Soziale Welt,47,* 360-81

Latour, B. (2005). *Reassembling the social: An introduction to actor-network-theory*. Oxford University Press

Law, J. & Singleton, V. (2014). ANT, multiplicity and policy. *Critical Policy Studies, 8(4),* 379-396, DOI: 10.1080/19460171.2014.957056

Law, J. (1992). Notes on the actor-network theory: Ordering, strategy, and heterogeneity, *Systems Practice*, *5*, 379–393. https://doi.org/10.1007/BF01059830

Leff, E. (2012). Political ecology: A Latin American perspective. In UNESCO-EOLSS Joint Committee (Ed.), *Culture, civilization and human society*. EOLSS Publishers. http://doi.org/10.5380/dma.v35i0.44381

Lepawsky, J., & Mather, C. (2011). From beginnings and endings to boundaries and edges: Rethinking circulation and exchange through electronic waste. *Area, 43(3),* 242– 249. https://doi.org/10.1111/j.1475-4762.2011.01018.x

Liboiron, M. & Lepawsky, J. (2022). *Discard Studies: Wasting, Systems, and Power*. MIT Press.

Lidskog, R., Mol, A. P., & Oosterveer, P. (2015). Towards a global environmental sociology? Legacies, trends, and future directions. *Current Sociology, 63(3),* 339–368. https://doi.org/10.1177/0011392114543537

Little, P. E. (2006). Political ecology as ethnography: A theoretical and methodological guide. *Horizontes Antropológicos, 12(25),* 85–103. https://doi.org/10.1590/S0104-71832006000100005

Loftus, A. (2012). *Everyday Environmentalism: Creating an urban political ecology*. The University of Minnesota Press. http://www.jstor.org/stable/10.5749/j.ctttszjp

Lynch, K. (1990). *Wasting Away.* Sierra Club Books.

MacBride, S. (2008). The immortality of waste: Depression-era perspectives in the digital age. *Substance, 37(2),* 71–77. https://www.jstor.org/stable/25195172

Mahesh Kumar, A. S., & Rajesh, A. S. (2019). A unique technique for solid waste segregation. *International Journal of Trends in Scientific Research and Development, 3(5),* 604–607.https://doi.org/10.31142/ijtsrd26355

Maiti, S. & Agrawal, P.K. (2005). Environmental Degradation in the Context of Growing Urbanization: A Focus on the Metropolitan Cities of India. *Journal of Human Ecology*, *17(4)*, 277–287, DOI: 10.1080/09709274.2005.11905793

Mania, S. & Singh, S. (2016). Sustainable Municipal Solid Waste Management in India: A Policy Agenda. *Procedia Environmental Sciences*. *35*, 150 – 157.

Maskey, B. (2018). Determinants of household waste segregation in Gorkha municipality, Nepal. *Journal of Sustainable Development*. *11(1),* 1.

Mavila, A. D., & Francis, P.T. (2019). Impact of Swachh Bharat Abhiyan on residents of Cochin corporation. *Indian J Community Med*. *44(1),* 19-22.

McAfee, K. (2016). The Politics of Nature in the Anthropocene. *Rachel Carson Center*. *2,* 65–72.

McFarlane, C. & Silver, J. (2017). The poolitical city: Seeing sanitation and making the urban political in Cape Town. *Antipode, 49 (1),* 125-148.

McKee, E. (2015). Trash Talk: Interpreting Morality and Disorder in Negev/Naqab Landscapes. *Current Anthropology*. *56(5),* 733–752.

McLaughlin, T. (1971). *Coprophilia: Or, a peck of dirt*. Cassell.

Mehrotra, S. (2021). *Case Study 2: Monitoring India's National Sanitation Campaign (2014–2020),* The Sanitation Learning Hub, Brighton: IDS, DOI: 10.19088/ SLH.2021.011

Melosi, M. V. (2005). *Garbage in the cities: Refuse reform and the environment*. University of Pittsburg Press.

Meltzoff, S. K. (2013). *Listening to Sea Lions: Currents of Change from Galapagos to Patagonia.* AltaMira Press.

