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Towers of Trash: Dissecting India's Solid Waste Management Crisis

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“Live simply so that others may simply live.”-Mahatma Gandhi

Abstract

This paper explores the complex issue of poor solid waste management in the nation of India. The infamous Ghazipur landfill in New Delhi serves as a focal point of this paper as it provides drastic examples of the consequences of solid waste management systems that do not operate effectively. Drawing on information from various scholarly sources, Chapter 1 discusses the issue of solid waste mismanagement in India and its surrounding quantitative and qualitative data. Chapter 2 highlights the socioeconomic, cultural, and religious aspects of consumption, growth, and waste, specifically in relation to prevailing sociological attitudes on material wealth and luxury. Chapter 3 analyzes the issue in the contexts of public health and environmental justice focusing on how casteism, discrimination and wealth inequality exacerbate disproportionate exposures to mismanaged solid waste throughout India. Chapter 4 highlights the laws, regulations and political systems that govern and influence solid waste management systems in India. Drawing on discussions and lessons learned in previous chapters, the concluding Chapter 5 lists policy recommendations centered on waste management regulation reform coupled with action against inequalities in education, labor and other social, political, and economic institutions that further instances of environmental injustice faced by disenfranchised and minority groups. Chapter 5 also draws from successful examples of efficient waste management systems in India.

Keywords: India, South Asia, waste management, sanitation, environmental justice, environmental sociology, wealth inequality, casteism, public health.

Table of Contents

Introduction: Ghazipur- A City Swallowed by Garbage

India is a nation home to over 1 billion people and contains some of the most densely populated cities in the entire world. Sustaining a population as large as India's is a complicated process. Rapid population growth can stress aspects of society such as access to healthcare, housing, food availability and the allocation of social welfare, as limited resources and increased competition create the perfect storm for inequality and turmoil. Compromised environmental quality is a considerable side effect of rapid urbanization and population growth in which the consumption of resources, goods and energy increases drastically. In a globalized world with packaged and processed consumer goods more readily available than ever, the topic of effective and sustainable solid waste management inevitably arises. While waste collection and management practices vary across the nation, one notable example of the challenges India faces with its management of solid waste disposal is the Ghazipur garbage dump.

The Ghazipur Garbage Dump, located in the Indian state of Delhi, has gained significant media attention due to its unbelievable size and height. Many refer to it as a "trash mountain" rather than a landfill, as this title seems more encompassing of its unfathomable proportions. Its size rivals that of the Taj Mahal, one of the seven modern wonders of the world as well as India's most famous and treasured landmark. The dump is located in East Delhi, which, according to the 2011 census, has a population of almost 2 million people, while the entire state of Delhi has a total population of almost 20 million. Delhi suffers from several environmental issues, including extremely poor air quality, rising temperatures and flood risks. The Ghazipur dump is more than unsightly; its inconceivable collection of waste spreads toxic fumes, polluting the air and soil. Its size poses a more present danger, as trash landslides from Ghazipur have resulted in two reported deaths. The Ghazipur dump is reported to receive about 2,000 tonnes of garbage daily. This

immense amount of toxic waste coupled with the already high temperatures in Delhi creates a cycle of methane emissions and general warming and poses countless risks to the residents of Delhi. The most immediate health risks, however, are faced by the residents of Ghazipur, East Delhi, many of whom continue to suffer from respiratory illnesses, cancer, and an overall lower quality of living due to the rancid, toxic and rotting material collecting in the Ghazipur garbage dump. Residents of Ghazipur have protested, and many Delhiites have voiced their complaints about the unsightly and toxic site. However, little has been done to stop or even slow the addition of waste to the landfill. In fact, the landfill has been open for almost two decades longer than it was intended to be in operation, as it reached formal capacity in 2002, 18 years after its opening in 1984.

The sheer ability of such waste to conspicuously accumulate, the injustices associated with it and the difficulties surrounding efforts to remediate the site make Ghazipur a startling example of the pitfalls of solid waste management in India. Not only does the site create considerable environmental hazards and pose significant threats to public health but it also exacerbates issues of environmental injustice and inequality and calls attention to the sociological and cultural changes occurring throughout the nation. Within India, stark differences in wealth distribution can clearly be seen. In burgeoning cities, such as Mumbai and New Delhi, expensive and modern high rise buildings tower over slums where millions of Indians reside, as growing populations and increasing income gaps make employment and housing harder and harder for those at the bottom of the ladder. In Mumbai, the film capital of India, many Bollywood stars- many of whom are some of the highest earning celebrities in the entire world- live lavish and glamorous lifestyles, full of red-carpet events, extravagant weddings, and access to the most opulent and costly property in the country. The majority of residents of this heavily

populated city, however, experience a very different Mumbai; “more than half of the city's population lives in slums, or areas of extreme poverty that often lack access to clean water, electricity, and public transportation”.[1] Indian social and cultural norms surrounding consumption, waste and the perceived disposability of resources align with the country’s characteristically extreme wealth and social disparities as ideals such as extravagance and luxury take priority over social responsibility and heavily influence consumer behavior at a large scale. By accounting for sociological perspectives in India that drive individual action, an informed analysis on the various factors that influence waste management patterns throughout the nation can be carefully crafted.

This paper will delve into the issues associated with solid waste management and the implications these challenges have on the environment, social equality, political progress, public health and safety and Indian society and culture. Chapter 1 will explore the current state of solid waste management in India as well as the socio-economic and political trends that gave rise to the current system. Chapter 2 will analyze the cultural and sociological backdrop of India and its influence on solid waste accumulation and management and Chapter 3 will discuss the environmental inequalities that are caused and intensified by drawbacks in India’s waste management system. Public health will be a focus in Chapter 3, particularly as it intertwines with environmental inequality and injustice. Chapters 4 and 5 will examine environmental policy in India and possible solutions to the issues in question, respectively.

[1] Bendix 2018

Chapter 1. The Realities of Solid Waste Management in India

Solid Waste Management in India: The Challenges. Solid waste management refers to the "control of generation, storage, collection, transport or transfer, processing, and disposal of solid waste materials in a way that best addresses the range of public health, conservation, economics, aesthetic, engineering and other environmental considerations."[2] Solid waste management involves political, financial, scientific, and legal planning; a feat that can be even more challenging when focusing on large, densely populated urban areas. Challenges surrounding solid waste management are hardly limited to India, as unprecedented waste accumulation plagues nations all over the world, undeveloped and developed alike. In fact, India's dumping grounds take the backseat in size and severity compared to others around the world; "India's dumpsites are not the biggest in the world or the worst. To be sure, Mumbai's Deonar site is a small mountain of garbage and ranks as a Tyrannosaurus rex among dumps. One survey ranks it as the eighth largest, well behind the leader, Apex Regional, which occupies 890 hectares (2,200 acres) on the outskirts of Las Vegas, Nevada".[3]

What makes India particularly notable in its struggles with solid waste management is its unique combination of rapid population growth, limited access to land and relentlessly extreme disparity in income and social welfare amongst its citizens. Socioeconomic shifts and changes in consumer behavior in India over the past few decades have also contributed to the country's striking accumulation of waste and struggle to manage it; "It has been predicted that the world will produce approximately 27 billion tonnes of waste by 2050. It is believed that by 2025 each

[2] Ghosh 2019

[3] Doron and Jeffrey 2018

person will generate approximately 0.7 kg of solid waste within urban India which surmounts to a value which is four to six times higher than in 1999. As a result of population growth, challenges relating to waste increase, resulting in the need for decentralized waste management. Due to an increase in population and shifting lifestyles, it is noted that urban India possesses approximately 170,000 tonnes of waste formation every day. This amalgamates to an annual figure of approximately 62 million tonnes, which is estimated to rise by 5% every year".[4] With such substantial waste production it is necessary for India to not only craft effective waste management systems but to pinpoint the issue at the source and slow the production and disposal of toxic waste. However, waste control systems in many Indian cities are often mismanaged and unorganized as recycling in India is a largely informal and unstandardized process; "India is getting buried under mounds of garbage as the country has been generating more than 1.50 lakh (1 lakh= 100,000 units) metric tonne (MT) of solid waste every day. Worse - approximately 90% (1,35,000 MT per day) of the total amount is collected waste. Of the total collected waste, only 20 per cent (27,000 MT per day) is processed and the remaining 80 per cent (1,08,000 MT per day) is dumped in landfill sites".[5]

A major reason behind the unregulated collection of waste in India is the largely unofficial and disorderly processes behind collection and disposal of waste. The safe and effective handling of solid waste is an essential part of any productive waste management system. In India, however, most of the municipalities do not have access to adequate tools and equipment for handling unorganized waste. The municipal governments organize the collection

[4] Somani 2021

[5] Shrivastava 2019

of garbage from door to door, where waste collection & handling is mostly done manually. Sometimes municipalities also assign private organizations the tasks of collecting, segregation/sorting, transportation, preprocessing of waste, and final disposal. However, collected recyclable waste by the vendors are sold to local scrap-dealers.[6] Waste pickers work within these toxic landfill sites, often with little to no protective gear or equipment, to collect recyclable materials that are sold in local markets where they are repurposed.

