

**A Community-Managed Sanitation Program for the Residents of the Majnu Ka Tila
Pakistani-Hindu Refugee Camp in Delhi, India**

by

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Sanitation is a human right for all. All people are rights-holders to systems that are safe, accessible, hygienic, private, and culturally acceptable. The whole process of collecting, containing, treating and safely disposing of human waste is known as sanitation. One of the most basic requirements for a dignified and healthy life, and a key part of sanitation, is a functioning toilet. Toilets function properly only when they are connected to a system that can safely manage human waste. However, over 4 billion people globally do not have access to sanitation systems that adequately separate them from contact with human waste. When this access is lacking, the basic process of digestion becomes a cumbersome task, forcing people to make choices that put their health and safety at risk.

On the outskirts of Delhi, the capital of India, there is an area called Majnu Ka Tila (MKT), where about 700 people have been living in a makeshift camp since 2012. Fearing religious persecution in neighboring Pakistan, these people fled to India to seek refuge. Despite having been here for over a decade, the residents of the camp have little to no access to water, decent sanitation, or electricity. People from the camp are forced to openly defecate in the surrounding areas, leading to adverse health effects and subjecting them to verbal and physical harassment from the public.

Aiming to design a public health intervention that can help to address their basic human right to sanitation, this thesis presents a community-managed sanitation program for the MKT camp. After outlining relevant definitions, presenting a thorough review of both the global and

local scope of the issue, exploring caste and gender dimensions of the issue and evidence from successful programs, I will present a tailored program designed for the context of this camp. The program is centered on the residents and their needs, and will build community toilet blocks using dry composting systems and women-led oversight. Careful co-production and co-management of the program with the community, relevant government authorities, and local partners will work to empower camp residents to claim their human right to sanitation.

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Preface

I would like to extend my deepest gratitude to the people of the Majnu Ka Tila camp, who opened their homes to me and shared their experiences with me candidly. Since installing one BasicSHIT women's composting toilet in the camp in July of 2022, I have been thinking critically about how I can lend my privilege and access to resources to this community's advantage. This thesis is inspired by the people I met that day. It is centered around the community, and is just the beginning of my venture into co-producing successful sanitation programs that are guided by genuine compassion and care for people.

I would also like to thank my committee of incredible advisors, Dr. Baumann, Dr. Finkel and Dr. Documet, who remained patient with me and took the time to guide me throughout the writing process.

Lastly, to my community of supportive friends and family, thank you for your endless love and encouragement.

Positionality Statement:

I am a woman of Indian and Nepali ancestry, born and raised in the United States. My approach to program design is based on three years of training as a Master of International Development and a Master of Public Health candidate at the University of Pittsburgh.

It should be noted that the program I have developed for the purposes of this thesis is designed as a pilot program. Before ever being implemented, it would require rigorous outside assessment and an iterative process of refinement.

1.0 Sanitation: What Is It & Why Does It Matter?

Sanitation refers to the management of human waste through a chain of activities and facilities, and is vital to our individual health, public health, the environment, and our livelihoods (JMP, 2022). Over half of the world's population, 4.2 billion people, use sanitation services that do not treat human waste, posing an immense threat to our environment and health. More than 600 million people have no toilet at all, and are compelled to openly defecate, compromising their personal health and sense of dignity and privacy (UNICEF & WHO, 2020).

1.1 Global Recognition

The World Health Organization and UNICEF Joint Monitoring Program for Water Supply, Sanitation and Hygiene (JMP) is a monitoring platform mandated to produce estimates of progress on drinking water, sanitation, and hygiene that are internationally comparable (UNICEF & WHO, 2020). According to their definition, this thesis refers to poor or inadequate sanitation as either openly defecating, or use of a sanitation facility that does not hygienically separate human waste from human contact and does not safely dispose of or treat human waste.

In 2015, the United Nations (UN) General Assembly recognized sanitation as a human right. The human right to sanitation entitles all people to sanitation services that protect their dignity and privacy, that are physically accessible, affordable, safe, hygienic, and socially acceptable. Outlining the right to sanitation in these specific terms implies that people are not only entitled to toilets, but also to environments that are not negatively affected by unmanaged human

waste (UNICEF & WHO, 2020). As such, the UN's 2030 Agenda for Sustainable Development Goal (SDG) 6 calls for the availability and sustainable management of water and sanitation for all. Progress towards this goal is frighteningly off track and uneven, as the pace at which sanitation coverage is increasing will need to quadruple to meet SDG 6 by 2030 (UNICEF & WHO, 2020).

Target 2 of 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,' with an indicator 6.2.1a that monitors the proportion of the population using 'safely managed sanitation' services to track progress toward the target (UN Water, 2020). 'Safely managed sanitation' are facilities that are not shared with other households, and where the excreta created are either: treated and disposed of on-site; stored temporarily then emptied and transported to treatment off-site; or transported through a sewer with water to be treated off-site (UNICEF & WHO, 2020). In 2020, only 54% of the world population had access to safely managed sanitation, leaving nearly one in two without (Ritchie & Roser, 2021).

1.2 Public Health Significance

Lacking sanitation introduces people to illnesses and diseases that are easily preventable. A single gram of human feces contains millions of bacteria and viruses, and one thousand parasite cysts (Tyagi, 2011). Figure 1 shows the transmission pathways of diseases caused by feces (Tyagi, 2011). These include diarrhea, cholera, vector-borne diseases, childhood stunting, and soil-transmitted helminth infections (UNICEF & WHO, 2020). Where sanitation systems are poor and human waste is allowed back into the environment without treatment, water supplies become polluted. Inadequate sanitation also leads to the spreading of fecal pathogens via the fecal-oral

route, person-to-person, by flies, or via soil. Through these various pathways, poor sanitation contributes directly and indirectly to 830,000 preventable deaths a year (UNICEF & WHO, 2020).

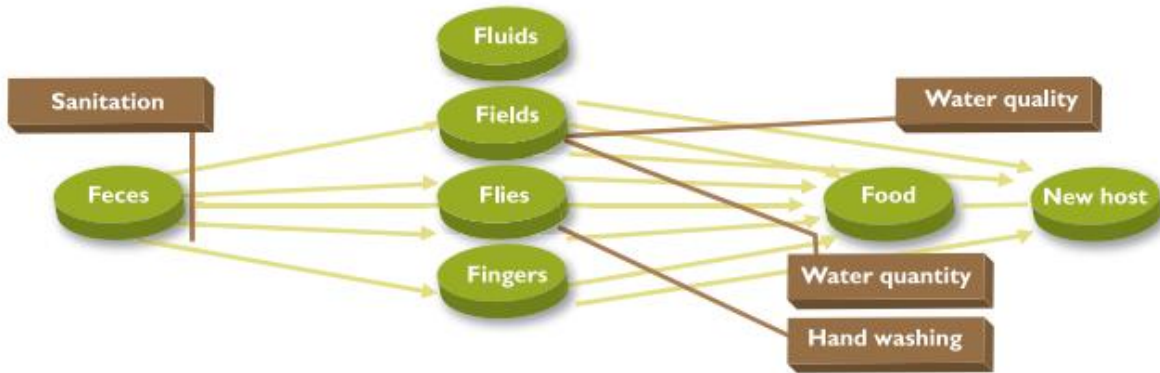


Figure 1. Transmission Pathways, Source: Tyagi, 2011

Unsafe water, inadequate sanitation and poor hygiene are the leading contributing factors to diarrheal disease, the 8th biggest killer in the world in 2019, responsible for 1.5 million deaths, according to the World Health Organization (WHO, 2020). The WHO estimates that 88% of cases of diarrhea globally are due to inadequate provision of water, sanitation and hygiene services, collectively known as WASH. Improving WASH services could prevent an estimated 6.3% of deaths globally (Vogel et al., 2022).

Low-income countries face higher rates of deaths from unsafe sanitation. The World Health Organization reports that diarrheal diseases rank in the top five causes of death in low-income countries (WHO, 2020). Across Sub-Saharan Africa and Asia, rates of death from unsafe sanitation are greater than 50 deaths per 100,000; compared to rates in Europe that are below 0.1 deaths per 100,000 (Ritchie & Roser, 2021). The uneven distribution of adverse effects can be seen on an individual level, too. Poor sanitation impacts the most vulnerable and marginalized among us,

especially women, those with disabilities, and the poor, disproportionately. Dignity, which revolves around one's ability to manage their bodily functions like menstruation, defecation and urination, is threatened when people face sanitation insecurity. Safety, both physical and psychological, is put at risk when vulnerable groups can't access proper sanitation services (UNICEF & WHO, 2020). The role of gender and caste as factors that exacerbate the negative effects of poor sanitation in the Indian context are further explored in subsequent sections of this thesis.

Even beyond health and social impacts, poor sanitation has grave economic costs. In 2015, lack of access to sanitation cost the global economy US\$222.9 billion, or 0.9% of global GDP. Premature mortality, loss of productivity, healthcare costs, the cost of time loss, and potential tourism losses all contribute to this high economic cost (Lixil, 2016).