Méndez-Fajardo, S., & Gonzalez, R. A. (2014). Actor-network theory on waste management: A university case study. *International Journal of Actor-Network Theory and Technological Innovation (IJANTTI), 6(4),* 13–25. http://doi.org/10.4018/ ijantti.2014100102

Menikpura, N. Sang-Arun, J. and Bengtsson, M. (2012). *Towards Climate-Friendly Waste Management: The Potential of Integrated Municipal Solid Waste Management*. Institute for Global Environmental Strategies.

Meter, K. (1994). Sociological Methodology. *Bulletin of Sociological Methodology / Bulletin de Méthodologie Sociologique*. *42,* 72-94

Mies, M. (1981). *The social origins of the sexual division of labour*. Institute of Social Studies.

Mies, M. (2014). *Patriarchy and accumulation on a world scale: Women in the international division of labour*. Bloomsbury Publishing.

Miller, B. (2000). *Fat of the land: Garbage of New York—The last two hundred years*. Four Walls Eight Windows.

Ministry of Environment, Forest, and Climate Change. (2016). *Solid waste management Rules.* Government of India.

Ministry of Urban Development. (2014). *Municipal solid waste management*, CPHEEO.

Mishra, S. &Mishra, D. (2018). Waste Generation and Management in Anthropocene Epoch: An Objective Appraisal of Indian condition. *International Journal of Advanced Research, 6(6),* 1109–1129,

Mohanty, C. Mishra, U. & Beuria, P. (2014). Municipal Solid waste management in Bhubaneswar, India- A Review. *International Journal of Latest Trends in Engineering and Technology. 3(3),* 303–312.

MoHUA. (2021). *Annual report 2020–2021*, Ministry of Housing and urban affairs. http://mohua.gov.in/upload/uploadfiles/files/Annual_Report_2020_21_MoHUA_EnglishVersion% 20(Final).pdf MoHUA 2021b.

Mol, A. (2002). *The body multiple: ontology in medical practice*. Duke University Press.

Monzambe, G. M., Mpofu, K., & Daniyan, I. A. (2019). Statistical analysis of determinant factors and framework development for the optimal and sustainable design of municipal solid waste management systems in the context of industry 4.0. *Procedia CIRP*, *84*, 245-250.

Morrison, S. S. (2015). *The literature of waste: Material ecopoetics and ethical matter*. Palgrave Macmillan.

Mosse, D. (2018). Caste and development: Contemporary perspectives on a structure

Mukui, S. J. (2013). Factors influencing household solid waste management in urban Nyeri municipality, Kenya. *Ethiopian Journal of Environmental Studies and Management, 6(3),* 280–285. http://doi.org/10.4314/ejesm.v6i3.8

Murdoch, J. (1997a). Inhuman/nonhuman/human: Actor-network theory and prospects for a nondualistic and symmetrical perspective on nature and society. *Environment and Planning D: Society and Space, 15(6),* 731–756. https://doi.org/10.1068/d150731

Murdoch, J. (1997b). Towards a geography of heterogeneous association. *Progress in Human Geography, 21(3),* 321–337. https://doi.org/10.1191/030913297668007261

Murgatroyd, L. (1982). Gender and occupational stratification. *The Sociological Review, 30*(4), 574-602.

Murphy, A. K. (2012). "Litterers" How Objects of Physical Disorder Are Used to Construct Subjects of Social Disorder in a Suburb. *The ANNALS of the American Academy of Political and Social Science*. *642(1),* 210–227.

Murphy, R. (1995). Sociology as If Nature did not Matter: An ecological critique. *The British Journal of Sociology*.*46(4),* 688–707.

Nandan, A. and Yadav, B.P., Baksi, S., & Bose, D. (2017). Recent Scenario of Solid Waste Management in India. *World Scientific News. 66,* 56–74.

National health portal. (2019). *Introduction to waste management*. https://www.nhp.gov.in/solid-waste_pg.

Nyarai, P.S., Willard, Z. Moses, M., & Ngenzile, M. (2016). Challenges of solid waste management in Zimbabwe: a case study of Sakubva high-density suburb. *Journal of Environment and Waste Management. 3(2),* 142–155.

Nygren, A., & Rikoon, S. (2007). Political Ecology Revisited: Integration of Politics and Ecology Does Matter. *Society and Natural Resources, 21(9),* 767-782.

O'Brien, M. (2008). *A crisis of waste, understanding the rubbish society*. Routledge.