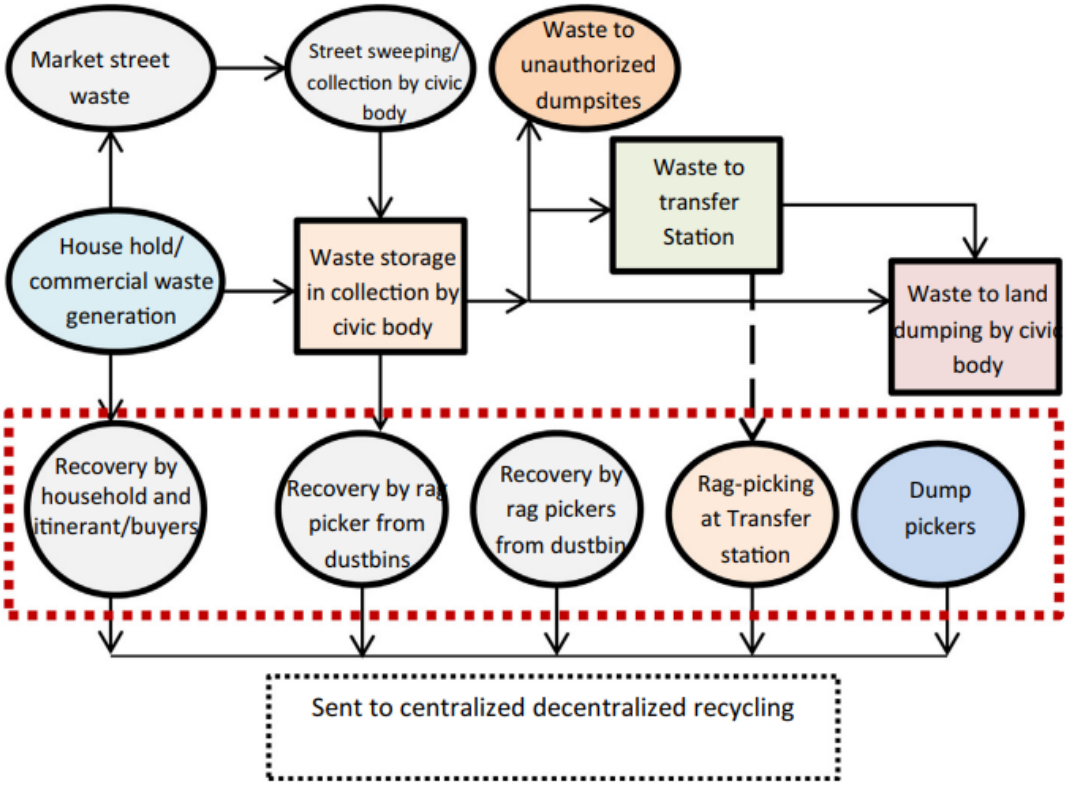

Figure 1: Schematic flow chart of typical MSW Management handling in Indian cities[7]

Though this informal practice decreases the amounts of waste inflow into water bodies and open dumps, it is also a hazardous activity that creates health and occupational risks.[8] These

[6] Kumar 2020
[7] Kumar 2020
[8] Ferronato and Torretta 2019

informal methods of waste collection in India are not officially integrated into India's central solid waste management system as they are characterized by small-scale, labor-intensive, unregulated, and unregistered trading and provisioning of materials and services. Waste pickers collect household or commercial/industrial waste and many hundreds of thousands of waste pickers in India depend on waste for an income, despite the associated health and social issues.[9]

Figure 2: The Ghazipur Landfill fades into the background of a Delhi neighborhood[10]

[9] Kumar 2017

[10] France-Presse 2019

Ecosystem Services. Landfill sites, like the aforementioned Ghazipur shown in Figure 1, store much of the discarded municipal solid waste, often staying in operation past capacity and posing countless problems to urban dwellers and the environment. Landfills in urban areas greatly threaten essential ecosystem services, including provisioning, regulating, cultural and supporting services. Provisioning services refer to the resources that are provided by nature and the many benefits they bring to human society. These resources include food, water, timber, medicinal plants, and many more. Regulating services, such as pollination, carbon storage, climate regulation and flood control, keep the environment stable and provide a livable atmosphere to all living things. Ecosystems also shape the culture of a given geographic location. In India, ancient religions like Hinduism and Buddhism possess deep ties to nature and the Earth making cultural ecosystem services a very large part of Indian society. Supporting ecosystem services, such as nutrient cycling and photosynthesis, are necessary to sustain all other ecological processes and make an environment conducive for human dwelling.

Open dumping, as seen in landfills, severely interferes with naturally occurring ecosystem services and contaminates the surrounding environment in various ways. Uncontrolled disposal generates severe heavy metal pollution in water, soil, and vegetation. The informal recycling processes of waste picking within open dump sites pose serious health risks to people working on these areas and increases the release of solid waste in water bodies subsequently intensifying marine litter and worsening environmental contamination.[11] Improperly maintained landfills interfere with many ecosystem services, specifically regulating services that include atmospheric regulation and water purification; “Till very recent times, landfills have been used simply to dump waste material, so not much care was taken in their consumption and maintenance. But

[11] Ferronato and Torretta 2019

with rapid industrialization the concept has changed its shape. As uncontrolled landfills have caused pollution of various parts of the environment and many tragic accidents, regulations have been imposed on landfill location, site preparation and maintenance. As a result of this, landfill gas (LFG) generation has increased. LFG emission in the atmosphere is a potential threat to the global environment. Additionally, studies have shown that leachate and runoff from these landfills reach the Yamuna River (one of India's largest rivers) through groundwater. Many other studies also concluded that the groundwater of residential areas near landfills is significantly contaminated by leachate percolation and contains toxic contaminants originating from landfills and improper solid waste disposal."[12] Groundwater contamination and the emission of harmful gases are a few of the many consequences of solid waste disposal at the scale of landfills like Ghazipur. Not only do these interfere with naturally occurring processes of water purification and carbon storage, but they also pose environmental health and safety issues to surrounding communities of people which will be discussed further in Chapter 3.

Landfills house inordinate amounts of plastic which presents a multitude of obstacles that negatively impact ecosystem services and environmental health. Despite the potential for recycling plastic, more often than not plastic is improperly discarded due to its seemingly unstoppable large-scale production and consumption. Plastic leakage into terrestrial and marine environments is an issue that is growing rapidly, especially in developing countries like India. It is estimated that plastic litter in landfills and natural ecosystems will reach 12 billion tons by 2050 in the business-as-usual scenario of current waste management and if there are no targeted

[12] Balasubramanian 2018

improvements made through technological innovations and other interventions. [13] South Asia's rivers carry unfathomably amounts of plastic as it is estimated that the Indus River carries 164,332 tons of plastic while the, Meghna, Ganga, and Brahmaputra rivers house 72,845 tons of plastic combined. Plastics waste cause severe problems if leaked into the environment, such as the blockage of waterways, disturbing the natural regulation of water purification and flood and erosion control. Microplastics and nanoplastics present additional problems that threaten provisioning services such as food production, as these small plastic particles are consumed by organisms and then spread to larger animals within the food chain; "The transfer of plastic into the food chain is dangerous to animals and human beings. In addition, plastic ingestion by aquatic organisms (e.g., dolphins, turtles, seabirds, and others) blocks their breathing pathways, leading to death. It is projected that marine litter may harm almost 600 species by 2050; 90% of seabirds will be under threat due to plastics ingestion, and approximately 15% of the marine species come under endangered categories because of the ingestion and entanglement of plastics"[14].

Furthermore, microplastics and nanoplastics cause shifts in soil ecosystems. The presence of plastics leads to fluctuations in soil temperature creating adverse impacts on soil ecosystems and associated ecosystem services; "Soil temperature flux alters soil decomposition rates, which can have massive impacts on soil ecosystem services. The subsequent alteration of physicochemical parameters is also known to have a significant impact on the forested land; especially, it can lead to soil erosion, forest fire, and desertification of unprecedented levels,

[13] Kumar et al 2021

[14] Kumar et al 2021

causing immense loss of biodiversity and subsequent ecosystem services".[15] Pollination is another ecosystem service affected by microplastics as there are species of pollens with similar sizes to micro and nano plastics. Small plastics can obstruct the pollen grain making pollination a difficult process. Obstruction of pollination has large-scale consequences; "Hindering pollination will lead to a decrease in seed banks; the worst affected species might be endemic or rare ones with limited viable seed banks, because, to a large extent, pollination is more prone to local extinction." [16] Landfills all over the world are riddled with plastics that pose threats to ecosystems and global health. While many of the studied impacts of landfill waste, most notably plastic, are included in this discussion, the long-term effects of the infiltration of solid waste into ecosystems as well as many of the ongoing effects of wide-scale toxic chemical emissions, micro and nano plastics leakage and groundwater contamination on global environmental health and safety remain hauntingly undiscovered.

The History of Indian Environmental Policy and Barriers to Unity. India possesses major opportunities to overhaul their existing solid waste management system by regulating and formalizing the currently unsafe and unchecked practices that are characteristic of waste-picking. India's history of environmental policy and reform, however, is a slow-moving one that is struggling to develop in tune to keep up with the country's rapidly growing population. Gaining independence from Britain in 1947, modern India is a young nation dealing with major socioeconomic, demographic, and political changes. India's Ministry of Urban Development was not created until 1985. Up until this time urban issues, such as the concentration of solid waste,

[15] Kumar et al 2021

[16] Kumar et al 2021

had no formal precedent or legal procedure through the eyes of the Indian government. Policies addressing disease surveillance, epidemic control and urban solid and liquid waste management first appeared in the Ninth Five-Year Plan of 1997–2002. The issue, however, was that by 2001, 286 million people lived in towns and cities; an exponentially greater number than ever before in the history of the nation.[17]

While the idea of sustainable development and environmental protection was considered in older Indian legislation, for example in the Factories Acts of 1881, 1934 and 1948, the basic environmental plan in Indian legislation was created after the 1972 Stockholm Conference and the 42nd amendment in Article 48 part IV & Article 51A(g) in the Constitution of India. The Constitution of India was amended within five years after the Stockholm Declaration and a National Committee on Environmental Planning and Coordination was set up by the Government of India. "The right to a clean, healthy and pollution-free environment" was included as the fundamental right of life enshrined in Article 21 of the Indian constitution."[18] While such policy at the national level is an essential start, its enforcement is another issue entirely. Chapters 4 and 5 will discuss existing policy concerning solid waste management in India and opportunities for reform.