1.3 Specific Definitions

The negative consequences of poor sanitation occur not only because people lack toilets, but also because of hazards and failures across the sanitation service chain. The sanitation service chain refers to all the stages in a safe sanitation system: the capture, containment, emptying, transport, treatment, and safe disposal of human waste (UNICEF & WHO, 2020). The service chain starts with toilets, where people deposit their excreta and urine. That excreta and urine are contained and stored, and then conveyed to treatment facilities, where they undergo chemical treatment. Once the human waste is properly treated, it can be disposed of safely.

1.3.1 Centralized Sanitation

A centralized sanitation system is a series of underground pipes, connected to toilets, that carry excreta and urine mixed with water to a sewage treatment plant located in a distant area (Chandana & Rao, 2022). Sewage treatment plants receive wastewater from several domestic and industrial buildings in a city or town, and use chemicals to treat wastewater so that it no longer poses a health risk. Cities can have multiple sewage treatment plants depending on the size of the population and the geographical spread (Chandana & Rao, 2022).

Under a centralized system, the collection and treatment of feces and wastewater happens off-site, at an external location. Another name for a centralized sanitation system is a sewer-based system, which is held as the gold standard for sanitation in much of the developed world (Smith, 2019). The toilets that use a centralized sanitation system usually feature a “flush and forget” arrangement, where the user pushes a lever to dispense water from an attached cistern (Chandana & Rao, 2022). Water acts as a medium to flush excreta and urine through the sewer system towards external treatment plants. Centralized sanitation systems depend on the availability of large volumes of running water to carry excreta (Arbogast & So, 2013).

1.3.2 On-Site Sanitation

Differing from this, on-site sanitation technologies are systems that are built near toilets, to contain waste close to the point at which it is generated. With these systems, fecal matter is stored “within the premises of the dwelling and its immediate surroundings” (Thattil et al., 2021). On-site technologies collect excreta, urine, and wastewater and allow it to decompose or degrade

partially or fully. An on-site sanitation system can also be called a decentralized system, or a non-sewered sanitation system (Chandana & Rao, 2022).

Non-sewered sanitation systems are used in several parts of the world. Where a traditional underground sewer system is not feasible, non-sewered systems, if built and maintained correctly, they are a safe and effective method of sanitation (Chandana & Rao, 2022). As the terms non-sewered and on-site can be used interchangeably, henceforth the term on-site sanitation will be used to describe a non-sewered system.

On-site sanitation comes in several variations, as well. Toilets that use on-site sanitation can be connected to septic tanks or underground pits. They can be pour-flush toilets, where the user manually pours water into the toilet to flush the waste down (Chandana & Rao, 2022). They may instead be dry toilets, situated squarely on top of pits, where users deposit excreta directly into the pits without needing water to flush it down. No matter the type of toilet, because they do not automatically carry waste off-site to a treatment plant, on-site systems require that the mixture of excreta, urine, and wastewater, known as fecal sludge, be dealt with once the system becomes full (Chandana & Rao, 2022). Users of these systems can opt to empty the fecal sludge, close the system and stop its use, or construct an entirely new system (Chandana & Rao, 2022).

1.3.3 Fecal Sludge

The mixture of fecal waste, water, and urine found in on-site systems is known as fecal sludge. Fecal sludge is a “raw or partially digested slurry or semisolid sludge” that can sometimes include household waste (Chandana & Rao, 2022). There is an entire subset of sanitation known as fecal sludge management (FSM) which is aimed at collecting, emptying and transporting, and treating waste from on-site systems (Chandana & Rao, 2022).

Fecal sludge, if not managed correctly, can pose immense health risks to the people who use on-site systems. It is highly pathogenic and contains many microorganisms that can put public health in danger if it is left to spread into the environment (CAWST, 2016). If their containment systems are not built correctly, fecal sludge can seep into and contaminate groundwater, which is often used as a supply of drinking water (CAWST, 2016). Once removed from their on-site containment systems, often fecal sludge is illegally dumped into waterways, open fields or bushes, and the natural environment. Consequently, the environment and living areas can be awash in untreated human waste, leading to very real and very serious health and environmental repercussions (Arbogast & So, 2013). When fecal pathogens contaminate water and food, they cause many waterborne illnesses, such as cholera, E. coli infection, typhoid fever, rotavirus, giardiasis, hookworm, and Hepatitis A and E (CAWST, 2016).

The recommended way to handle fecal sludge differs based on the characteristics of the sludge and the on-site technology where it collects (CAWST, 2016). Fecal sludge's water content varies depending on the type of toilet it is connected to. It may contain various waste products if users add garbage to their latrines, like menstrual hygiene products, diapers, food waste, plastics, or textiles. The sludge will also vary in the stability of its organic material, ranging from fresh and non-degraded, to stable and broken down. The older the sludge is, the more the organic material is broken down, and the safer it is to handle (CAWST, 2016). Also important to consider is the volume of sludge in the system, which depends on the number of users (Chandana & Rao, 2022). These factors will determine the best way to manage the sludge from the on-site system.

Figure 4 shows the decision matrix for fecal sludge emptying. The main takeaway from this figure is that depending on how degraded the sludge is, how watery it is, and its quantity, the methods of emptying the on-site system will vary. For on-site systems that create a more liquid

sludge, like septic tanks, vacuum trucks are more easily able to vacuum out the sludge and transport it. Where toilets use less water, the fecal sludge is often much thicker and requires manual emptying (Chandana & Rao, 2022). Manual emptying of fecal sludge in India is a caste-based profession (Joy & Bhagat, 2016). This concept will be extensively discussed in section 3: **Caste & Sanitation**.

Often, mechanized emptying is arranged with a private service provider, who dispense trucks, fitted with large vacuums, to extract fecal sludge out of their on-site systems into the tanks of the trucks. Hiring a desludging service is one way to ensure that there is no contact between any person and raw human waste. The trucks then transport the waste to treatment plants, or often dump the waste out in the open (Chandana & Rao, 2022).

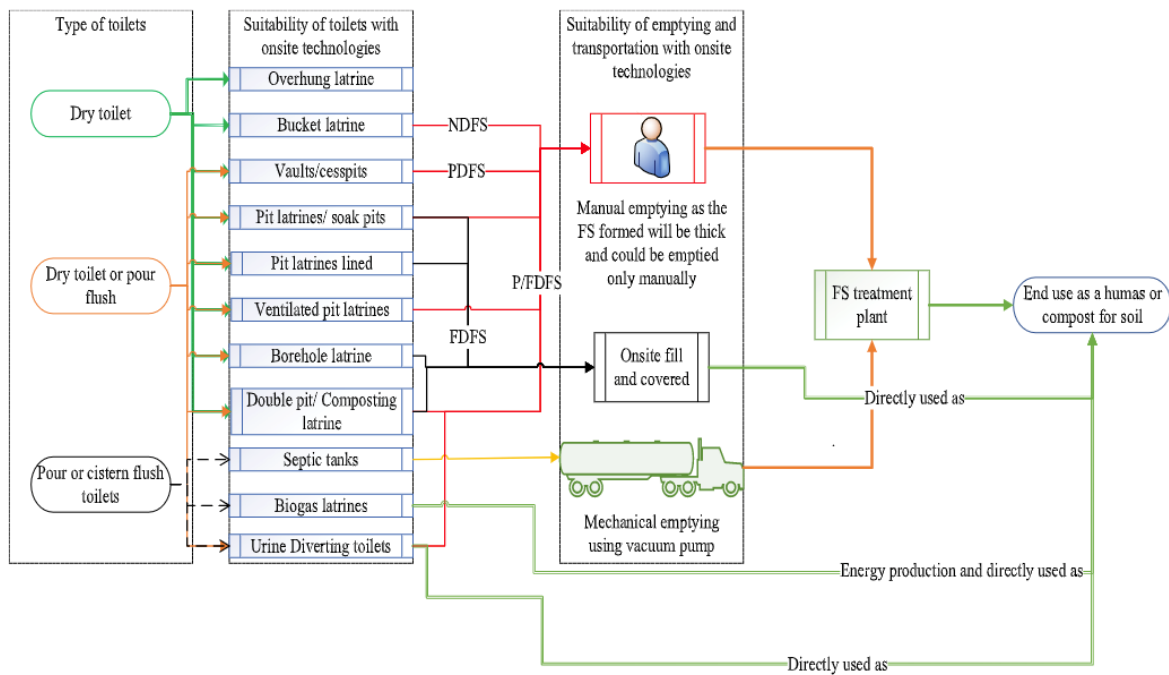


Figure 2. Decision Matrix on the Emptying of Fecal Sludge, Source: Chandana & Rao, 2022

Note: NDFS – non-degraded fecal sludge, PDFS – partially degraded fecal sludge, FDFS – fully degraded fecal sludge

In densely populated urban areas, when on-site systems fill up and need to be emptied, the collection of fecal sludge from these toilets can often be a problem (Chandana & Rao, 2022). If using private emptying trucks, it becomes difficult for the trucks to navigate narrow lanes to get close enough to the toilets to empty them (Chandana & Rao, 2022). When pits or tanks are not reliably emptied, their contents can overflow out of the systems into the surrounding environment, leading to toilet abandonment by the users (Chandana & Rao, 2022).