O'Reilly, K. & Elizabeth, L. (2014). The Toilet Tripod: Understanding Successful Sanitation in Rural India. *Health & Place*. *29*, 43–51. doi:10.1016/j.healthplace.2014.05.007.

Observer Research Foundation. (2020). *Solid Waste Management in Urban India: Imperatives for Improvement.*

Ojedokun, O. (2015). The littering attitude scale (LAS). *Management of Environmental Quality: An International Journal*. *26(4),* 552 – 565

Opayemi, A. S., Oguntayo, R., Popoola, A. O., & Alabi, A. (2020). Psychosocial factors as determinants of littering prevention behavior. *Int. J. Hum. Capital Urban Manage*, *5(1),* 59-68.

Orloff, A. (1996). Gender in the welfare state. *Annual review of sociology*, *22(1),* 51-78.

Otitoju, T. A., & Seng, L. (2014). Municipal solid waste management: household waste segregation in Kuching South City, Sarawak, Malaysia. *American Journal of Engineering Research (AJER)*. *3(6),* 82-91.

Padilla, J., and Trujillo, (2017). Waste disposal and households' Heterogeneity. Identifying factors shaping attitudes towards source-separated recycling in Bogotá, Colombia. *Waste Management* https://doi.org/10.1016/j.wasman.2017.11.05

Pandey, A. Sahu, R. Tyagi, R. (2019). A research study on waste segregation at source is the key to municipal solid waste management in Delhi**.** *Indian J.Sci.Res. 18 (2),* 255-259.

Pardo, I. (2011). Italian rubbish: Elemental Issues of Citizenship and Governance, In I. Pard and G.B. Prato, G. B. (eds), *Citizenship and Legitimacy of Governance*. London: Routledge

Pardo, I., Prato, G. B., & Rosbrook-Thompson, J. (2020). Ethnographies of Urbanity in Flux: Theoretical Reflections. *Urbanities-Journal of Urban Ethnography*, *10(3),* 2-12

Paulson, S. Gezon, L. L. and Watts, M. (2003). Locating the Political in Political Ecology: An Introduction. *Human Organization. 62(3),* 205-217. https://www.jstor.org/stable/44127401

Pearson, M. (2010). *Talking trash and getting wasted: A political ecology of consumption and waste management in the Saint Paul (Capstone Projects, Paper 3).* Macalester College. http://digitalcommons.macalester.edu/geogcapstones/3

Pebley, A. R. (1998). Demography and the environment. *Demography*, *35(4)*, 377-389.

Pelling, M. (2003). *The vulnerabilities of cities: Natural disasters and social resilience.* Earthscan.

Plumwood, V. (1986). Ecofeminism: An overview and discussion of positions and arguments. *Australasian Journal of Philosophy. 64(1),* 120–138, DOI: 10.1080/00048402.1986.9755430

Poletto, M. and Mori, P. and Schneider, V. et al. (2016). Urban Solid waste management in Caxias Do Sul/Brazil: Practices and Challenges. *Journal of Urban and EnvironmentalEngineering.10(1),*50-56

Pongrácz, E. (2002). *Re-defining the concepts of waste and waste management: Evolving the theory of waste management* [Doctoral Dissertation, University of Oulu]. JULTIKA University of Oulu Repository. http://urn.fi/urn:isbn:9514268210

Pradanos, L. (2018). *Non-human Agency and the Political Ecology of Waste, Postgrowth Imaginaries: New Ecologies and Counter hegemonic Culture in Post-2008 Spain*, Liverpool University Press.

Prakasam, V. and, Das, Y. (2016). A Sustainable Approach to the Municipal Solid Waste Management in Neyyatinkara Municipality, Kerala, India. *Applied Ecology and Environmental Sciences*. *4(4),* 89-95 DOI:10.12691/ages-4-4-2

Prato, G. B. and Pardo, I. (2013). Urban Anthropology. *Urbanities. 3 (2),* 80–110.

Pye, G. (2010). *Trash culture: Objects and obsolescence in cultural perspective*. Peter Lang.