[17] Doron and Jeffrey 2018

[18] Ghosh 2020

India's demography poses unique challenges as ethnically, geographically, linguistically, and culturally it is one of the most diverse countries in the world. Cultural and linguistic barriers cause rifts and partitions across India as states like Kerala in Southern India and Maharashtra in Northern India can vary drastically in infrastructure, literacy, access to education and so forth. Such diversity makes India an incredible nation home to centuries of history and culture. However, it can also pose barriers to the centralization of processes like solid waste management and the enforcement of the policy that surrounds it.

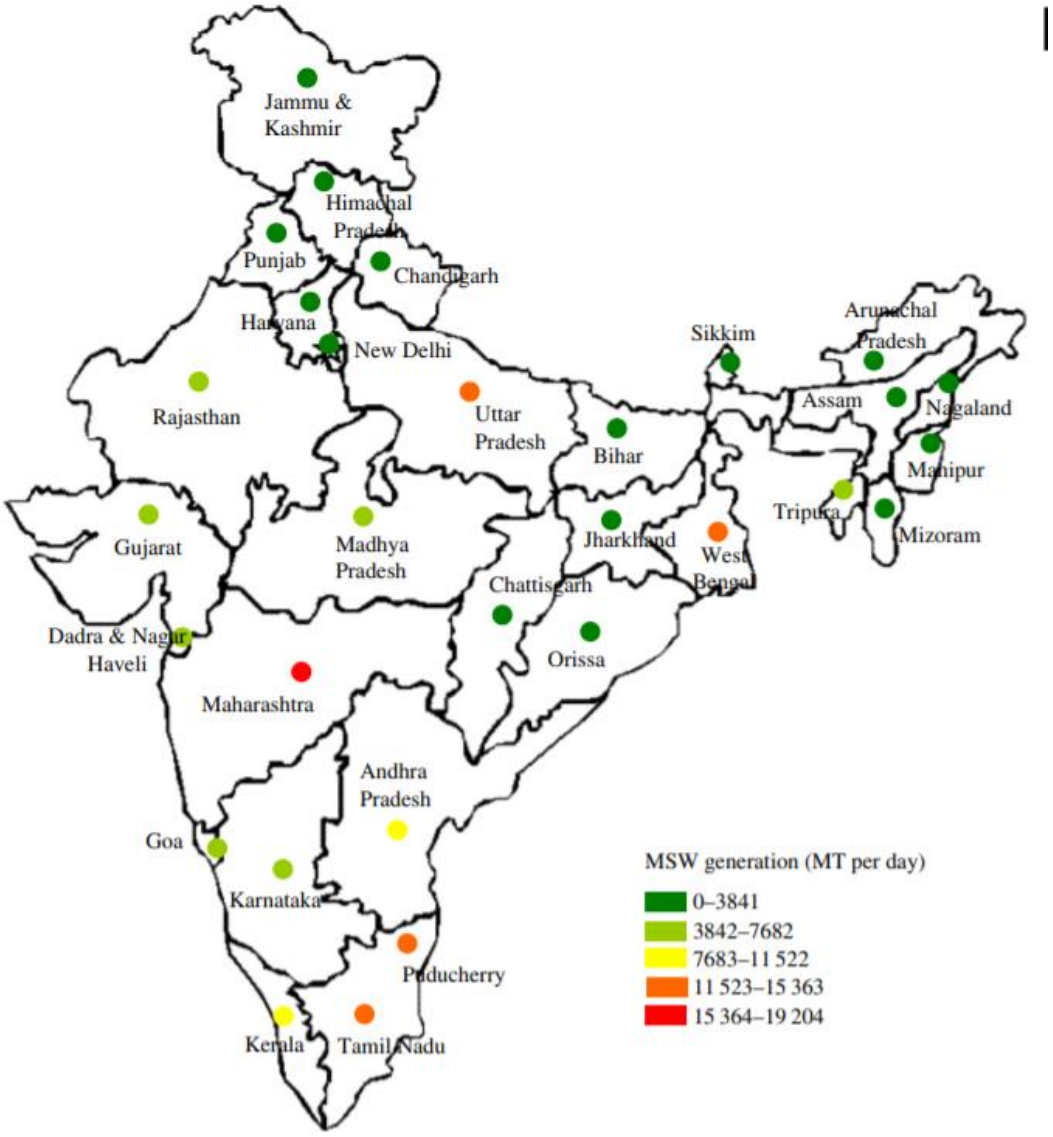

Figure 3: Map demonstrating the municipal solid waste generation of each Indian state (measured in 2012).[19]

As shown in Figure 3, solid waste generation varies greatly across state lines. Indian states home to large metropolitan areas, such as Maharashtra, Tamil Nadu and West Bengal which contain the cities of Mumbai, Chennai, and Kolkata, respectively, generate larger volumes of solid waste when compared to more rural areas such as the states of Northeast India. Such concentrations of massive metropolitan areas in very different parts of the country make unifying policy difficult to accomplish. For example, the official state language of Tamil Nadu, home to the city of Chennai, is Tamil while Kolkata's official language is Bengali. In Maharashtra the most spoken language is Marathi. Though English serves as the official and unifying language throughout the country, linguistic and cultural barriers exist nonetheless as literacy in English is typically limited to a small minority of Indians belonging to the upper class. Disparities in financial welfare of certain states as well as the fragmented political backdrop of the country also lead to a lack of regulation and variance in solid waste management systems throughout the country.

Geographic diversities present further obstacles to unification as it is impractical to use similar waste collection and disposal methods for the entire nation when regional differences must be accounted for; "The typology of the garbage in the cities changes with their geographical conditions, climate, social and economic status of the people. The populated cities are generating more municipal waste. Variation in the waste leads to more challenges for the

[19] Kumar 2017

municipalities, which clearly show the same strategy cannot apply to all cites."[20] Coastal urban regions, including cities in West Bengal and Kerala, must be mindful of landfill placement near bodies of water as seasonal monsoons can create issues surrounding collection, disposal, and safe treatment of waste. Alternatively, mountainous regions such as northeast India, face the issues of efficient collection, transportation and sorting of waste as land is largely elevated and sloped in these areas, complicating the process of centralizing solid waste management.

Chapter 2. Trash and Treasure: Changing Cultural Narratives on Consumption and Waste

Where does Waste Come from? Just as important as understanding the systems of waste management is understanding where the waste originates from to begin with. The word "waste" in the 21st century has taken on an entirely new meaning where materials that are unable to biodegrade for centuries are considered "disposable". Landfills all over the world, India included, are filled with electronics, clothing, single-use plastic, and many other materials that are discarded daily as a result of global consumer behavior.

Modern India is no exception to this pattern of consumption despite its frugal and environmentally aware roots. In fact, Indian culture is traditionally characterized by circularity and ecological responsibility. During the nationalist movement, Gandhi's campaigns centered around repairing and reusing materials as was typical of the largely village-dwelling country that depended on and supported local economies. Ancient Indian religions, Hinduism, Jainism and Buddhism, for example, believe in the connected nature of all living things and the individual responsibility to positively impact one's surroundings rather than damage it. Simple living and environmental awareness are central tenets of Indian culture and spirituality as many actions

[20] Kumar 2020

seen in the west as “sustainable practices” are the average way of life in India. With changing demographics and globalization, however, India’s once deeply rooted values of frugality and simplicity are rivaled by the throw-away culture and consumerist behavior that is typical of nations that develop a substantial middle and upper class. When compared to developed nations such as the United States, for example, India is a country that is only beginning to enjoy and abuse the wonders of throw-away culture brought on by globalization and the availability of cheaply made, relatively inexpensive goods. India maintained a closed economy until the 1990s meaning that mainly younger generations of Indians have adopted this modern, hyper-consumptive behavior in lieu of simple living on a larger scale than ever before. Up until its economic liberalization in the early 1990s, solid waste in India was largely biodegradable in nature such as food, paper, leaves and other such materials. Ever since this economic and political shift the republic has become younger, increasingly urban and financially prosperous. With this shift came changes in the composition of the country’s garbage as copious amounts of electronics, batteries, plastic, and construction waste all made their way into India’s landfills.[21]