2.0 India's Sanitation Landscape

2.1 The Evidence

In India, only 46% of the population of 1.4 billion people use safely managed sanitation services (UN Water, 2020) and (Silver et al., 2023). This means nearly 450 million people in the country routinely practice open defecation, posing a major environmental and public health hazard to its citizens (Vogel et al., 2022). Such high numbers, in turn, contribute to the fact that the disease burden, measured in disability-adjusted life-years, of diarrheal diseases in India is approximately three times higher than that of countries at a similar level of development (Chen et al., 2020). The leading cause of death in India due to a communicable disease is diarrhea, which accounted for 9.9% of deaths in 2017 (Mohanty & Saxena, 2023). Overall, diarrheal diseases are the fourth largest cause of death in the nation (Vogel et al., 2022).

On-site sanitation systems like septic tanks and pits are the primary method of human waste management in urban and peri-urban India. Peri-urban regions are regions that extend beyond municipal boundaries (Bharat et al., 2020). On-site systems, which are also the mainstay of wastewater management in many other low and middle income countries, are often not adequate solutions, due to poor design, siting, and lack of maintenance (Dasgupta et al., 2021). The Indian government considers these systems a stopgap arrangement to be chosen over the capital and capacity-intensive central sewage systems (Dasgupta et al., 2021). Despite national urban infrastructure schemes in India that have endorsed sewage system development, 60% of urban households between 2012-2018 depended on on-site systems (Dasgupta et al., 2021).

In a study published in 2021, researchers conducted a sample survey of on-site sanitation systems through interviews with 3000 households and 50 non-household actors across four states in India in 2019 (Dasgupta et al., 2021). The findings showed that 72% of the septic tanks used in urban India were discharging wastewater that was not adequately treated directly into storm water drains (Dasgupta et al., 2021). Plainly, the safe management of fecal waste is a major concern in the provision of sanitation services in India (Bharat et al., 2020).

Another research study conducted in 2016 employed advanced microbial source tracking techniques to analyze fecal exposure in public and domestic domains in 30 intervention and 30 control villages in Odisha, India (Odagiri et al., 2016). The researchers set out to examine the effect that increased latrine coverage had on fecal exposure through various pathways in the community (Odagiri et al., 2016). Results of the study showed that there was no evidence that increasing functional latrine coverage reduced human fecal contamination or the prevalence of pathogens in water sources (Odagiri et al., 2016). Specifically, a 27-percentage point increase in access to improved sanitation at the village-level did not lower the detectable human fecal and pathogen contamination of water in this setting (Odagiri et al., 2016). This is evidence that latrine coverage alone is not enough to reduce epidemiological risks, and that the safe management and disposal of human waste is of utmost priority (Odagiri et al., 2016).

2.2 The Sewage Problem

There is a difference between fecal sludge and sewage. Fecal sludge is the semi-solid material that accumulates from on-site sanitation systems, whereas sewage is the mixture of human waste, toilet paper, and municipal waste that is meant to be carried to an external treatment plant

with large volumes of water through a piped sewage network (Netsol Water, 2022). There currently is no standardized protocol for fecal sludge management used in India, or around the world. Limited understanding of the chemical and biological characteristics of it have also hindered resource recovery from fecal sludge (Chandana & Rao, 2022). The treatment and management of sewage, however, is better understood globally.

A forefront health and environmental concern in India is containing and treating its sewage. An estimated 93% of sewage that is created in the country makes its way, untreated, into rivers, lakes and ponds (Chaturvedi, 2018). A different source finds that of all the sewage generated by the average Indian city, only about 31% of it is treated, and the remaining 70% is disposed of, untreated, into open drains and peri-urban fields (Bharat et al., 2020). As important as the safe containment of human waste is, proper sanitation requires that the waste is also adequately treated, so as not to harm public or environmental health. Such a mismanagement of sewage contributes directly to water pollution and high rates of diarrhea in India (Dasgupta et al., 2021).

Even if sewage and fecal sludge is transported to sewage treatment plants, sewage treatment plants (STPs) across urban India largely miss the mark on volumes of sewage treated (Bharat et al., 2020). They do not operate at full capacity, do not meet the discharge standards, and feature deficits in operation and connectivity (Bharat et al., 2020). Several STPs also face issues of non-operation and poor management.

Groundwater contamination is also an increasingly worrisome issue, as the lack of safe disposal of domestic sewage threatens pollution of groundwater, which acts as the primary source of water supply for domestic use and consumption. On-site sanitation often directly contaminates groundwater (Bharat et al., 2020). The Central Pollution Control Board of India has noted that

50% of the 620 districts in the nation have contaminated groundwater, and 56% of Indians depend on groundwater for their daily water needs (Kumar, 2019).

2.3 The Effects of Urbanization

India is one of the fastest urbanizing nations in the world, with around 459 million people living in urban areas with a growth rate set to increase from 33.6% to 50% by 2030 (Bharat et al., 2020). This puts a massive strain on resources and urban sanitation infrastructure and management. As more toilets are built in households, more pressure is put on the urban water supply (Bharat et al., 2020). Threats of water scarcity are already evident in several cities and small urban towns, putting toilets at risk of becoming dysfunctional (Bharat et al., 2020).

Planning sanitation in Indian cities is challenged by the heterogeneity present across social, political, economic, and cultural dimensions, making sanitation policy subject to many barriers. These barriers include a lack of political or financial support, poor capacity of implementers, and a non-existent planning framework (Mitra et al., 2022). Another challenge is that the poor urbanize faster than most populations (Lüthi et al., 2009). The urbanization of poverty creates a situation where much of the urban poor live in unplanned and underserved informal settlements, like slums (Lüthi et al., 2009). City planning authorities often do not have the capacity nor do they plan for the delivery of services in these areas. In these urban settlements, on-site sanitation and irregular water supply tend to be the norms (Lüthi et al., 2009).

Urban local bodies, the equivalent of a local municipal government authority, lack the financial and institutional capacity to oversee effective fecal sludge management across India, leading to poor or no delivery of this service in urban areas (Bharat et al., 2020). Urban local bodies

are largely understaffed and underperforming, pointing to the importance of a more cohesive governing structure (Bharat et al., 2020).

2.4 The Swachh Bharat Mission

Around 57% of all the people in the world who practice open defecation can be found in India (Joy & Bhagat, 2016). Accordingly, Prime Minister Narendra Modi's flagship program on sanitation, known as the Swachh Bharat Mission (Clean India Mission, or SBM), was launched in 2014 with the goal of achieving an open defecation-free India by 2019.

The official stance of the Indian Government today is that through the program's mass provision of toilets, the nation is now open defecation free (Jacob, 2022). Data from the National Family Health Survey released in March of 2022 by the International Institute for Population Sciences in Mumbai, however, indicates that 19% of households in India still had no toilet facility in 2019-2021, and instead openly defecate (IIPS, 2021).

The Swachh Bharat Mission was intended to be different from previous programs with more emphasis on behavior change and the sustainability of interventions. It benefitted from a significantly higher budget and more political will than previous programs, as well as a massive social push to achieve sanitation coverage and improve cleanliness across the nation (Bharat et al., 2020). The program afforded flexibility and oversight to local and state governments, allowing them to decide how to use funds and what their monitoring and evaluation strategies would be (Chen et al., 2020).

Under the SBM, since 2014, over 6 million toilets have been constructed in urban areas of India; 550,000 of which were public and community toilets in urban slums (Bharat et al., 2020).

Several studies have noted the persisting gaps in coverage, and inadequate maintenance and use of these toilets (Bharat et al., 2020). In surveys conducted in 2016 and 2017 by the Quality Council of India, it was reported that about 91% of the SBM constructed toilets were being used. An external assessment by WaterAid indicated that 31% of the SBM toilets were unsafe to use, only 33% were sustainably safe, meaning they eliminated risks of contamination in the long term, and 35% were safe but in need of major upgrades to remain so (Heller, 2017).

The SBM has overlooked the connections between sanitation and access to water, waste management, and maintenance service (Abhiyan, 2017). Most of the SBM toilets are not connected to larger sewage networks, and instead rely on on-site systems to collect fecal sludge (Joy & Bhagat, 2016). Without a plan in place to manage this fecal sludge, the toilets do not meet the criteria for safely managed sanitation (Heller, 2017). The Indian Government's implementation of a large-scale program like SBM, which has built toilets without paying attention to the management of human waste, begs the questions: who will clean and maintain the toilets, and how?