Rakib, M. Hye, N. and Haque, A. (2022). Waste Segregation at Source: A Strategy to Reduce Waterlogging in Sylhet. In A. K. Enamul Haque et al. (eds.), *Climate Change and Community Resilience*. https://doi.org/10.1007/978-981-16-0680-9_24

Ramachandra, T.V, Bharath, H.A., Kulkarni, G., & Han, S.S. (2018). Municipal solid waste: Generation, composition and GHG emissions in Bangalore, India. *Renewable and Sustainable Energy Reviews. 82*, 1122–1136

Rame, L. S., Widiatmaka, Hartono, A., & Firmansyah, I. (2022). The effect of demographic factors on waste generation and heavy metal in illegal landfill at Malaka Regency, East Nusa Tenggara Province. IOP Conference Series: *Earth and Environmental Science, 950(1),* 012055. https://doi.org/10.1088/1755-1315/950/1/012055

Ranajn, R.K., Nigam, H. Trivedi, H. & Patel, R. (2020). Self Segregation of Household Waste and Alarm System. *International Research Journal of Engineering and Technology*. *7(5),* 5096-5101.

Rao, M. (2012). Ecofeminism at the crossroads in India: A review. *DEP*. *20,* 124–139.

Rao, S. (2021). Practices and Public Perception on Municipal Solid Waste Management in Bhubaneswar. *Journal of the Maharaja Sayajirao University of Baroda, 55(5),* 378-387.

Rath, S. & Swain, P. K. (2022). The Interface between Political Ecology and Actor-Network Theory: Exploring the Reality of Waste. *Review of Development and Change, 27(2),* 264– 278. https://doi.org/10.1177/09722661221122553

Rathje, W., & Murphy, C. (1992). *Rubbish! The archaeology of garbage*. Harper Collins.

Rathore, G. J. S. (2020). Formality and informality in e-waste economies: exploring caste-class in urban land and labor practices. *Urban Geography*. *41(6),* 902–906, DOI: 10.1080/02723638.2020.1785745

Reclus, E., & Keane, A. H. (1890). *The earth and its inhabitants*. D. Appleton and Company.

Reno, J. (2015). Waste and Waste Management. *Annual Review of Anthropology, 44,* 557–572.

Reno, J. O. (2016). *Waste away: Working and living with a North American landfill*. University of California Press.

Robbins, P. (2007). *Lawn people: How grasses, weeds, and chemicals make us who we are*. Temple University Press.

Robbins, P. (2012). *Political ecology: A critical introduction (2nd ed.)*. Wiley-Blackwell.

Rocheleau, D., & Roth, R. (2007). Rooted networks, relational webs, and powers of connection: Rethinking human and political ecologies. *Geoforum, 38(3),* 433–437. https://doi.org/10.1016/j.geoforum.2006.10.003

Routray, P., Torondel, B., Clasen, T., & Schmidt, W. P. (2017). Women's role in sanitation decision making in rural coastal Odisha, India. *PloS one, 12(5),* e0178042.https://doi.org/10.1371/journal. pone.017804

Royte, E. (2005). *Garbage Land,* Little Brown, and Company

Ruming, K. (2009). Following the actors: Mobilizing an actor-network theory methodology in geography, *Australian Geogra- pher 40,* 451 -69

Russell, B. (2011). *Research Methods in Anthropology: Qualitative and Quantitative Approaches.* AltaMira.

Rybova K., Slavik. J. (2016). Can demographic characteristics explain inter-municipal differences in the production of municipal waste? In: Špalková, D., Matějová, L. (eds.) Proceedings of the 20th International Conference Current Trends in Public Sector Research. Brno: Masaryk University, 375 – 382.

Saberwal, S. (1996). On Reality: Its Perception and Construction. *Sociological Bulletin. 4(2),*161–168. https://www.jstor.org/stable/23620216

Saha, N. and Banerji, H. (2018). Bhubaneswar in a Global Flux. Spaces and Flows. *International Journal of Urban and Extra Urban Studies. 9(4),* 45-61. http://doi.org/10.18848/2154-8676/CGP/v09i04/45-61

Sampson, R. J., & Raudenbush, S. W. (1999). Systematic social observation of public spaces: A new look at disorder in urban neighborhoods. *American Journal of Sociology*. *105*(3), 603-651.

Scanlan, J. (2005). *On garbage.* Reaktion Books.