[21] Bisen 2019

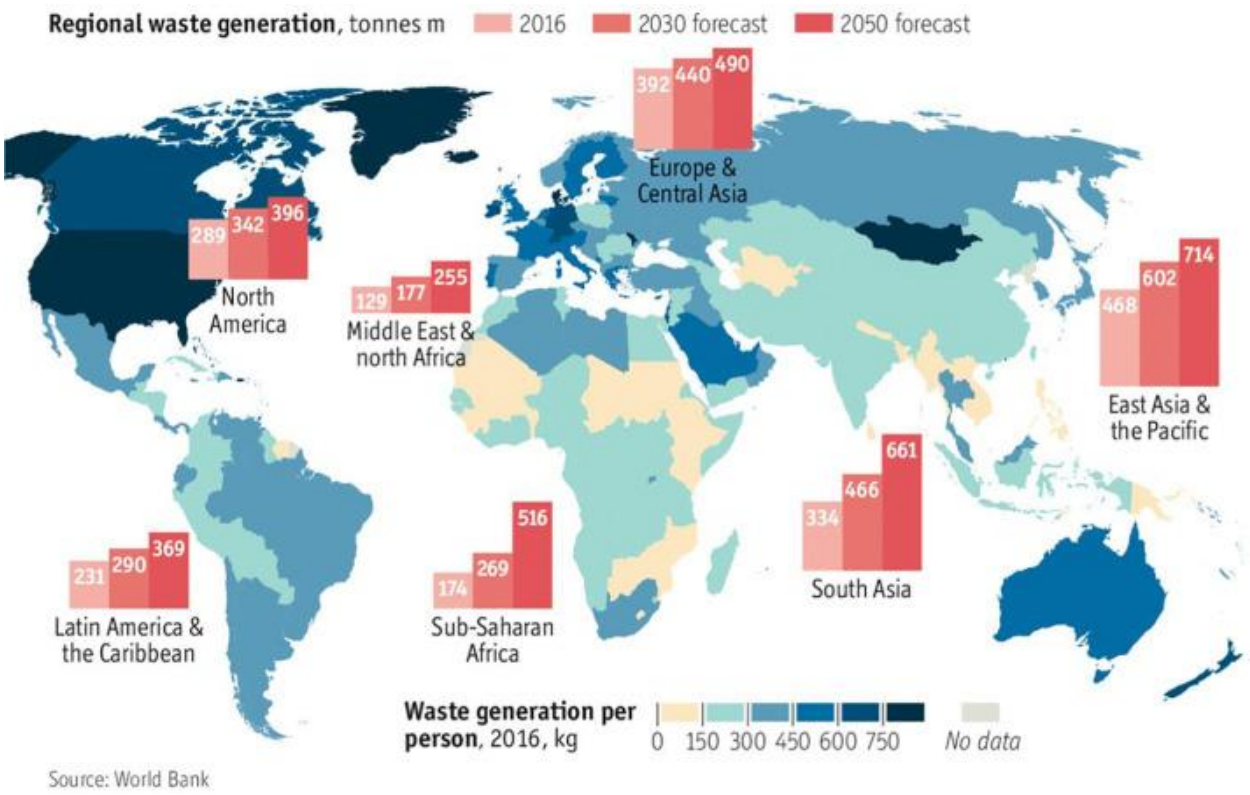

Figure 4: Global trend of the waste generation and projection[22]

In line with the increases in income are variances in how the upper-class contributes to waste accumulation, namely in that the volume of solid waste created by high-income groups is measurably greater; "The waste composition has a significant impact on waste management practices. High-income groups utilize more packaged products, resulting in higher volumes of paper, glass, metals, plastics, and textiles as compare to low-income groups. Such municipal solid waste may also contain harmful wastes such as paints, used medicine, pesticides, *E*-wastes and batteries."[23]

[22] Kumar 2020

[23] Kumar 2020

Despite the emergence of throw-away consumption in India, proclivity to reuse and recycling can still be seen in the informal networks that develop as waste pickers assign new purpose to discarded materials. Hinging on poverty and economic disparity, these networks are fueled by Indian citizens with no other choice but to scavenge through waste and make a living off the profits of materials that may provide use or functionality. Chapter 3 will delve into the reality of this unofficial recycling network and the systems of social inequality and disproportionate exposure to environmental hazards it perpetuates. India's informal recycling network makes a discarded object's lifecycle unpredictable when compared to garbage in developed nations.[24]

Cultural Contradictions: Achieving Ancient Luxury with Modern Day Materials. Analyzing India's consumption patterns is complex as it is virtually impossible to simplify or generalize the patterns of thought and action across the nation due to the diversity of India; "Such deep attachment to the socio-cultural norms of Indian consumer is reflected quite explicitly in their pattern of behavior as well. India is a large country not only as a part of humanity, but also in terms of its diversity, with many languages, cultures and religions, remarkably distinct pursuits, vastly disparate convictions, and widely divergent customs".[25] Diversity is a constant throughout India, yet easily identifiable and irrefutable are the changing socioeconomic demographics of the nation and the shifts in patterns of consumption that this creates. The heightening number of Indian households with disposable incomes has led to an increase in consumption. Coupling this with India's massive population growth, it becomes more understandable how the sheer amount

[24] Doron and Jeffrey 2018

[25] Ghoshal 2015

of waste accumulating on Indian land, as demonstrated in the Ghazipur landfill, has ended up there. While it is true that simplicity and frugality are culturally embedded values in India, the subcontinent's history boasts of luxury and indulgence from its legendary empires, royal families, and infamous palaces like the Taj Mahal. Historically, upper-class India is known to celebrate extravagance and opulence; traditional jewelry, clothes and weddings are thought to be some of the largest cultural proponents of modern Indian life, and with every passing year each industry seems to grow more saturated and competitive, as jewelry gets bigger and rarer, clothes get grander and more elaborate, and weddings get more ornate and ostentatious. In South Asia, religious and social ceremonies mark the milestones in life from coming-of-age to marriage. Annaprasan, which is celebrated when a child eats rice for the first time, is another example of such an institution. These ceremonies and norms vary across India and are identified differently in various languages and scriptures. The continued prevalence of traditional ceremony is indicative of India's cultural complexity. While modern India is accustomed to advanced technology as well as lifestyle, fashion, and spending habits similar to those of the west, these reflections are considered peripheral as cultural values still dominate and dictate Indian society in visible ways."[26]

Weddings are a prime example of Indian culture's focus on traditional social customs. The establishment of one's social status through the display of wealth is prioritized amongst many Indians, especially those searching for spouses for their children, as the exchange of dowry is still widely practiced. In South Asia, the appearance of wealth is crucial for both the bride and groom's families, as a woman's family is expected to pay for the wedding as well as the dowry, and a man's family should prove themselves able to provide for the new couple. India's wedding

[26] Ghoshal 2015

industry flourishes in a culture that fixates heavily on marriage and profits off the desire for people to be accepted by society. Expensive weddings in India have been criticized for their glaring displays of overconsumption, contributing to food waste, plastic waste, and even technological waste. In 2016, a bill was proposed to congress to cut down excessive waste from weddings after a wealthy South Indian family threw a 5-billion-rupee (about 70 million USD) wedding for their daughter, which caused controversy throughout the state; "The proposed bill will not only limit the number of guests and dishes served to avoid waste, but also put a "tax" on the most extravagant newlyweds. Those who spend over 500,000 rupees ($7,500; £6,000) will have to give 10% of the overall cost to poorer brides to help them pay for their weddings".[27] The proposed "Wedding Tax" was never passed, but the sentiments behind it shed light on how large the wedding industry is and how seriously it is taken in Indian culture and society as well as how such creation of waste in the name of ceremony and social integration is increasingly normalized.

Keeping Up with the Patels. This trend of advertising one's wealth has added significantly to overall waste production within India, as rampant spending, consumption and travelling have become commonplace amongst India's growing upper class. In a country simultaneously containing extreme displays of poverty and wealth, aspiration is a key motivator behind consumption. A study on the consumption of energy intensive goods in India titled *Keeping up with the Patels: Conspicuous consumption drives the adoption of cars and appliances in India* found that households that view themselves as middle class relative to being poor, and those that perceive themselves comfortable relative to being middle class, have a higher probability of

[27] BBC News 2017

owning a car and multiple appliances.[28] The findings of this study demonstrate that aspiration for a more comfortable lifestyle may prompt Indian households to not only purchase expensive appliances that consume lots of energy but to also desire consumer goods that may not be affordable. In other words, the desire to keep up with their seemingly successful peers is measurably greater, replacing the humble simplistic lifestyles that dominated village values of the early republic. The measured increase in inclination of Indian households and individuals towards goods and services that exist as social status markers but with objectively less practical functionality leads to greater wastage as status symbols go out of style and the older models are disposed to make room for the new. Heightened further by social media, marketing and online shopping, the affordability of goods and services once seen as luxurious and aspirational given the reality of globalization and the accessibility of inexpensive, low-quality items appeals to Indian consumers who are value conscious as well, as money no longer exists as a barrier to buying goods one does not necessarily "need". Additionally, the changing demographics of family structures impacts Indian spending behavior greatly, as nuclear households consistently replace the once typical joint family. This shift measurably creates an increase in basing consumer decisions on lifestyle considerations and the need to 'keep pace'.[29]

The concept of capitalistic aspiration and opportunity is reflected in modern Bollywood cinema. "Bollywood" refers to the Hindi-language film industry which is one of the largest film industries in the world; "With an outreach in more than 90 countries, a market share of 2.1 billion dollars and a target audience of at least 1.2 billion people, Bollywood, also known as the

[28] Ramakrishnan 2020

[29] Ramakrishnan 2020

Mumbai film industry, is a formidable entertainment force." [30] Bollywood films have remained a crucial aspect of Indian culture and society since the early 20th century and shifts in subject matter of modern Bollywood cinema reflect changes in the nation's socioeconomic makeup as well as value system. Indian cinema provides a lens into the ever-changing social norms concerning gender equality, religious discrimination, and the caste system. Perhaps most importantly, however, is the ability of this colossal film industry to advertise, accentuate and market the ideals of social mobility, and consumption. Themes of economic and social mobility have infiltrated modern cinema, presenting the narrative that financial freedom and success are achievable ideals. High-grossing Bollywood films are often big-budget productions that target specific socioeconomic groups. Ideals presented in Bollywood films, such as beauty standards, luxurious standards of living, and expensive clothing, make a massive impact on the spending behaviors and the material aspirations of average Indians.

Activism and The Treadmill of Production. The theory of the "treadmill of production", as discussed by Luis Barbosa in *Twenty Lessons in Environmental Sociology,* can clearly be seen in current day India.[31] In fact, the accumulated waste in the Ghazipur landfill is the perfect representation of the negative consequences of overconsumption as outlined by the theory. According to Barbosa, the treadmill of production refers to the sociological theory that environmental degradation and production go hand in hand and that as societies and economies evolve, the environment undergoes more and more stress. The treadmill of production theory also touches upon the idea that as industries continue to expand, waste continues to increase,

[30] Khadilkar et al 2021

[31] Barbosa 2015

creating more environmental health and safety issues. This theory criticizes capitalist states that stress consumerism as the main instrument behind environmental degradation, and calls for institutions of influence, such as governments and municipalities, to rectify social inequalities and environmental issues.