3.0 Caste & Sanitation

3.1 The Caste System

The caste system in India has historically regulated economic, social, and civil life in the nation. Caste is a stratification of social classes that ranks groups based on descent and is hereditary in nature (Bhattacharjee, 2014). Although discrimination based on caste is outlawed in India's Constitution, caste as a system of social stratification remains legal and continues to influence daily life (Tóth, 2022). The caste in which one is born assigns them to occupations, and caste-based social organization is governed by customs and reinforced both economically and socially (Bhattacharjee, 2014). The caste designation of a community has significant and enduring implications for those community members' land and productive resource control, and access to opportunities (Bhattacharjee, 2014).

The Hindu religion classifies Hindus into one of five castes, which define what jobs they do and what privileges they have – Brahmins (priests and teachers), Kshatriyas (rulers and warriors), Vaishyas (landowners and merchants), Sudras (servants), and Dalits (known as untouchables) (Tóth, 2022).

3.2 Dalits

At the bottom of the caste hierarchy is the group known as Dalits, or literally “broken people” (Bhattacharjee, 2014). Dalits fall under the administrative classification of Scheduled

Castes (SCs), who are categorized as poor, disadvantaged, socially excluded groups of people who face more difficulty accessing rights, entitlements, and opportunities, due to caste-based discrimination (Joy & Bhagat, 2016). The 2011 Census of India found that 16.6% of the total Indian population is SC (Joy & Bhagat, 2016). The bottom-most classification of Dalits renders them as socially “untouchable,” and “polluted,” which has been used to justify the discriminatory practices used towards them (Bhattacharjee, 2014). The documented caste-based delineation of labor has relegated them to all types of inhuman sanitary work in India (Saikia & Noklenyangla, 2015). Dalits in India have a long history of being treated as ‘waste-absorbers,’ cleaning the waste of others and getting others’ waste dumped into their living spaces (Joy & Bhagat, 2016).

Dalit people have been confined to livelihoods that are deemed too menial or deplorable for upper caste groups to do, such as manual scavenging and sanitation work (Bhattacharjee, 2014). Despite laws governing sanitation accommodations and environmental regulations, India has no categorical legal provisions for the management of fecal sludge. Instead, the handling of fecal sludge is relegated to sanitation workers (Cannie & Cannie, 2020). Dalit women who do sanitation work find themselves at the intersection of both caste-based and gender-based marginalization.

3.3 The Violence of Manual Scavenging

Manual scavenging is the unsafe practice of the removal of fresh and untreated human excreta from buckets, septic tanks, sewers, pit latrines, storm water drains, railways, and other public areas (Cannie & Cannie, 2020). Given the dense compacting of people and buildings in Indian cities, many of the lanes and gullies are too narrow for sewage cleaning vehicles to enter, necessitating the work of scavengers (Pradhan & Mittal, 2020). Of all the people in India who are

engaged in this work, 99% of them are Dalit (Yadav, 2019). Manual scavenging's allied forms include the clearing and cleaning of feces from public and private latrines using brooms, tin plates, and baskets to carry the waste to dumping grounds (Cannie & Cannie, 2020).

Perhaps the principal horror of manual scavenging is that it is an inherited occupation (Shankar & Swaroop, 2021). Toxic notions of religious purity and pollution have haunted India for centuries, and allow the degradation of an entire community of people to persist (Shankar & Swaroop, 2021). A 2012 study by Sripad and Ashish found there was “considerable intergenerational occupational persistence,” of this work (Shankar & Swaroop, 2021, pg 70).

It is difficult to quantify the exact number of people in India who are engaged in manual scavenging, as government estimates are much lower than those put out by civil society organizations. One measure claims that 1.2 million people have been forced into this occupation, but notes that this number is likely far from reality, as it does not capture all the people in India who come into contact with raw human waste (Shankar & Swaroop, 2021). Human waste in India is not confined to toilets, instead ejected into public spaces through open defecation, primitive and broken sewer systems, unreliable fecal sludge emptying, and the discharge of sewage by trains directly onto their tracks (Shankar & Swaroop, 2021). Accordingly, estimates suggest *five million* sanitation workers in India come into direct contact with untreated human excreta, through their work cleaning and maintaining public spaces (Shankar & Swaroop 2021).

Shankar and Swaroop (2021) make the charge that this practice amounts to a genocidal level of violence that is inflicted on the most vulnerable and marginalized citizens of India. The “unparalleled social abuse of untouchability” is the violence that upholds this system of oppression (Shankar & Swaroop, 2021, page 70). The authors argue that the violence occurs across many

dimensions, including the threat of physical violence as Dalit people are routinely abused if they do not show up for work (Shankar & Swaroop, 2021).

The violence of social exclusion is also present, as sanitation workers' habitations are frequently pushed to the outer edge of villages and towns, near garbage dumps (Shankar & Swaroop, 2021). Everyday activities are cumbersome for this population, where fetching water or buying food become obstacles to overcome, and seeking better employment is grounds for social boycott (Shankar & Swaroop, 2021). There is a deeply-rooted social stigma attached to the work that makes it difficult to break out of the cycle and access alternative employment opportunities (Yadav, 2019).

People from Dalit communities, whether from scavenging families or not, face high levels of ostracism in society (Saikia & Noklenyangla, 2015). The intolerance they encounter is so rampant that most scavengers cannot live in the cities they work in. They find themselves on the outskirts of urban areas, in colonies where access to common resources is scarce or forbidden entirely. In some cases, Dalit people are restrained from even drawing water from public wells (Saikia & Noklenyangla, 2015). The community is unable to access basic services like healthcare, sanitation and water, employment, or justice. Their classification of 'untouchability' has denied Dalit communities access to civil society, entrance to shops, and participation in religious ceremonies (Bhattacharjee, 2014).

Extreme social stigma attached to sanitation work leads to high levels of bullying and discrimination in schools, by both students and teachers (Bhattacharjee, 2014). A report from the international organization Human Rights Watch noted in 2014 that "70-80% of children from manual scavenging communities drop out of school before they reach 7th grade," (Bhattacharjee,

2014, page 20). Consequently, the literacy level among Dalits is 66.1%, compared to the all-India literacy level of 73% (R.H., 2020).

The reality and history of manual scavengers are some of the cruelest forms of indignity and inhuman social arrangements. Working as daily wage laborers, people engaged in manual scavenging do so at poverty wages as low as 35 US cents a month. In other cases, people doing this work for households are given leftover bread, a little grain, or discarded clothes instead of monetary compensation (Shankar & Swaroop, 2021).

Within the work, there are also gender divisions, as 95% of private and village toilets are cleaned by women (Bhattacharjee, 2014). Cleaning of open defecation in roads, open areas, and open gutters is done by both men and women, and the cleaning of septic tanks, closed gutters and sewers is mostly done by men (Bhattacharjee, 2014). Women engaged in this work are at the intersection of caste and patriarchy, exacerbating their negative experiences and making it more difficult for them to access better opportunities (Shankar & Swaroop, 2021). These women use brooms and pieces of cardboard to scrape and scoop excreta out of latrines and into baskets that they carry with them all day, sometimes on their heads. When it rains, human excreta runs out of the baskets onto their clothes and skin (Bhattacharjee, 2014). If they do not show up for work, women sanitation workers face threats of physical violence and verbal abuse (Shankar & Swaroop, 2021).

Men in this caste-based occupation descend into septic tanks and manually empty fecal sludge with buckets (Shankar & Swaroop, 2021). Holding their breath and without any personal protective equipment, these men dive into sewage drains and clear blockages with their bare hands. To mask the odors and numb themselves from this horror, men frequently chew tobacco and drink alcohol before entering sewage drains (Shankar & Swaroop, 2021).

Manual scavenging poses extremely hazardous risks to those involved in it. Those doing sanitation work experience trauma, debilitating diseases, and skin disorders from coming into contact with excreta daily (Shankar & Swaroop, 2021). The average life expectancy in India is 70, but for sanitation workers it is less than 50. Men who clean septic tanks and sewage drains die by 32, on average (Shankar & Swaroop, 2021, page 70). Every two days, the death of a sanitation worker by asphyxiation in a septic tank or sewer is recorded (Shankar & Swaroop, 2021). Every year nearly 600 underground drainage and septic tank cleaners die prematurely (Saikia & Noklenyangla, 2015).

Casualties occur when people fall or slip, experience oxygen depletion, heat stress, drowning, or asphyxiation from toxic gasses (Cannie & Cannie, 2020). Those who handle raw sewage experience multiple adverse health effects like skin diseases, respiratory illnesses, anemia, jaundice, and carbon monoxide poisoning that can lead to death (Cannie & Cannie, 2020). Harmful gasses like hydrogen sulfide, methane, carbon dioxide, and ammonia can be inhaled during the emptying of septic tanks. These gasses in high concentrations can be fatal, and lower continuous exposure will usually result in respiratory illnesses (Pradhan & Mittal, 2020). Several infections like gastroenteritis, intestinal parasitic infections, and Pontiac fever are common among the population (Saikia & Noklenyangla, 2015). The community also endures musculoskeletal disorders like intervertebral disk herniation (Pradhan & Mittal, 2020).