Schultz, P. W., Bator, R. J., Large, L. B., Bruni, C. M., & Tabanico, J. J. (2013). Littering in context: Personal and environmental predictors of littering behavior. *Environment and Behavior*. *45(1),* 35-59.

Sclar, E.D. & Volavka-Close, N. (2011). Urban Health: An Overview. *Encyclopedia of Environmental Health*, 556-564.

Seng, B., Fujiwara, T., & Spoann, V. (2018). Households' knowledge, attitudes, and practices toward solid waste management in suburbs of Phnom Penh, Cambodia. *Waste Management & Research, 36(10),* 993-1000.

Sharholy, M. Ahmed, K., Mahmood, G., & Trivedi, R.C. (2005). Analysis of municipal solid waste management systems in Delhi – a review, *Proceedings for the Second International Congress of Chemistry and Environment,* 773–777.

Sharholy, M., Ahmed, K., Mahmood, G., & Trivedi, R.C. (2008). Municipal solid waste management in Indian cities – A review. *Waste Management*. *28*, 459–467.

Shiva, V., & Mies, M. (2014). *Ecofeminism*. Bloomsbury Publishing.

Sibley, C. G., & Liu, J. H. (2003). Differentiating active and passive littering: A two-stage process model of littering behavior in public spaces. *Environment and Behavior*. *35(3),* 415–433.

Sivakumar, K., & Sugirtharan, M. (2010). *Impact of family income and size on per capita solid waste generation: a case study in Manmunai North Divisional Secretariat Division of Batticaloa.*

Smith, M. (2018). " Waste Is Not Just Waste Anymore": Deconstructing the Relationship between Sustainable Waste Prevention and Individual Socio-Demographic Characteristics (The Juxtaposition of Ushongo Mtoni Village and Moshi Urban, Tanzania).

Smith, N. (2006). Foreword. In N. Heynen, M. Kaika and E. Swyngedouw (eds) *In the Nature of Cities: Urban Political Ecology and the Politics of Urban Metabolism*, Routledge.

Somerville, M. (1848). *Physical Geography*. Creative Media Partners.

Spelman, E.V. (2016). *Trash Talks: Revelations in the Rubbish*. Oxford University

Srinivas, M. N. (2003). *Religion and society among the Coorgs of South India*. Oxford University Press.

Srinivasan, K. (2006). Public, Private and Voluntary Agencies in Solid Waste Management: A Study in Chennai City. *Economic and Political Weekly*. *41(22)*, 2259–2267.

Srivastava, K. and Gupta, N. (2019). Standardizing the Scale to Measure the Attitude of the Homemakers towards the Management of Household Waste**.** *International Journal of Basic Sciences and Applied Computing*. *2(9)*, 10-13.

Stone-Jovicich, S. (2015). Probing the interfaces between the social sciences and socialecological resilience: Insights from integrative and hybrid perspectives in the social sciences. *Ecology and Society*, *20(2)*, 25. http://doi.org/10.5751/ES-07347-200225

Strasser, S. (1999). *Waste and want: A social history of trash*. Henri Holt.

Straughan, P. T., GANAPATHY, N., Goh, D., & Hosein, E. (2011). Towards a cleaner Singapore: Sociological study on littering in Singapore.

Subramani, T. Umarani, R. and Devi, B. (2014). Sustainable Decentralized Model For Solid Waste Management In Urban India. *Int. Journal of Engineering Research and Applications*. *4(6)*, 264-269.

Sujauddin, M., Huda, S. M. S., & Rafiqul-Hoque, A. T. M. (2008). Household solid waste characteristics and management in Chittagong, Bangladesh. *Waste Management*, *28(9)*, 1688–1695. http://doi.org/10.1016/j.wasman.2007.06.013

Swachh Bhubaneswar Abhiyan. https://www.bmc.gov.in/programs/swachh-bhubaneswar-abhiyaan

Swyngedouw, E. (1996). The city as a hybrid: On nature, society, and cyborg urbanization. *Capitalism Nature Socialism*. *7(2)*, 65–80.

Swyngedouw, E. (2004). *Social Power and the Urbanization of Water. Flows of power*, Oxford University Press.

Swyngedouw, E., Kaika, M., and Castro, E. (2002). Urban water: A political-ecology perspective. *Built Environment. 28(2),* 124–13. https://www.jstor.org/stable/23288796

Tammemagi, H. (1999). *The Waste Crisis: Landfills, Incinerators, and the Search for a Sustainable Future*, Oxford University Press.