Activism and progress in India tend to be strained by deep-rooted systemic and cultural issues. For example, many Indians suffer from desensitization to the struggles of others; seemingly shocking displays of poverty, pollution, and hunger are all commonplace, and the average Indian sees such exhibitions of suffering daily. A white-collar worker on his way to the office on a typical day in Delhi will likely pass by slums and beggars; a young girl on her way to school is sure to see children her own age performing manual labor, such as waste-picking or bricklaying. Most Indians have come to view this reality as unavoidable, normal and even acceptable. It should not be surprising, then, that despite the unavoidable existence of landfills like Ghazipur and the countless issues this waste poses, many Indians, including government officials, are turning their heads away. This desensitization to social issues is a major barrier to action and change within Indian society and continues to dig lower classes and the least advantaged Indians deeper and deeper into an inescapable hole of physical suffering, poverty, subjugation, and disenfranchisement. While activism is alive and well in India, feelings of apathy and avoidance surrounding vital issues tend to prevail as Indians have grown used to inequality and injustice, whether or not they are on the receiving end of systemic misfortunes.

Chapter 3. Overflowing Landfills, Public Health Problems and Environmental Injustice

A Public Health Crisis. As was touched upon in Chapters 1 and 2, the inordinate buildup and the improper solid waste disposal processes that take place in India have severely adverse impacts on ecological and human health. Due to the densely populated nature of Indian metropolitan areas,

atmospheric and environmental issues brought on by dumping sites can affect massive communities of Indian citizens in awful ways.

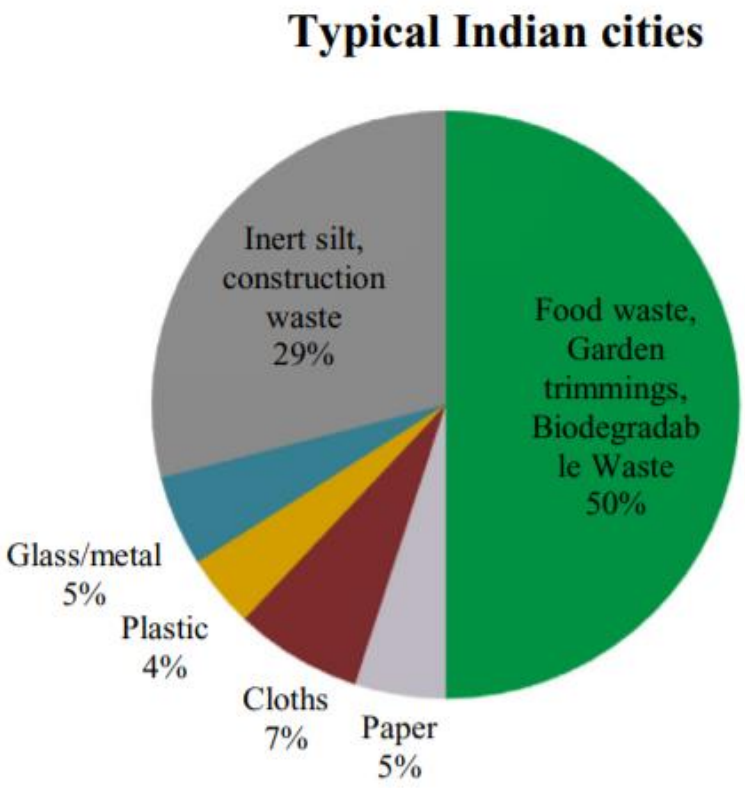

Figure 5: The composition of discarded waste in Indian urban environments as measured in 2018 (does not include E-waste).[32]

As shown in Figure 5, much of the waste found discarded in Indian urban dumping sites is biodegradable waste which gives rise to a host of environmental health complications. Landfills, especially those of Ghazipur's proportions, release methane from the decomposition of biodegradable waste under anaerobic conditions. This methane causes fires and explosions which

[32] Kumar 2020

not only contributes to global warming but impacts the safety and health of nearby residents. The burning of waste at landfills also releases fine particles & smog, which cause and contribute to the spread of respiratory diseases. [33] Additionally, the odor of burning waste as well as the contamination of inadequately processed chemicals from degrading waste into local waterways and soil poses threats to the wellbeing of urban dwellers. A study found that discarded tires at dumps collect water which create conditions conducive for mosquitoes to breed, which increases the risk of diseases such as malaria, dengue and West Nile fever. Humans are also severely adversely affected by harmful gases like CO, CO2, PM2, mercury, & polycyclic aromatic hydrocarbon (PAHs), plastic pyrolysis, and even arsenic in water caused by contamination from concentrated solid waste pollution. Exposure of high levels to such chemicals can lead to cancer and even death. Additionally, unrecycled plastic finds its way into nearby bodies of water and oceans contaminating marine life and affecting the safety and quality of seafood that is consumed by urban dwellers. [34]

As discussed in Chapter 1, microplastics introduced by waste in landfills lead to the obstruction of ecosystem services as well as pose hazards to human welfare. The inhalation of microplastics by people in proximity to large landfills is a major concern when discussing the health effects of inadequate solid waste disposal and dumping; “Similar to other pollutants, humans inhale microplastics. The continuous inhalation of microplastics leads to serious health concerns including lung congestion, cancer, ulcers, and several other nasal and olfactory infections. There are significant knowledge gaps, ecological concerns, and serious public health

[33] Kumar 2020

[34] Kumar 2020

concerns regarding the toxicity of microplastics and nanoplastics, as they will lead to a burden for the health system infrastructure in society, especially in the third world nations, whose current medical infrastructure is already overwhelmed. The public health concern will directly lead to lowering the HDI (Human Development Index) and simultaneously will be a major hurdle for achieving the SDGs (Sustainable Development Goals) targets."[35] Microplastics and other airborne pollutants emitted by the burning of trash in landfills, either through the process of incineration or the general heating of waste brought on by rising temperatures, can cause irreversible respiratory damage which has broader implications of global health when considering the ongoing global pandemic and the spread of respiratory illness. In the instance of Ghazipur, locals in East Delhi disproportionately suffer from respiratory illnesses and other medical issues brought on by their proximity to the landfill; "Local doctor Kumud Gupta said she sees about 70 people, including babies, each day mostly suffering from respiratory and stomach ailments caused by polluted air. A recent study said the dump was a health risk for people living within five kilometres (three miles), including for cancer".[36] There have been calls to action regarding Ghazipur, as its size, and surely, its smell, make it very hard to ignore. In 2017, the Climate and Clean Air Coalition, an initiative launched by the United Nations Environment Programme, released a report on the Ghazipur landfill exposing the massive risks to environmental health and safety it poses. The report responded to the landslide at Ghazipur that resulted in two deaths in 2017 and went on to outline the countless issues that the landfill is riddled with, including poor planning and organization, spontaneous fires, unsafe miscalculation

[35] Kumar et al. 2021

[36] Frayer 2019

of the slope of the landfill, and lack of surrounding breathable air space. While the report calls for engineering and structural improvements on the landfill, such as using thermal cameras to identify zones of irregular heat to prevent fires and avoiding placing trash at the top of the landfill (as this increases the slope and leads to more instability), it does not address the larger issue of the sheer amount of trash coming into Ghazipur and the unstoppable growth of garbage.

"Rag picking" and Unregulated Waste Collection. As mentioned in Chapters 1 and 2, India's solid waste management system relies on informal recycling. The waste picking personnel that operate within this unofficial recycling network are referred to as "rag-pickers". Rag-pickers sort through trash in areas of high concentration, such as Ghazipur, and sell recyclables to middlemen. Rag-pickers are not considered official employees and receive minimal-if at all-compensation. Despite India's urgent need for effective solid waste management and recycling, rag-picking is a very high risk yet very low-reward job that is conducted by those with absolutely no other choice but to resort to it; "Even if you sort your trash at home, municipal garbage

collectors — if they even service your neighborhood — often toss it into the truck all together. It gets sorted again at a landfill — not by the municipality but by the poorest of the poor".[37]

Figure 6: A young child rag-picking to help support his family on the streets of Mumbai[38]

Ghazipur is home to many rag-pickers who make a living from sifting through trash to find recyclables. Sheikh Rahim, a rag-picker living on the outskirts of the Ghazipur landfill, states that this job, despite its health and safety dangers, was largely unavoidable; "I don't have a choice…If I don't, our streets will fill with trash. We won't be able to handle it. It already stinks. Our eyes burn. In summer, this trash mountain spontaneously catches fire".[39] Along with many

[37] Frayer 2019

[38] Doron and Jeffrey 2018

[39] Frayer 2019

other rag-pickers, Rahim climbs Ghazipur everyday with no safety equipment to sort through the tons of trash that arrive daily. India's network of rag-pickers is indispensable, as their contributions to cleaning up the city are nothing to scoff at; "Municipalities collect 30% to 60% of urban waste while the remaining substantial trash is picked by rag pickers unhygienically. Garbage collected by the informal sector is about 15% to 20% mostly recyclable waste and sometimes hazardous waste too."[40] Despite India's dependency on people like Rahim, for his efforts he receives meager compensation and no formal benefits; "Rahim picks through rotten trash for about five hours a day, then sorts and sells a day's haul for 150 rupees, about $2 dollars".[41]

[40] Kumar 2020

[41] Frayer 2019

Figure 7: Sheikh Rahim after a day's work of sorting through garbage at the Ghazipur landfill[42]