The practice of manual scavenging has been ongoing for centuries in India and is consistently overlooked by the government (Ziyauddin, 2016). In 1993, the *Employment of Manual Scavengers and Construction of Dry Latrines (Prohibition) Act* was enacted. This was meant to eliminate the employment of people as manual scavengers, but most state governments have failed to implement it. The Act was revised in 2013 to the *Prohibition of Employment as Manual*

Scavengers and their Rehabilitation Act, meant not only to end manual scavenging as employment, but also to rehabilitate existing scavengers into different and better jobs (Joy & Bhagat, 2016). Although the practice has been outlawed, manual scavenging persists across India. Despite the Indian constitution's guarantee of equal status under the law for all citizens, and the outlawing of untouchability practices, these systems of marginalization continue. Caste remains a justification for the inflicting of cruel and inhumane treatment to an entire subset of the Indian population (Bhattacharjee, 2014).

3.4 India's Missed Marks

The government itself employs the largest number of manual scavengers, to clean railway tracks, schools, hospitals and jails (Shankar & Swaroop, 2021). In 2010, the Indian Ministry of Urban Development conducted a national study which found that of 423 Indian cities, 65% of them (274) have no safe or satisfactory arrangement for human waste collection. Most of these cities use manual labor to desludge septic tanks and clear sewer blockages (Pradhan & Mittal, 2020, Saikia & Noklennyangla, 2015). There is record of municipalities in cities and towns hiring manual scavenging labor on a contract basis to clean their cities and sanitation systems, because India does not use any technology that totally removes human contact with sewage during the cleaning and maintenance of sewer systems (Pradhan & Mittal, 2020). Even if septic tanks collect waste safely, unless there are arrangements for emptying services to come empty and transport the fecal sludge to treatment centers using vacuum trucks, the employment of manual scavengers will persist (Ziyauddin, 2016).

The Swachh Bharat Mission, the nation's flagship sanitation program hailed around the world as a triumph, built millions of toilets on top of single pits or connected to septic tanks (Shankar & Swaroop, 2021). Emptying fecal sludge from these contaminants as they fill up will require manual scavenging, incidentally increasing the number of people engaged in this work and demonstrating a major programmatic failure of the Swachh Bharat Mission (Shankar & Swaroop, 2021).

The former UN Special Rapporteur on the Human Rights to Drinking Water and Sanitation Mr. Léo Heller himself noted about the Swachh Bharat Mission that India's steps toward the realization of the right to sanitation may unintentionally violate the principle of non-discrimination. He writes in an official statement in 2017 that an increase in the number of toilets in India heightens concerns that manual scavenging will proceed in a discriminatory and caste-based manner (Heller, 2017). Mr. Heller indicated his worry that the deeply-ingrained practice of inflicting sanitary work to lower castes, along with the rise of on-site sanitation systems through the Swachh Bharat Mission, would result in the persistence of employing people as manual scavengers (Heller, 2017).

The complex interplay between individual, interpersonal, community, institutional, and policy factors have compounded over generations, systematizing the discrimination and poor human development of Dalit people in India (R.H., 2020). This is intensified by the weak implementation of existing laws that ban the practice (Bhattacharjee, 2014). Manual scavenging is a direct human rights violation, of not only the right to sanitation, but also the right to health, dignity, and dignified work (Joy & Bhagat, 2016). Caste is undoubtedly an important dimension in the sanitation landscape of India.

4.0 Gender & Sanitation

4.1 An Overview

A lack of sanitation affects everyone, but it is women who suffer the worst consequences. When women and girls lack access to safe and hygienic sanitation, they bear a greater burden of the poor outcomes than men and boys (Geertz & Iyer, 2018). Sanitation needs affect women's daily lives in many ways, as they queue in long lines for public toilets, travel to distant locations for a decent toilet, and use toilets that fail to consider their gender-specific needs (Caruso et al., 2017). Experiences of urination, defecation, and menstrual management can pose challenges to women and girls, exposing them to a plethora of physical, social, and mental health risks (Caruso et al., 2017). Inadequate sanitation poses unique health hazards for women and girls, such as urogenital tract infections, urinary incontinence, chronic constipation, and increased risk of maternal mortality from unhygienic birthing practices or poor infection control (Sahoo et al., 2015).

In schools, while poor sanitation affects the learning of both boys and girls, there is ample evidence to suggest that toilet insecurity contributes to girls' absence and lack of attendance, as it makes it impossible for girls to manage menstrual hygiene while in school. One study from India features quotes from girls that stopped going to school, who say that they would return if the proper toilet facilities existed in their schools (Geertz & Iyer, 2018).

4.2 Norms & Structures

While pregnancy and menstrual hygiene management play a part in the disparities, biological needs alone are not enough to capture the asymmetrical negative physical and mental consequences of poor sanitation that women experience (Geertz & Iyer, 2018). Increasingly, evidence is emerging from the sector that suggests that there are also cultural practices, social norms, and structural biases that create these conditions for women (Geertz & Iyer, 2018). Taboos and norms around menstruation make sanitation for women around the world an even more sensitive issue (Geertz & Iyer, 2018).

Gender dynamics and power relations within the home create barriers for women's access to sanitation facilities that differ based on geography, religion, and societal structures (Geertz & Iyer, 2018). Research from Orissa, an eastern state in India now known as Odisha, has shown that community and household level dynamics impede women's decision making power about sanitation facilities for their households, despite efforts from the government to encourage women's involvement in these decisions (Caruso et al., 2017).

Generally, expectations and gender norms around a woman's modesty can influence her sanitation behavior (Geertz & Iyer, 2018). Sanitation has been identified as a cause of stress and anxiety, principally among women (Caruso et al., 2017). This evidence also highlights that specific socio-cultural perceptions of gender and gender roles influence how women experience sanitation (Caruso et al., 2017).

4.3 The Effects

Women and girls' access to sanitation inform their everyday behavior. The magnitude of negative consequences that arise from poor sanitation is not limited to pathogen exposure and the risk of infectious diseases, as the individual choices that people must make when attending to their sanitation needs can also cause harm (Caruso et al., 2017). Across the world, where they face sanitation insecurity, women report holding in their natural bodily urges throughout the day (Geertz & Iyer, 2018). They wait all day for nightfall, as the veil of darkness allows them to defecate or urinate in more privacy than they would be able to do in the daytime (Geertz & Iyer, 2018). Where women do not have access to functioning toilets within the home, they must take extra caution to ensure they are not seen urinating, defecating, or washing in public (Geertz & Iyer, 2018). Women withhold and abstain from eating and drinking so they can avoid needing to use a public toilet or openly defecating during the day. Wanting to avoid being seen or harassed by men, women make daily choices that can negatively affect their long term health (Geertz & Iyer, 2018).

Poor sanitation is also directly correlated with women's time loss, as they address health concerns, collect and purify water, and try to find a suitable place to practice their defecation needs (Geertz & Iyer, 2018). These activities take time away from women that they can be using to go to school or work. There is no lack of evidence from around the world demonstrating that it is mostly women who bear the brunt of responsibility for water. Fetching water, being judicious with its use, and maintaining its availability in the home are duties that fall largely onto women (Geertz & Iyer, 2018). Pour-flush latrines in India require that large amounts of water are collected and carried, which most often is done by women (Geertz & Iyer, 2018).

Lacking hygienic sanitation invites rates of infections, such as urogenital tract infections, in women and girls that are higher than those in men and boys (Geertz & Iyer, 2018). Some

evidence has demonstrated a causal link between infant mortality and mothers' exposure to poor sanitation (Geertz & Iyer, 2018). Open defecation in India has been associated with adverse pregnancy outcomes and preterm birth (Caruso et al., 2017).

4.4 Sanitation & Gender-Based Violence

Open defecation exposes women to increased risks of gender-based violence (GBV) (Geertz & Iyer, 2018). Women across diverse global contexts have reported that GBV occurs while women and girls are urinating or defecating in the open, while on the walk to public toilets, and while using sanitation facilities outside the home (Geertz & Iyer, 2018). In India and in Kenya, women who openly defecate have higher odds of experiencing non-partner violence, as their privacy and dignity is compromised (Caruso et al., 2017).

In fact, qualitative research has linked a lack of clean water and sanitation in the household for women to their heightened fear of sexual violence in India, Vietnam, Ghana, and Kenya (Jadhav et al., 2016). To add to this growing body of evidence, the authors of a 2016 study analyzed data collected from the Indian National Family Health Survey run in 2005-2006 by the Indian Ministry of Health. They make the case that access to sanitation is a key factor in fully understanding sexual violence against women (Jadhav et al., 2016). Using a stratified random sampling approach, the researchers arrived at an analytic sample that included 75,619 women. Specifically, the researchers were looking at women's access to household sanitation facilities, as this was a data point collected by the National Family Health Survey (Jadhav et al., 2016). The authors define sexual violence based on World Health Organization definitions, where non-partner

sexual violence (NPSV) is when any women age 15 or over is forced to perform any sexual act that they did not want, by someone other than their husband or partner (Jadhav et al., 2016).