Tanyanyiwa, V. I. (2015). Motivational Factors Influencing Littering In Harare's Central Business District (CBD), Zimbabwe. *IOSR Journal of Human and Social Sciences, 20(2),* 58-65.

TERI. (2014). *Waste to resources, a waste management handbook*. TERI Press.

Thakkar, S. (2016). Is India Transforming? Narratives from Dabok, Rajasthan. *Economic and Political Weekly*. *51(47)*, 17-20.

Thill, B. (2015). *Waste*. Bloomsbury Publishing.

Thompson, M. (1979). *Rubbish theory: The creation and destruction of value*. Oxford University Press http://pure.iiasa.ac.at/14741

Todd, D. J. (1979). Mixing Qualitative and Quantitative Methods: Triangulation in Action. *Qualitative Methodology*. *24(4)*, 602- 611

Torgler, B., Garcia-Valinas, M. A., & Macintyre, A. (2012). The justifiability of littering: an empirical investigation. *Environmental Values*. *21(2),* 209–231.

Tripathy, U. (2018). *A 21st Century Vision on Waste to Energy in India: A WinWin Strategy for Energy Security and Swachh Bharat Mission (Clean India Mission),* Background Paper, 8th Regional 3R Forum in Asia and Pacific India.

U.N. Environment. (2017). *Glossary of terms*. Basel Convention.

United Nations Centre for Regional Development and Ministry of Housing and Urban Affairs (MoHUA), Government of India and Ministry of the Environment, Government of Japan, 8th Regional 3R Forum in Asia and the Pacific. (2018). *A 21st Century Vision on Waste to Energy in India: A WinWin Strategy for Energy Security and Swachh Bharat Mission (Clean India Mission).*

United Nations Environment Programme (2005). *Solid Waste Management Volume 1*. https://wedocs.unep.org/20.500.11822/30733.

Vij, D. (2012). Urbanization and Solid Waste Management in India: Present Practices and Future Challenges, *Procedia - Social and Behavioral Sciences, 37,* 437–447, https://doi.org/10.1016/j.sbspro.2012.03.309.

Vince, G. (2016). *Adventures in the Anthropocene: A journey to the heart of the planet we made,* Vintage Publishing.

Viney, W. (2014). *Waste: A Philosophy of Things*. Bloomsbury Academic.

Vitousek, P.M., Mooney, H.A., Lubchenco, J., & Melillo, J.M. (1997). Human Domination of Earth's Eco-systems. *Science*. *277*, 494-499.DOI:10.1126/science.277.5325.494

Vlachos, E. (1975). Social Aspects of Solid Wastes Development and Management: Refuse, Recovery and Reuse. *Water, Air, and Soil Pollution. 4*, 293–301.

Wanjohi, P. (2016). *An assessment of attitude and behavior towards littering among the citizens of Nairobi city*. University of Nairobi

Watkins, E. (1993). *Throwaways: Work culture and consumer education*, Stanford University Press.

Whatmore, S. (1999). Hybrid geographies: Rethinking the 'human' in human geography. In D. Massey, J. Allen & P. Sarre (Eds.), *Human geography today* (pp. 22–39). Polity Press.

Whatmore, S. (2002). *Hybrid geographies: Natures cultures spaces*, SAGE Publications. https://doi.org/10.4135/9781446219713

Wolf, E. (1972). Ownership and political ecology. *Anthropological Quarterly*. *45(3)*, 201– 205. http://www.jstor.org/stable/3316532

Zakianis, S., & Djaja, I. M. (2017). The importance of waste management knowledge to encourage household waste-sorting behavior in Indonesia. *International Journal of Waste Resources, 7(04)*.

Zimmer, A. (2010). Urban political ecology: Theoretical concepts, challenges, and suggested future directions. *Erkunde. 64(4)*, 343-354

Zimmerman, M. (1981). *The Eclipse of the Self*. Ohio University Press.

Appendix

Interview schedule

Household Survey Questionnaire

NATIONAL INSTITUTE OF SCIENCE EDUCATION AND RESEARCH

School of Humanities and Social Science

Note- The information requested is purely for academic purposes and will be treated confidentially.