Religion, Caste, Class and Inequality. The story of Rahim, which is representative of the stories of many rag-pickers, is a prime example of the environmental inequality that affects those in close proximity to Ghazipur. Rahim, a Muslim minority in Delhi of low socioeconomic status, was never given the opportunity to pursue an education. Without an education, he is considered an unskilled worker and must work as a rag-picker, not only to support his family, but as this is the only way he can actively decrease the level of toxicity and pollution that he and his loved ones are exposed to. Rahim is a victim of the systemic social inequality that plagues India, as one's status by birth often dictates the life they are destined to live. India's history of the caste system points to centuries of socioeconomic inequality that is directly linked to factors individuals are born into and cannot change about themselves; factors like one's ancestry, familial religious affiliation and ethnic background. Slums in Mumbai and other big cities are made up of the lowest class which includes the most disadvantaged groups of India; religious and ethnic minorities, as well as those belonging to lower castes. Muslims, for example, despite making up a sizable amount of the population of India, experience a disproportionately lower standard of living on average compared to Hindus in India; "India's Muslim community has for long faced discrimination and relatively lower living standards. Previous research has shown that the Muslim community has the lowest rate of enrollment in higher education in India, accounting for just 4.4% of students. It also faces high levels of poverty, with 25% of India's 370,000

[42] Frayer 2019

beggars being Muslim".[43] Poor government protection and treatment of minorities can be attributed to a variety of factors, but the most notable is India's highly polarized political setup. The leading political party in power is the BJP, or Bharatiya Janata Party. This party, backed by Prime Minister Narendra Modi, represents Hindu nationalistic ideals that overtly prioritize the interests of Hindus. However, religious and ethnic minorities are not the only Indians that are left behind, as Hindus belonging to lower castes suffer from significant disenfranchisement, as caste continues to be both a marker of status and a barrier to upward mobility throughout India. Though discriminating based on the caste system has been technically outlawed for more than 50 years, caste continues to govern society in both explicit and indirect ways; "Nearly a third of Dalits (lowest caste) make less than $2 a day and many don't have access to education or running water. Most menial jobs are carried out by Dalits; few office jobs are. Hate crimes against Dalits have proliferated in recent years".[44]

Labor surrounding waste and garbage has long been regarded as the lowest and least respectable type of work associated only with the "untouchable" castes: "Traditionally, people working with the waste management sector popularly known as rag pickers. They commonly belong to the socially and economically sub-marginal community. They sweep the streets, cleans toilet & sewer drainage. Hence, the prevailing, social-cultural taboo towards the waste system also affects how society sees waste."[45] The concept of impurity is prevalent in rhetoric surrounding the caste system as entire groups of people are thought to be impure simply because

[43] Thomas 2018

[44] Chaudary 2019

[45] Kumar 2020

of the case they were born into; “Caste—ideas, beliefs, and practices associated with one’s birth and with ritual purity and pollution—complicates India’s confrontation with waste…Groups associated with waste are treated as if they themselves were waste—not to be associated with or touched and in some places, not so long ago, not even to be seen.”[46] The caste system assigns all to do with waste, dirt and garbage to the Dalits, essentially treating the people belonging to this lowest class as human filth. As India continues to urbanize and consume resources in larger volumes, de facto social institutions like the caste system and religious discrimination visibly prevail as younger generations of disenfranchised families adopt the roles of their mothers and fathers; roles like rag picking; “Loathsome tasks have been performed by people who are born into subcastes—jatis—deemed to be at the bottom of a Hindu hierarchy. Such hierarchies are sometimes replicated among Muslims, Christians, and Sikhs.” [47]

While caste is an undoubtedly South Asian concept, the idea of associating entire communities of people with garbage is not limited to India. New York, thought to be one of the most developed cities in the world, is historically plagued with environmental racism and injustice, often exposing people of color to disproportionate amounts of environmental harm and toxin. Regions occupied by communities of color in New York are commonly dismissed as undesirable areas, even though atmospheric unpleasantries, such as strong odors and high levels of pollution, are repeatedly strategically directed towards minority communities that often lack the resources to combat the placement of sites like garbage dumps and incinerators in their neighborhoods. This perpetuates a stigma that such neighborhoods and communities are “dirty”

[46] Doron and Jeffrey 2018

[47] Doron and Jeffrey 2018

when in reality they are being used as dumping grounds by the rest of the city; "Residents understand "dirty" neighborhoods as "unhealthy" places. Four types of stigma are concurrently operating: technological (industry), air pollution (or dirt), health, and social stigma. The role of political neglect is also a key factor in social stigma. In contrast to earlier associations of garbage, filth, and disease with the stigmatization of people based on their poverty, race, or ethnicity, late-twentieth-century environmental justice campaigns in New York understand the stigmatization of places, people, and garbage as a catalyst for social movement mobilization and community organizing. Environmental justice activists in the four neighborhoods clearly perceived a relationship between economic decline, environmental and air pollution, and health and social stigma."[48]

Such stigma is shockingly prevalent in India as rag-pickers and those who live in environmentally undesirable urban areas face discrimination and major barriers to social mobility. Additionally, the lack of protective programming geared towards minorities and lower castes within the Indian government makes access to education and employment extremely difficult. This issue, coupled with the surge in population, makes the government's ability to effectively provide aid and address social and environmental issues increasingly daunting, as there is often a lack of organization, resources, and motivated personnel to approach these problems. Residents such as those of East Delhi who must deal with the effects of the Ghazipur landfill suffer the brunt of environmental injustice, typically due to their socioeconomic background. As discussed in *Twenty Lessons in Environmental Sociology*, environmental justice is defined as "a theoretical and methodological approach to examining the uneven ways in with

[48] Sze 2006

pollution and other environmental hazards are distributed among particular social groups, communities and regions."[49] Environmental justice encompasses the concept of environmental racism and highlights the disproportionate exposure to environmental hazards faced by those of lower socioeconomic status and those belonging to minority groups. The lack of educational opportunity, lack of access to necessary facilities (such as healthcare, clean water, etc.) and generational disenfranchisement suffered by much of the Indian population makes social mobility difficult or even impossible. These phenomena explain why despite the overwhelmingly toxic areas surrounding Ghazipur and the dangers the landfill poses, many residents are left with no other option but to stay put. Environmental inequality is so starkly apparent in a city like Delhi, where those with money can easily distance themselves from displeasing areas such as Ghazipur, though they are likely the highest contributors to the staggering accumulation of material waste as discussed in Chapter 2. Those without money are forced to live amongst or clean up the trash of more privileged Delhiites as they lack the political influence and funding for legal action to effectively put an end to this vicious cycle of injustice.

Chapter 4. The Politics of Garbage

Existing Policy Surrounding Solid Waste Management and Proposed Solutions. In terms of national legislation, India's solid waste management system relies on the official "Municipal Solid Waste Management and Handling Rules" passed in 2000 by the national Ministry of Environment and Forests. Updates to the rules are revised and published periodically and they deem municipal administrations as responsible for following regulation concerning collection, storage, transport, processing, and disposal of solid waste. Municipalities are referred to as

[49] Barbosa 2015

"urban local bodies", and these administrations are dependent on the central and state governments for a major portion of their funds, which are mainly in the form of 13th and 14th Finance commission grants and other scheme specific grants.[50] The official Municipal Solid Waste Management and Handling Rules originally published in 2000 does specify procedure surrounding actions including water and air quality monitoring, toxic pollution prevention, and safe handling, transport, segregation and disposal practices. However, the regulation of these practices suffers due to the varying capacities of the urban local bodies, many of which are underfunded, understaffed, and entirely overwhelmed; "There is also a lack of accountability in current SWM (Solid Waste Management) systems throughout India. Municipal authorities are responsible for managing MSW (Municipal Solid Waste) in India but have budgets that are insufficient to cover the costs associated with developing proper waste collection, storage, treatment, and disposal. The lack of strategic MSW plans, waste collection/segregation and a government finance regulatory framework are major barriers to achieving effective SWM in India."[51] The increase in the volume of waste disposed for dumping has led to lower rates of waste segregation as well, leading to a greater amount of unprocessed waste and a lack of prioritization of recycling eligible waste; "The quantity of mixed waste arriving at landfill sites for dumping has been increasing exponentially. The demand for land for processing, machinery, and capital expenditure and the contract payments for outsourcing various SWM activities have

[50] Ghosh 2020

[51] Kumar 2017

also increased making SWM a capital-intensive activity. Therefore, the demand for expenditure is manifold higher than the resources allocated for SWM."[52]

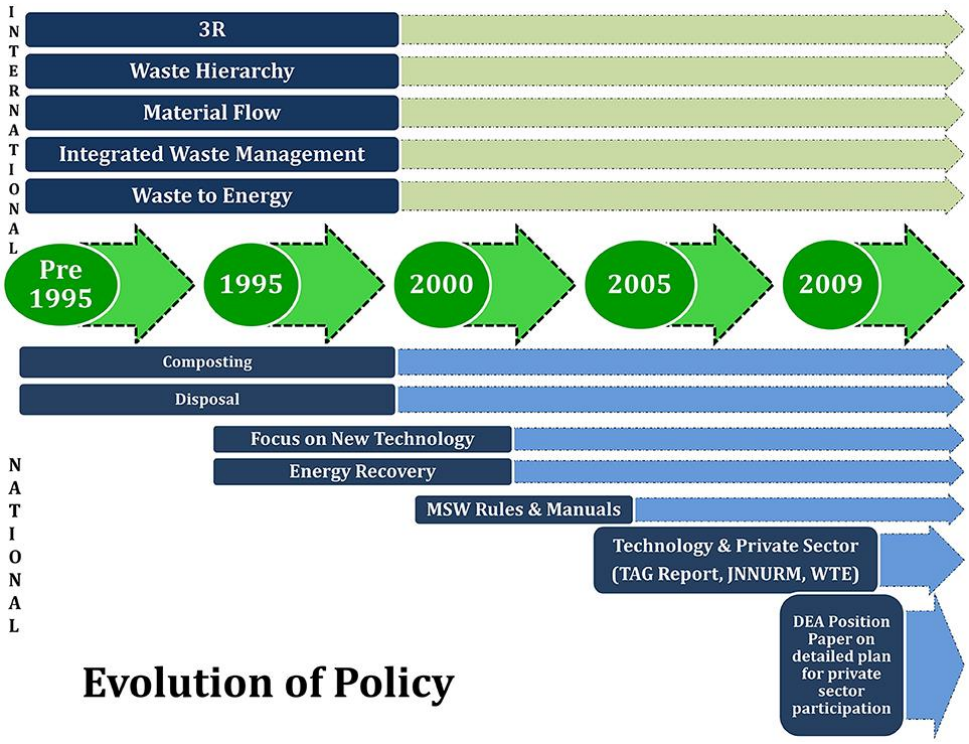

Figure 8: The evolution of waste management policy and trends in India[53]