A bivariate analysis of household sanitation and NPSV, adjusted for women's demographic characteristics, found that non-partner sexual violence is twice as common among women who openly defecate than it is among women who use toilets (Jadhav et al., 2016). Specifically, the authors note that “compared to women who have access to a toilet in their household, Indian women who must open defecate have 2.14 times the risk of NPSV ($p < .01$)” (Jadhav et al., 2016, page 6). There is an important link between sanitation and gender-based violence that must be addressed in sanitation policy.

4.5 Sanitation & Psychosocial Stress

Sanitation-related psychosocial stress is a contextualized understanding of the connection between the sanitation environment and the physical and mental well-being of women and girls (Sahoo et al., 2015). Often lacking the agency to change their sanitation environments, many women are compelled to adapt their personal behaviors in response to sanitation-related stressors (Sahoo et al., 2015). Physiological regulations like withholding food and drink or holding in urges to defecate, and behavior modifications like changing timings of sanitation activities to reduce the chances of exposure are common methods women use to minimize sanitation-related psychosocial stress (Sahoo et al., 2015).

The authors of a 2015 study set out to add to the understanding of the psychological, social, and health impacts of sanitation behavior among women of reproductive age in Odisha, India. Study participants were women from three different Odisha settings: urban slums, rural villages,

and indigenous villages (Sahoo et al., 2015). Over fifty in-depth interviews were conducted in 2013 of people from four “life stages,” adolescent girls, newly married women, pregnant women, and established adult women from the three different settings in Odisha (Sahoo et al., 2015). Odisha has a population of roughly 41 million, and lags in sanitation, as 78% of the state’s population practiced open defecation based on Census data collected in 2011, higher than the national average of 50% (Sahoo et al., 2015).

The study found that sanitation behavior for women extended beyond urination and defecation to include carrying water, bathing, personal hygiene and menstrual management, and washing and changing clothes. While engaging in these sanitation activities, women experienced three overarching dimensions of stressors – environmental, social, and sexual – each of which varied based on life stage and living arrangements (Sahoo et al., 2015).

Related to the environmental dimension of stressors, several women without any toilet access reported walking long distances or crossing physical barriers like high walls and fences to find clean and private places for defecation and menstrual management (Sahoo et al., 2015). They encountered mosquitoes, feared snakes, and walked over stones and thorns without shoes. During rainy seasons, walking in mud that was potentially mixed with feces disgusted women, and required them to spend extra time cleaning. Compounding this was water access. Further travel time was required to find sites with adequate water for bathing and post-defecation cleaning, and the physical burden of carrying water over long distances made this more difficult (Sahoo et al., 2015).

Among those women who did have access to private or public sanitation facilities, they noted that many of the latrines they used were dirty or in deplorable condition, located far outside the home, lacked bathing or changing spaces, were often missing roofs and locks, had broken

doors, and operated at limited hours (Sahoo et al., 2015). Even when women were using a facility, these factors made them feel vulnerable and contributed to the environmental dimension of their sanitation-related psychosocial stress (Sahoo et al., 2015).

As for the social dimension of stress, when women without sanitation access near their homes were pushed into public spaces, their actions were observed and governed strictly (Sahoo et al., 2015, page 85). Social encounters in these spaces influenced their comfort levels, family reputations, and community standing (Sahoo et al., 2015). In the rural and indigenous village settings of Odisha, women's interactions with men are expected to be limited. Being seen by men during the practice of their sanitation-related behaviors was reportedly a source of deep shame and dishonor for the women (Sahoo et al., 2015).

Unreliable and unclean spaces, whether private, public, or open-defecation sites, made women fear contracting infections. They frequently described the symptoms related to uro-genital tract infections, and noted that if they contract these infections, it can be a further source of embarrassment for them (Sahoo et al., 2015). Health risks from unsanitary situations represent stressors along the social dimension.

Along the sexual violence dimension of stressors, women from the study described facing frequent and unwanted sexual encounters, peeping, and flashing during their daily sanitation practices (Sahoo et al., 2015). Women across all age groups mentioned that men or boys from their communities would throw stones at them and tease them as they walked out for sanitation (Sahoo et al., 2015). The women also encountered drunk men when trying to access toilets, and reported feeling unsafe in these situations (Sahoo et al., 2015). Nearly all study respondents from urban Odisha gave accounts of real incidents of women from their communities becoming victims of

sexual assault (Sahoo et al., 2015). Their fear of sexual assault while tending to their sanitation needs is grounded in real experiences, not abstract thought (Sahoo et al., 2015).

The findings of this study demonstrate that sanitation insecurity has real and lasting implications for women, that extend beyond their physical health. Lacking a clean and private sanitation facility is a source of environmental, social, and sexual-violence related stress for women.

4.6 Key Takeaways

A strong case can be made for the creation of gender-sensitive sanitation policy and programming. Gender-responsive sanitation approaches should consider the physical, environmental, and social needs of women, the collection of gender disaggregated data, and the creation of programming that improves equity and dignity, along with access to functioning facilities (Sahoo et al., 2015).

Women have consistently been excluded from the planning, design, organization, and implementation of sanitation programs (Caruso et al., 2017). Many WASH projects omit women from these processes, constructing toilets without the consideration of women's safety and comfortability. Where toilets are not located in walkable, safe, accessible areas, women will find them difficult to use (Geertz & Iyer, 2018). Women should be part of decision-making processes, and their engagement must be purposeful and meaningful (Geertz & Iyer, 2018). Engaging women in the planning process can ensure that new sanitation facilities suit not only the physical needs of women, but also the gendered circumstances women live in, making it more likely that they can and will use the new facilities in the long-run (Caruso et al., 2017).

Specific to the risks of sexual violence for women, the Jadhav et al. findings about non-partner sexual violence (NPSV) suggest that moving forward, sanitation and water projects must include a gender and violence component in their planning (Jadhav et al., 2016). To a certain degree, infrastructure improvements can provide some level of protection against NPSV for women, but only when their development is sensitive to the gendered needs and considerations of women (Jadhav et al., 2016). Additionally, violence against women as they tend to their sanitation needs can be minimized or even overcome if the entire community, including men and boys, are engaged in good practices and participatory planning (Mara, 2016).

When women can more easily access appropriate facilities, their risk of violence and experiences of shame, fear, and embarrassment are reduced (Sahoo et al., 2015). Sanitation programming that reflects the varied needs of its intended users is imperative for the success and impact of the program (Sahoo et al., 2015). Public and community toilets must be close to where people live, and must have sex-separated stalls, good lighting at night, secure locks on the doors, be spacious enough, and must accommodate children and those with physical disabilities (Geertz & Iyer, 2018).

Evidence demonstrates that including provisions for hand washing, space for a bathing area, and ample availability of water make it easier for women to use community or public sanitation facilities (Caruso et al., 2017). People have different needs, so programs must avoid the temptation of building scalable generic latrines, and instead focus on building facilities that can accommodate and serve the needs of people with differing levels of physical mobility (Caruso et al., 2017). Simple solutions like including handrails and making stalls bigger for those who use wheelchairs can have profound effects (Caruso et al., 2017). Just like caste, gender is unmistakably a critical dimension of the sanitation landscape, both in India and the rest of the world.

5.0 Urban Sanitation Approaches

5.1 Background

It is common for those living in slums in India to have inadequate or non-existent provisions for sanitation (Burra et al., 2003). The investment in sanitation in poorer areas of Indian cities has largely come from local bodies like slum boards, housing authorities, development authorities, and municipal corporations (Burra et al., 2003). These local governing bodies build public toilet blocks that they themselves are meant to maintain, but have little to no accountability to the communities in which they build (Burra et al., 2003). Public toilet blocks are made for anyone's use. The toilet blocks that are built per year are not done so based on any needs assessment or analysis of budgetary resources, and instead these programs underutilize available resources allocated for sanitation while also undeserving the needs of the population (Burra et al., 2003).

When building toilet blocks, local bodies typically source contractors to carry out the work. It is the engineering arm of a local body that deals with these processes, and they rarely consult or involve residents in the design, planning, construction, or provision of maintenance of the toilet blocks. Conservancy departments of municipal corporations are usually charged with the cleaning and maintenance of public toilet blocks, but their staff fail to do this (Burra et al., 2003). The community or inhabitants of the local area generally feel no sense of ownership over new toilets, and the quality of toilets is often poor and inappropriate for the needs of the area, not considering water access or waste management provision in their design (Burra et al., 2003).

These public toilet blocks usually end up in states of serious disrepair within months of their construction, leaving people who depend on them with no alternative but to openly defecate (Burra et al., 2003). In turn, the space surrounding these toilet blocks often become sites of frequent open defecation, producing a large health burden that contributes to high infant mortality and rates of diarrheal diseases (Burra et al., 2003). The toilet blocks can also easily become sites where households dump their everyday waste, as these communities often have no provision for garbage collection services. Women bear the brunt of the burden of no accessible and safe toilets, adjusting their behaviors in dangerous ways that can impact their long term gastric and menstrual health (Burra et al., 2003).