A. Identification

SL. No.	Details	Code
1	Survey No	
2	Zone	
3	Ward	
4	Household number	
5	Date of interview	

A. Respondent's profile

6	Name
7	Age 1. 15-30 2. 31-44 3. 45-55 4. Over 55
8	Sex 1. Male 2. Female 3. Third gender
9	Religion 1. Hindu 2. Muslim 3. Christian 4. Other 5. Do not know
10	Caste 1. Brahmin 2. Kshatriya 3. Vaishya 4. Shudra 5. Don't want to specify

11	Social category 1. General 2. SEBC 3. OBC 4. SC 5. ST 6. Don't want to specify
12	Education 1. Below primary 2. Primary 3. Secondary 4. Matriculate 5. Intermediate 6. Graduate or above 7. Others
13	Marital status 1. Married 2. Unmarried 3. Separated 1. Widowed
14	Head of the household 1. Male 2. Female 3. Joint 4. Third gender 5. Don't want to specify
15	Number of family members
16	Number of dependents
17	Total number of earning members
18	Primary source of livelihood
19	Monthly earning amount 1. 20000/- and below 2. 21000/- 40000/- 3. 41000/-60000/- 4. 61000/--80000/- 5. 81000/-100000/- 6. More than 100000
20	Secondary source of livelihood
21	Earning amount

B. Waste generation

22	How do you view waste?
23	What does your household waste consist of? (Name the wastes generated at your home) 1. Paper and paper related materials 2. Food waste 3. Plastic 4. Metals 5. If any other, please specify
24	Which household activity produces more waste? (Activities producing waste) 1. Cooking 2. Cleaning 3. Gardening 4. Children's play 5. If any other, please specify
25	Which activity as answered above produces the most amount of waste in your household?
26	What do you use to store waste at your household? (Storage process) 1. Plastic bag 2. Bin 3. At a corner of the house 4. If any other, please specify
27	Where do you place your dustbin in your household? 1. Outside the rooms 2. Inside the room 3. Near the kitchen 4. Outside the house
28	How many dustbins do you have in your household? 1. None 2. One 3. Two 4. Three 5. Do not know
29	What do you do with the waste? (Mention chronologically) 1. Keep it in the dustbin outside home 2. Throw it in open spaces 3. Give it to the BMC 4. Compost it 5. Burn it 6. Recycle it 7. If any other, please specify
30	If you recycle waste, then how?
31	If you compost, then how?

32	What is the approximate amount of waste generated at your household in a typical day? 1. Up to 5kg 2. 6-10kg 3. 11-15kg 4. More than 15 kg 5. Do not know

C. Waste segregation and collection

	Comments/ concerns/ problems encountered 
33	Do you segregate your waste at the household level? 1. Yes 2. No 3. Do not know
33.a.	If yes, why?
33.b.	If no, why?
34	How do you segregate them?
35	How long have you been segregating waste?
36	Is there any agency that collects waste from your neighborhood? 1. Yes 2. No 3. Can't say

37	If yes, which agency? 1. BMC 2. NGO 3. Local authority 4. Do not know 5. If any other, please specify
38	How frequently waste is collected from your area? 1. Daily 2. Once in 2 days 3. Once in a week 4. Once in a fortnight 5. Once in a month 6. Don't know/Can't say
39	Do you pay to the person/ agencies who collect waste? 1. Yes 2. No 3. Can't say
40	If yes, how much do you pay?
41	Are you satisfied with the waste collection? 1. Highly satisfied 2. Satisfied 3. Neutral 4. Dissatisfied 5. Highly dissatisfied

D. Household littering

	Comments/ concerns/ problems encountered 
42	Have you ever littered? 1. Yes 2. No

	3. Can’t say
43	How often did you litter? 1. Sometimes 2. Rarely 3. Never 4. Can’t say
44	If yes, what made you do so? 1. There was no dustbin available 2. Unknowingly 3. The nearby dustbin was full 4. Impact of family and friends and other social groups 5. Do not know 6. If any other, please specify
45	Where did you litter? 1. In the open spaces 2. On the road side 3. Near the house 4. Near my neighbor’s house
46	When do you litter? 1. While going outside 2. When no one is around 3. Most of the time 4. When there is no dustbin 5. Don’t remember 6. Can’t say
47	What are the items that you usually litter? 1. Food waste 2. Papers 3. Food packages/ product packages 4. If any other, please specify