[52] Ghosh 2020

[53] Randhawa 2020

In an attempt to address the major issue of funding, the trends in solid waste management policy, as shown in Figure 6, continue to focus more and more on the opportunities of assigning waste management to the private sector. However, a major issue with privatizing solid waste management is the prevalence of the informal waste-picking sector in India; "The informal sector has a significant value in the waste material reduce, reuse and recycling in low and middle-income countries like India. Poor women and men and even young children in alarming numbers are observed in these informal recycling activities. Pune's municipal corporation takes help from waste pickers to collect organic waste for composting and bio-gas generation which contributes to the clean city. A recent study of Indian cities found that waste pickers recovered approximately 23% of waste. In the city of Bangalore, waste pickers, mostly women, from the Hasiru Dala cooperative diverted over 1050 tons/day of waste leading to the city saving Rs. 84 crore (approximately 1 billion US dollars) annually and avoided considerable amounts of CO2 emissions by doing so."[54] Many plans to privatize the waste management sector ignore this informal sector entirely which would threaten the livelihoods of the hardworking people that make up this valuable waste-picking network. Despite the immense contributions of the personnel making up this informal network they consistently lack the support of municipalities, government agencies, and policymakers. As Indian waste management systems head towards either partial or complete privatization it is vital to consider the effects this shift would have not only on the lives of the hundreds of thousands of people making up the informal recycling network but also on the future of the industry and the accessibility of work within it; "With little formal interest in resources from waste, all the recyclables in the waste stream belonged to the informal waste-picker becoming part of a complex recycling chain, and a major source of

[54] Kumar 2020

livelihoods. The shift in the narrative of urban waste from a source of risk to a resource for energy generation results in the same recyclable waste potentially being sought by Waste-to-Energy plants in order to produce energy, particularly as they are incentivized by the volume of waste they process. This in turn may have serious consequences for the livelihoods of waste-pickers and implications for environmental outcomes as different wastes are processed in new ways."[55]

India's solid waste management is decentralized, as urban local bodies and individual municipalities make decisions on how to manage their waste. While centralization and national regulation may provide its own benefits, implementing nation-wide policy is never simple in a country like India with so many people, languages, divisions, and borders. Given the fragmented and unorganized nature of waste management systems in the nation, policy that addresses waste management, while important and necessary, should be secondary to addressing the root of the problem at play, which is waste production and manufacturing. Chapter 5 will discuss the implications this concept has on Indian society, consumer behavior and social reform. From a political and economic perspective, addressing the problem of waste production has been proposed in the form of mandating fees for waste collection services which works by not only making citizens aware of the waste they produce but also places stress on large companies that disproportionately add to waste accumulation. Fees or taxes surrounding waste collection could bolster the funding of the municipalities and allow for newer equipment, more organized collection systems and better wages and safer environments for workers; "An average charge of 1 rupee per person per day would generate close to 50,000 crores (about 500 million US dollars) annually, and this level of funding would probably be sufficient to provide effective waste

[55] Randhawa 2020

management throughout India. Information on future quantities and characterization of wastes is essential as this determines the appropriateness of different waste management and treatment options. State-level procurement of equipment and vehicles is necessary for primary and secondary collection with effective systems for monitoring collection, transport, and disposal."[56] Additionally, the advancement of urban local bodies and municipal administrations must be assembled in accordance with the severity of the problem. In other words, cities with high populations and large volumes of waste collection must expand their municipal solid waste departments accordingly, "ULBs need to be responsible for waste management, with the ULB Commissioner and Chairman directly responsible for performance of waste management systems. Waste management needs to be regarded throughout Indian society as an essential service requiring sustainable financing. A strong authority is needed to regulate waste management if SWM is to improve in India. Without clear regulation and enforcement, improvements will not happen. Strong waste regulations can drive innovation."[57] Crucial to ideas surrounding the upgrading of existing solid waste management policy and administration are policy plans intended to provide incentives surrounding progression in the industry thus making sustainable solid waste management an attractive endeavor. This could include financial incentives for reduction of waste in urban areas but also potentially the placement of fees and fines on municipalities that fail to keep their cities clean and environmentally safe.

The "Polluter Pays Principle". The Polluter Pays Principle was developed by the Organization for Economic Cooperation and Development (OECD) in 1972 to regulate economic

[56] Kumar 2017

[57] Kumar 2017

compensation for environmental disparity in which polluters were held accountable for environmental harm and pollution. In 1995 the Supreme Court of India ruled in favor of instituting the Polluter Pays Principle, essentially placing responsibility on polluters to pay the price for any economic reparations associated with victims of pollution as well as the costs of remediating the damaged environment in line with relevant sustainable development goals.[58] Though only officially making its way into the Indian legal system in 1995, use of the Polluter Pays Principle (PPP) to settle cases of environmental injustice has been seen in India before, most notably in the aftermath of the 1984 Bhopal Gas Tragedy. Union Carbide was the corporation at fault for the tragedy, which to this date remains one of the world's most horrific industrial disasters. Indian courts applied PPP to this case, however the Indian government assumed a system of direct liability by paying compensation to the victims of the tragedy and later collecting from the polluters in question through an action of subrogation."[59]

As an established method for settling cases of environmental hazards, the Polluter Pays Principle provides an interesting angle for solid waste management and environmental justice activists. The Polluter Pays Principle could potentially be applied to corporations that create much of the waste that ends up in landfills, in the streets and, eventually, in waterways. Large-scale accountability of highly polluting industries, such as those concerned with the production of plastic-packaging and electronics, could force such corporations to create effective systems of circularity, either by facilitating the collection and reuse of their materials or by investing in robust solid waste management systems throughout the nation. While the Polluter Pays Principle

[58] Choudhary 2019

[59] Khan 2015

has typically been used on a case-by-case basis of specific instances of pollution, as seen in the Union Carbide settlement, the Polluter Pays Principle could be applied directly to the massive amounts of pollution caused by open landfill dumping and poor solid waste management. Victims of such pollution include members of the informal waste-picking networks that manage solid waste throughout the nation as well as communities most affected by environmental issues brought on by this inadequate system of waste circularity, measured by their proximity to landfills and dumping grounds or their increased exposure to pollutants brought on by sites of improperly processed waste.

Chapter 5. Taking out the Trash: The Road to Cleaning Up the Country

Social Reform and the Need for Awareness. It is tempting to simplify the issue of waste as one that is surface level. In theory, waste should be easy to curb with strict regulation, incentivization and well-funded and organized systems. As discussed in chapter 3, however, the normalization of environmental and social injustice and sheer disparity between the haves and the have nots limits action on individual, state-wide and national levels. Apathy and desensitization to environmental issues as well as lack of hope in the ability of the nation to effectively overcome such struggles plagues India, creating barriers to change and activism. The physical distancing of privileged Indians from environmentally hazardous sites like Ghazipur further drives a wedge between the issues that concern the lower classes and the upper classes, as the least fortunate Indians struggle to find support in their plight against injustice. The acclaimed 2019 Hindi-language film “Gully Boy” explores the topic of socio-economic disparity and inequity in Mumbai, depicting grand and luxurious skyscrapers bordering impoverished slums alongside the following famed lyrics; “On the right, I see a building touching the skies. On the left, I see a

hungry child sleeping on the streets...We are so close to each other but, look! There is so much distance between us...What kind of compulsion is this?"

This begs the question; how can India go about rectifying this issue of apathy? Awareness and education campaigns stressing the importance of sustainable waste management is necessary as knowledge of waste management systems throughout urban India is minimal; "The general awareness of solid waste management is quite low due to a lack of self-motivation and attitude. Citizens are usually found discarding waste from their households without segregation, which further makes it challenging to the waste collector to distinguish the waste type (recyclable, biodegradable, etc). It's not only about their education, but also social taboos prevailing in society towards waste doesn't allow them to behave responsibly towards garbage. Municipalities must take responsibility to educate people about national policies and decentralized methods of the treatment locally. Educational institutes can also help local authorities to make individuals aware through various seminars, group meetings, posters, competitions, awards, advertisement, print media and penalties."[60] Government-run and private educational institutions alike must begin to emphasize the seriousness of waste management and the consequences of overconsumption. Ideals like circularity and sustainability should be incorporated not only in school curriculum at the elementary, middle, and high school levels but more investment into environmental health and solid waste management departments in higher education institutions, such as universities, must be made. Rather than allowing the predominant notion that monstrous accumulations of waste are an unavoidable consequence of a consumptive

[60] Kumar 2020

society to prevail, alternatives to unsightly and unsafe dumping grounds and untreated landfills must be explored and discussed.