Outside of the government agency, various organizations like NGOs, international agencies, charitable trusts and business associations also involve themselves in “toilets for the poor,” projects (Burra et al., 2003, page 13). Often, these projects build pay-per-use toilets where user charges contribute to the salaries of toilet caretakers, and cover the costs of materials and maintenance (Burra et al., 2003). While these public toilets have worked well in high-traffic public areas like railways and bus stops, their high prices per use (usually 1 Indian rupee per person per use) make them less workable in slums (Burra et al., 2003). For a family of five in a slum, this rate would mean they spend 150 rupees/month for each member to use the toilet block just once a day, a burdensome amount for most of the urban poor who live on just several rupees a day (Burra et al., 2003).

The government toilet block model leads to early decay and non-use, and the pay-per-use model creates toilets that are too expensive for the poor (Burra et al., 2003). Neither government nor private/charity-built toilet blocks serve the needs of people living in informal settlements and slums in urban India (Burra et al., 2003). Utility or service providers, be they the state or private

enterprises, need to work with the residents of an area to collaborate and produce better sanitation. Neither group can do so on their own, and instead collaboration can enhance mutual accountability and deliver better services (McGranahan & Mitlin, 2016).

Realistically, residents cannot be expected to take responsibility over their fecal sludge without incentive, and public agencies cannot be expected to manage individual toilets at a low enough cost to them (McGranahan & Mitlin, 2016). The obvious option becomes co-production, where the two parties work together to find a sustainable and win-win solution (McGranahan & Mitlin, 2016). Instead of public toilet blocks, which are built for anyone and often maintained by no one, community toilet blocks that are used and managed by a well-defined group of people can be a more viable sanitation option (McGranahan & Mitlin, 2016).

5.2 The Work of the Alliance

In Mumbai in 1984, hundreds of women pavement-dwellers – who are those living in makeshift housing on street sides and sidewalks – came together and organized to successfully prevent the destruction of their homes (SPARC India, 2014). Out of this effort came a network of women pavement-dwellers known as Mahila Milan (Women Together), who have since been working to improve their conditions. Some women of Mahila Milan discussed their needs with a Mumbai-based organization The Society for the Promotion of Area Resource Centres (SPARC), and identified access to toilets as their main priority. Together with the National Slum Dwellers Federation (NSDF), SPARC and Mahila Milan formed a collective known as “the Alliance,” in 1985 to address this situation (SPARC India, 2014).

Between 1988 and 1996, the Alliance established several community-designed, built, and managed toilet blocks in the Indian cities of Mumbai, Kanpur, Bangalore, Lucknow, and Hyderabad that had served more than 500,000 low-income urban residents by 2003 (Burra et al., 2003). The Alliance proposed a model where they would design the project, the city or municipal corporation would pay for the capital costs of toilet construction, and the community themselves would manage and maintain the toilets and generate the funding to do so (Burra et al., 2003). This model allowed for the clear division of roles: city authorities set the standards, funded the capital costs of construction, and provided water and electricity, while the Alliance and community organizations designed, built, and maintained the toilet blocks, often with the help of contractors and architects (Burra et al., 2003) and (Patel, 2015).

The Alliance model promoted a system where each family in the community buys a pass for the toilet blocks at 20 rupees/month, which is much cheaper than 1 rupee per use/per day charged by other public toilets (Burra et al., 2003). The local inhabitants themselves took over the construction processes, and often women community leaders managed this, increasing their knowledge and skills. Spearheading this work, women's groups in these communities figured out how to deal with bureaucratic local governments and their officials, giving them a greater sense of confidence (Burra et al., 2003).

Formation of management committees in each community formalized maintenance and management schedules for the toilet blocks (Burra et al., 2003). These committees dealt with both community and government representatives, encouraging committee members to increase their networking skills (Burra et al., 2003). The activities of the committees were funded partially through the monthly user fees, and from an internal startup capital fund of contributions from all willing community-members (Patel, 2015).

Many of the toilet blocks launched by the Alliance included a room and accommodations for a toilet caretaker and their family to live in, and included the costs of accommodation in their salaries, which lowered overall maintenance costs (Burra et al., 2003). Guaranteeing a minimum wage and a secure living space for the toilet caretakers, who were those from Dalit communities, proved a favorable method of ensuring a decent livelihood and more dignity for people who usually do this type of sanitation work in poor conditions (Burra et al., 2003).

5.3 Key Takeaways

These projects represent a meaningful investment in human capacity and learning. Creating space for the more formal and relevant participation of the poor in the construction and design of community toilets can expand their livelihood options and develop their skill sets (Burra et al., 2003). Community-management and control creates a possibility of change, helping to develop new leaders and forge relationships between communities and external agencies (Burra et al., 2003).

This model also breaks the stereotype that poor people are too marginalized to make change for themselves (Burra et al., 2003). It facilitates a shift from communities having to beg city authorities for services, to them seeing toilet blocks as their right, and feeling empowered enough to claim them (Burra et al., 2003). The involvement of communities builds their strength and confidence, and can encourage them to negotiate with authorities on other issues (Burra et al., 2003). A broad range of community members being involved in a sanitation intervention, like women, people with disabilities, and otherwise marginalized group members, can ensure that access and availability of services is equitable and safe for all (Nelson et al., 2021).

The successful scaling up of the Alliance's model of community-managed toilet blocks for urban settlements in India suggests that novel, community-engaged approaches are possible. Through multiple and varied efforts, the many challenges in service provision for vulnerable populations can be overcome, and low-cost, effective sanitation efforts can be implemented. Interventions should not only provide sanitation at a low cost, but should provide traction for users to collaborate with each other, co-produce improvements with local authorities, and work together to lower costs (McGranahan & Mitlin, 2016).

Despite its novelty, the Alliance's model of community managed toilet blocks has its limitations. Notably, it is not clear in the literature what type of waste management technology these community toilets used. Toilets in densely populated and narrow slum settlements are usually connected to septic tanks, implying that the community toilets built by the Alliance may have also used septic tanks. It is uncertain how these septic tanks were emptied, and what oversight the community committees had over them.

Additionally, even though it provides more decent conditions for them, this model perpetuates the role of Dalit people in sanitation work. As discussed in the **Caste and Sanitation** section, Dalit communities already face entrenched social stigma related to their caste-based occupation. Efforts to untie Dalits from sanitation work are undermined by any sanitation program that employs them in cleaning toilets, however dignified the working conditions may be.

6.0 Program Development: Delhi & the People of Majnu Ka Tila

6.1 Program Context: Delhi

Even as the National Capital Territory of India, 45% of Delhi does not have access to proper sewage disposal and drainage systems (Singh, 2017). Per day, Delhi generates 3,800 million liters of sewage, as reported by the Central Pollution Control Board (Singh, 2017). Because the city's sewage treatment plants do not operate at their full capacity, and the infrastructure that should be transporting sewage from toilets to treatment plants is inadequate, more than half of the sewage generated daily is not receiving any treatment. Instead, this large volume of untreated sewage is allowed to flow into the Yamuna, the major river that runs through the eastern part of Delhi, polluting its water (Singh, 2017). The main source of drinking water for the 32 million residents of Delhi comes from the Yamuna River (Aijaz, 2022).

Accordingly, in 2018, there were over 500,000 cases of diarrhea, 51,000 cases of typhoid, and 1,500 cases of cholera in Delhi, based on a report about the state of health for residents of Delhi published by the Praja Foundation (Praja Foundation, 2019). It should be noted, though, that these numbers come from cases of diarrhea, typhoid, and cholera that were reported to government or municipality-run hospitals in Delhi, and does not include cases from private hospitals or health clinics. Thus, these numbers are likely smaller than the true counts. Waterborne illnesses like diarrhea, typhoid and cholera, are worsened when sanitation systems do not properly separate people, water, or food supplies from human feces.

6.2 Delhi's Governance Structure

Delhi lies at the intersection of local, state, and national jurisdictions. Urban governance is complicated, as singular areas of responsibility are parsed among various agencies at different levels (Sheikh et al., 2015). The local government is made up of five urban local bodies, three of which cover 95% of Delhi's land area: the North Delhi Municipal Corporation, the South Delhi Municipal Corporation, and the East Delhi Municipal Corporation (Sheikh et al., 2015). The MKT camp, the site of this community-managed sanitation program, falls under the North Delhi Municipal Corporation's jurisdiction.

Delhi was designated as a state in 1991, with the creation of a state-level representative government called the Government of the National Capital Territory of Delhi (GNCTD) (Sheikh et al., 2015). At the national level, the Delhi Development Authority (DDA) is responsible for the physical planning and development of land and housing in the city. The DDA is accountable to the Ministry of Urban Development of the national Government of India (Sheikh et al., 2015). The Delhi Urban Shelter Improvement Board (DUSIB) is the state level body responsible for servicing the many informal and unplanned settlements across the city, such as slums (Sheikh et al., 2015).