48	If you see anyone littering, what do you do? 1. Stop them 2. Do not say anything 3. Ignore the incident 4. Put the litter in the dustbin after the person leaves the place 5. Ask them not to do so 6. Cannot say 7. If any other please specify
49	What can prevent people from littering? 1. Financial penalties 2. Regular litter removal and cleaning 3. Public awareness 4. Availability of adequate bins 5. Involving community members in cleanup activities 6. Appointing law enforcement officers 7. All of the above 8. Do not know 9. If any other, please specify
50	In your opinion, who is responsible to keep the city clean? 1. Citizens, 2. Municipality, 3. Students, youth, 4. Cleaners 5. Self 6. All 7. Do not know 8. If any other, please specify
51	Why do you think people litter? 1. Can't find a trash bin 2. Laziness 3. Less concern about the environment

	4. A dumpsite is available in nearby area 5. Habit 6. Do not know 7. Lack of awareness 8. It takes more time and energy to dispose waste 9. Because others do it 10. If any other please specify
52	If you need to dispose the waste but the nearest bin is overflowing, what will you do? 1. Drop it on the ground 2. throw it there 3. find another bin 4. keep the waste to dispose it later 5. Will put it on the top of the full bin 6. Do not know 7. If any other, please specify

E. Impact on the neighborhood and the city

	Comments/ concerns/ problems encountered 
53	Do you think Bhubaneswar has waste problem?

	1. Yes 2. No 3. Some parts have waste problem 4. Can't say
54	What are the problems of waste that you face in your neighborhood? 1. Unpleasant environment 2. High cost of litter cleanup 3. Burning of waste 4. Waste lies in the drainages and causes flood 5. Transmission of disease and infections 6. Loss of value of property 7. It causes accident 8. Can't say 9. If any other please specify
55	Do you think it has impacted the environment? 1. Yes 2. No 3. To some extent 4. Can't say
56	If yes then in what ways? 1. Aesthetic loss 2. Air pollution 3. Soil pollution 4. Water pollution 5. It makes the city unclean 6. It is unhygienic 7. It is bad for health 8. Can't say 9. If any other, please specify
57	Do you think waste has negatively impacted other non- humans in the

	neighborhood? 1. Yes 2. No 3. To some extent 4. Can't say
58	If yes then which non- human being are being impacted and in what ways? 1. Plant species 2. Animals 3. Others
59	Which part of the Bhubaneswar do you think is the most littered?

F. Policies, practices and perception

60	Have you ever heard of the Swachh Bharat Abhiyan/ Clean Bhubaneswar Campaign? 1. Yes 2. No 3. Can't say
61	(Awareness of national campaign tagline) Which is Swachh Bharat Abhiyan tagline? 1. One step towards cleanliness 2. Keep India clean 3. Let's clean up India 4. Do not know
62	Do you think these policies have positively impacted cleanliness of your neighborhood? 1. Yes 2. No 3. Can't say

62.a.	If yes, how? 1. People have stopped littering 2. The authorities are cleaning properly 3. There is high level of community involvement is cleaning the neighborhood
62.b.	If no, why?
63	Have you/ your neighbors stopped littering after the awareness campaign?
64	Have you made any lifestyle changes at your household level to generate less waste? 1. Yes 2. No 3. Can't say
64.a.	If yes, what are the changes you adopted? 1. I avoid using plastics while shopping/ buying 2. I carry my own cutlery 3. I have adopted a minimalist lifestyle 4. I don't buy plastic bottles 5. While buying any product, I look for products that are recycled 6. I never waste food
65	Do you think policies need to be more stringent? 1. Yes 2. No 3. Can't say
65.a.	If yes, why? 1. Simple awareness does not solve the issue 2. It will help in changing behavior

	3. If any other, please specify
65.b.	If no, why? 1. Stringent rules can't change behavior 2. Nothing can prevent people from littering 3. If any other please specify
66	Effectiveness of Swachh Bharat Abhiyan 1. Effective 2. Very effective 3. Can't say 4. Not effective
67	In your opinion, what changes can be made at the policy level to make your neighborhood clean?