Social taboos surrounding waste and the workers that manage it also prevent change and progress as such stigmas turn waste management into the elephant in the room. Addressing the evident issue of waste accumulation is necessary, yet societal attitudes around filth and garbage limit the ability to incorporate such rhetoric into daily life and culture. Not only is education about the intersections between sustainability, health, and waste management imperative, but greater respect, treatment and compensation must be provided for sanitation workers. The reality remains that sanitation workers, including waste-pickers and garbage collectors, are necessary for the health and safety of the nation, yet they are socially and economically marginalized in various ways. By empowering these networks and workers, Indian municipalities can demonstrate the value of waste management and draw greater interest into the sector. By investing in appropriate safety equipment, benefits and livable salaries for waste-pickers and sanitation workers, India can strengthen the industry while uplifting communities that face marginalization. While the issue of lack of funding remains, potential policies outlined in Chapter 4, including waste collection fees and taxes as well as polluter accountability, can be utilized to bring in revenue that fuels a more vigorous waste management network.

Along with awareness and industry reform, social reform is a key aspect of waste management. To address the social and environmental injustices associated with solid waste disposal in India prevalent issues such as casteism, religious discrimination, and wealth inequality must be challenged. The government must recognize all groups of Indians as equally deserving of the right to live safe and healthy lives. Education should not be reserved for the most privileged in the nation but should be available to all. Without these systemic changes,

wealth inequality will continue to grow, and social mobility will remain unfeasible for many Indians, leaving lower class Indians continually disproportionately more exposed to such environmental tribulations. Upper class Indians must also stray away from gross overconsumption in the name of tradition, as we have seen in recent years with the explosion of enormous wedding celebrations thrown for the purpose of flaunting wealth and status. Such declarations of status typically include a vast amount of waste production and carbon emissions. As demonstrated in Chapter 2, true traditional Indian culture reflects a resourcefulness and mindfulness surrounding consumption. A resurgence of such ideals would be beneficial today, especially considering the surge in population and diminishing of resources and livable land. To avoid repeats of Ghazipur and other forms of environmental inequalities and injustices in India, major changes must be made to both Indian culture and policy. India is a country full of promise and potential, and major strides toward environmental activism have already taken place. The Indian cities of Alappuzha and Muzaffarpur, for example, have been titled "zero-waste" and were named as some of the cleanest cities in the world. Attempting such sweeping reforms on a large city like Delhi will prove to be difficult, but it's far from impossible. Ghazipur, for instance, may seem like a daunting and immovable obstacle, but it is just a starting point in addressing Delhi and India's major environmental injustices. Conquering Ghazipur will be no simple feat, but it can be done with the right management and motivation. While the current residents of East Delhi may have to endure its toxicity for the foreseeable future, we can hope that with changes in policy and increased awareness, future generations of Indians will think of sites like Ghazipur as a distant and long-gone memory.

Learning from Example: Waste to Energy, Circular Economies, and Decentralization. Indian cities like Delhi and Mumbai do not have to search very far for inspiration to improve their solid

waste management systems. As mentioned above, Alappuzha, also known as Alleppey, is a city in the southern Indian state of Kerala that boasts one of the most successful waste management systems in not only the nation but the entire world. A coastal town with a relatively small population, Alappuzha's municipality was able to close all existing landfills by providing residents with the option to use composting bins or biogas composting installed into their property to process their waste; "Alleppey (Alappuzha) is a thriving municipality that has experimented with a new successfully initiated decentralized system of waste management. The total population of the Alleppey is 0.19 million, with an area of 46 sq. Km. The Alappuzha municipality has 40,000 households in 52 wards, all of which have either functioning pipe composting or portable biogas plants on their property. Households with enough land for a biogas plant were provided biogas plants, with subsidies offered to encourage households to adopt this option of waste management. It has been found that the Alappuzha municipality saved the cost of approximately Rs. 7 lakh (about 800,00 US dollars) for the transportation of waste on diesel trucks in the year of 2013–14. The decentralized waste management of Alleppey could inspire other urban local bodies."[61]

Along with decentralized waste management, Waste to Energy (WTE) is often endorsed as a plausible solution to landfill maintenance, and many WTE sites operate in India currently. WTE has to do with the heating of trash to create energy, which in theory would address not only the issue of the growing volume of solid waste in landfills but also the aspect of creating a fuel source from otherwise discarded material. WTE initiatives have made their way into the mainstream approach to solid waste management in India, however these plants are not without their drawbacks; "Several WTE projects implemented in Delhi have been met with widespread

[61] Kumar 2020

opposition and controversies over environmental impacts and social justice concerns. The operation of such plants depends on a supply of segregated waste that can provide a suitable input to the energy recovery process so it cannot be assumed that any given WTE technology will be workable in a particular context. Indeed, some have argued that incineration based WTE plants in India will be unsuccessful because the calorific value of Indian waste is very low. In the context of WTE in Delhi, recent projects have been reported to have been hurriedly implemented without due consideration of the socio-economic and environmental implications or concern for the impact of such projects on the informal livelihoods of waste-pickers".[62] The emissions brought on by WTE plants are also commonly criticized as a major pitfall of the method, as India lack's robust regulation concerning the operation of such plants. Additionally, WTE is seen as a temporary solution to the symptoms of the issue rather than a resolution to the greater issue of waste management, which requires limiting the amount of waste that enters landfills to begin with; "As one senior environmental NGO representative stated "Why is burning waste the most important thing? We still don't have infrastructure to regulate these toxic emissions, which are critical. Why can't we focus on recycling and composting as a means to tackle the problem of waste management?"[63] Unlike the instance of decentralized waste management in Alappuzha, WTE does not prevent the accumulation of waste in landfills but rather depends on and profits off of this consumptive system.

Circularity and zero-waste systems are preferred by NGO's and activists that strive to reform solid waste management in India. The city of Indore in west-central India serves as an

[62] Randhawa 2020

[63] Randhawa 2020

example for the rest of the nation and the globe on how to enforce a city-wide circular economy that organizes and reuses waste efficiently; “In Indore, treatment facilities like compost, biomethanation and bioremediation sites have been established and operated regularly. Compost is sold to the farmers and other users, whereas the gas generated from biomethanation plants are used for running public vehicles, namely state-operated buses. The dry waste is segregated and collected in three-binned vehicles. Plastics are recycled to make granules and in one small plant to convert into liquid fuel. Dry waste is separated in several streams and each of those (e.g. textiles, metals, papers, plastics, glass, etc.) go to the respective recycling plant. Indore Municipal Corporation encourages home composting and provides subsidies to its residents. In Indore, nearly 28,000 households participate in home composting and pot composting of household waste has been carried out in all 85 wards with the help of volunteers. The city has a target of reduction of 150 ton solid waste per day. A 100 tons per day capacity C&D waste plant runs in the city. All former rag-pickers have been taken into the mainstream formal sectors.”[64] Indore is a stellar example of circularity with mixtures of centralized and decentralized waste management systems in an urban environment. Indore efficiently and safely segregates waste while employing a combination of methods best suited to specific waste types. All residents in Indore do their part to cut down on and adequately recycle, reuse, and repurpose waste by participating in the city-wide waste management systems. Indore has also formalized the rag-picking network, giving formerly unprotected workers safety gear, municipality-funded resources, and greater compensation for their services. This aspect of Indore’s waste management system is particularly notable, as the city refused to leave behind rag-pickers in their vision of progress.

[64] Ghosh 2020

Colossal landfills like Ghazipur in Delhi and Deonar in Mumbai are some of the most extreme examples of the failures and limitations of large-scale solid waste management systems in the country. As discussed in this chapter, however, many Indian cities like Alappuzha and Indore continue to pave the way to a cleaner and greener nation by setting an example on how to create sustainable cities that uplift not only the environment but the communities within them. For all its manpower, ingenuity and age-old tradition, India is far from hopeless in tackling the issues brought on by solid waste mismanagement that threaten environmental and human safety. As discussed in earlier chapters the consequences of consumption are not limited to India by any means, as developed nations all over the world struggle with the same issues of overflowing landfills and wide-spread pollution. It may be tempting to doubt India's ability to overcome such burdens, what with the divided nature of the country as well as its status as a developing nation. However, the aspects of India that are often seen as obstacles to development, such as its growing population, its complex cultural systems that range from traditional to modern, and its characteristic diversity, present unique qualities that provide the nation with varying perspectives, possibilities, and boundless potential. While the reality remains that the nation's sanitation systems are in need of immediate and severe overhaul, steps throughout the country are being made on both small and large scales to set India up for an environmentally-sound future.

Conclusion: Simple Living. As Mahatma Gandhi once said, "Live simply so that others may simply live". This idea, presented by India's most beloved freedom fighter and one of the world's most revolutionary historical figures, not only applies to India's solid waste management crisis at its surface level but to its economic, social, and political implications as well. Living "simply", or rather being mindful of the consumption one partakes in, can directly lead to a

cleaner and safer living space for those whose daily lives are impacted by solid waste mismanagement and improper disposal. Similarly, living “simply” in a socio-economic sense challenges the idea that endless luxury and material aspirations are necessary to live complete and fulfilling lives. Instead, perhaps prioritizing the lives of those around us provides a meaningful purpose and allows us to forge a brighter future for younger generations.

The consequences of consumption are manifold, the most obvious being the landfills that tower in the background of bustling cities. The less obvious consequences, perhaps, are the prioritization of products over people, of material wealth over environmental prosperity. Living simply does not necessarily refer to a radical denouncement of all to do with consumption and material products. Rather, it has to do with our collective understanding of how our lives impact the lives of others. How a plastic bag we discard today could end up in a waterway endangering aquatic life tomorrow. How everything we throw away is not truly gone, but is affecting another part of the earth, likely in an adverse way. That people like Sheikh Rahim; real, hardworking, and honest people are forced to live amongst the rancid waste caused by the collective behavior of their communities. To address the problems at hand we must live so that others may live; we must live in ways that value each other and our planet. Taking out the trash is a start, but to make the changes the world needs we must challenge our contributions to global waste to begin with.

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