The Delhi Jal Board is a local-level body that is responsible for the water and sewage-related infrastructure in most of Delhi, and is accountable to the GNCTD. The Delhi Jal Board oversees water supply and distribution, and the collection, treatment, and disposal of sewage in all the North, South, and East Municipal Corporations noted above (Sheikh et al., 2015).

6.3 Program Site & Situation

6.3.1 Site

Zooming in on the northern part of Delhi, known as the Majnu Ka Tila area, there is a settlement of roughly 700 people from 120 families living in a makeshift camp (PTI, 2021, OpIndia, 2019). The Majnu Ka Tila camp will henceforth be referred to as the MKT camp. These people are Hindu migrants who fled neighboring Pakistan in 2012 for fear of religious persecution, and they have been living in this settlement on the outskirts of Delhi ever since (Joshi, 2022).

Despite the camp and its residents having been here for over a decade, there is a severe lack of research about the residents, and few policy efforts aimed at this population. Consequently, little to no empirical data is available about the residents' health status, rates of waterborne disease, demographics, or employment situation. Instead, the development of this sanitation program pulls from preliminary observations, from an assessment conducted by a local NGO working with this community called Humanitarian Aid International (HAI), and from a handful of online news articles.

6.3.2 Preliminary Observations

During the summer of 2022, I worked in Delhi as an international Fellow with a social collective and NGO called BasicSHIT (Sanitation & Hygiene Innovative Technology). BasicSHIT installs dry composting toilets and waterless urinals across Delhi for public use. We received funding from a private donor that would cover the cost of installing one toilet for public use somewhere in the city. Our donor requested that the toilet be specifically for women, but it was up

to us to decide where exactly it would go. After several weeks of site visits, as a team we determined that the Majnu Ka Tila camp on the outskirts of Delhi would be the best location. In early July, over the course of one day, we installed one BasicSHIT toilet for women in the back of the MKT camp.

Several women approached me that day to request that we bring more toilets. Quickly, it became clear that a singular toilet was not enough to meet their needs, nor the needs of the greater camp population. I was the only woman on the BasicSHIT team, so many women from the camp shared their experiences with me and told me about the difficulties they face every day without access to clean toilets near their homes. I listened to them speak candidly about their behavior modifications, the fear they felt while openly defecating, and the complaints their children made about stomach pains. Because these conversations were spontaneous and unstructured, without the backing of a formal survey or data collection methodology, I consider what I learned and observed that day to be anecdotal evidence, used as preliminary observations for the development of this program.

6.3.3 The Situation

Residents of the MKT camp live in semi-permanent structures with shanty roofs, made in part with bricks, sheets of iron, and cloth (OpIndia, 2019). Many camp residents work as informal daily wage earners while others sell small items on the roadside (OpIndia 2019 & 2021). Their precarious legal status as Pakistani nationals on long-term visas has barred them from receiving government papers, Indian citizenship, or identification cards that are needed to access formal employment opportunities. Most of the families have children of school-age, who also face challenges in accessing education (OpIndia, 2021).

The camp residents have received very little assistance from Delhi government authorities, even though the camp is on Central Government territory (Joshi, 2022, OpIndia, 2021). The Delhi Jal Board is meant to deliver water, sanitation, and wastewater services to the camp. Interestingly, a statutory body of the Government of Delhi, the Delhi Commission for Women, have themselves been quoted as saying that the “Hindu refugees continue to live in deplorable conditions and access to basic amenities like housing, water connection, electricity, toilets and proper means of livelihood are denied to them,” (Joshi, 2022, paragraph 5).

The community relies on one tap of public water supply that feeds into four other water taps throughout the camp. Using it as their drinking water, 98% of camp households reported that they consume this water without treating it (HAI, 2019). About 110 people per water tap means that residents collect water four times a day, routinely spending 1.5 hours on average for this task. Many residents also depend on water from the nearby Yamuna River for their daily use (HAI, 2019).

Two public toilet blocks on either side of the camp, constructed by the government, are available for residents’ use. It is unclear from the available literature when they were built. Each block has five stalls, unseparated by gender, totaling ten public toilets that camp residents could be using. The reality is that 80% of the public toilets are not functional - out of the ten toilets, only two are in usable condition (HAI, 2019). The reasons for this are obvious: these are pour-flush toilets, so users are required to manually pour water to flush waste down, but water scarcity being rampant in the camp has made the toilets unusable (HAI, 2019). Another reason is the lack of connection to any waste management system, and a lack of emptying of fecal sludge from the pits below. The combination of these issues has left human waste to collect at the top of the toilets, while sludge overflows into the area around the toilets. Pools of standing water cause insect vector

breeding, and flies and mosquitoes spread pathogens from human feces into water and food supplies (PTI, 2021).

Thus, most residents are forced to openly defecate (HAI, 2019). In my conversations with camp residents, I learned that they do this in the nearby forest, on the banks of the Yamuna River behind the camp, and even on the sides of streets. When openly defecating, they become subject to verbal harassment and even physical abuse by the public and passersby. Women mentioned that they withhold food and drink throughout the day so they can avoid needing a toilet. They said that their monthly menstruation is always a difficult time for them without access to a private and clean place to regularly change their menstrual products. They also mentioned that their kids miss school often, due to stomach pains and frequent diarrhea.

6.4 Program Design

6.4.1 Justification

Against the backdrop of both the larger picture of sanitation and governance in Delhi, and the specific case of the MKT camp, the necessity of a novel sanitation program, built by and for the camp residents, is undeniable. Therefore, I am proposing an approach in which a range of government stakeholders, local NGOs, and community-based organizations (CBOs) work in partnership with camp residents to run a community-managed toilet block program. While the Alliance's successful community-managed sanitation programs in India inform the structure of it, the program I propose differs from the Alliance model and addresses the limitations in their approach through:

- An emphasis on the safe management of human waste with dry composting toilets as an improved on-site sanitation system. Dry composting systems will be further explained in a following section.
- A community management committee that is made entirely of women from the camp, who are trained in leadership and financial management.
- Encouraging and incentivizing camp residents to maintain and operate the toilets themselves, instead of employing Dalit people for this.
- The use of land and construction space where toilets already exist, rather than needing to convince local government officials to allocate new space.
- A potential for income generation and resource recovery, through the harvesting of compost from dry composting toilets.
- The application of circular economy principles to reduce plastic waste while providing a sustainable sanitation solution.

The program I propose thus fills the gaps left by the Alliance's model, and is tailored to the unique context of the Majnu Ka Tila camp in Delhi. Figure 6 shows an overview of the program.



Figure 3. Program Overview, Source: Created by Author

6.4.2 Program Goals & Theory

Based on lessons learned from community-managed toilet blocks in various Indian cities (Burra et al., 2003), and on the acceptance of a BasicSHIT toilet in the camp already, this program is designed to engage and empower all residents of the Majnu Ka Tila camp to claim their rights to safe sanitation and healthier lives. The main goals of the program are as follows:

1. In the first month of the program, organize and train women from the camp to form an all-women Community Management Committee (CMC) to oversee the long-term operations and maintenance of the new toilet blocks;
2. Within the first four months of program initiation, update the existing non-functional public toilet blocks into two community-managed toilet blocks, fitted

with BasicSHIT dry composting toilets, through a process of co-production and meaningful participation from the camp residents; and

3. Within one year of program initiation, improve overall community health by reducing the rates of waterborne diseases among camp residents, measured by health surveys conducted before and after new toilet construction.

The theory of change for this program is that if residents are engaged in the design and construction of new toilets, and women residents form a committee to manage the new toilets, then all residents will have access to functional and hygienic sanitation, reducing their experiences of waterborne disease.

In the following sections, references to a “program team” will be made. The program team would spearhead implementation, and consist of local public health professionals, sanitation experts, and representatives from the various stakeholder groups.

6.4.3 Stakeholders

Representatives of the Delhi Jal Board, Delhi Development Authority, and the Delhi Urban Shelter Improvement Board will make up the government stakeholders for the program. Several CBOs will be recruited as partners, including a women-led non-profit called the Urban Management Centre to facilitate government capacity and participatory planning processes for the program. Additionally, a women’s trade union based in Delhi called the Self-Employed Women’s Association (SEWA) will assist in mobilizing and training women from the camp in leadership and self-reliance.

BasicSHIT will be the main local stakeholder for this program. Camp residents are still using the one BasicSHIT toilet we installed for women nine months ago. The successful uptake of

one of these toilets by the community indicates that BasicSHIT, as an organization that is known and already trusted by residents, is qualified to serve as the community's main local partner. BasicSHIT's team of dedicated and well-connected people will help to initiate this program on the ground in Delhi. Their government contacts and extensive networks will assist in the program's roll-out.

6.4.4 Funding Structure

This program proposes a financial model wherein the government authorities provide the upfront capital costs for removing the existing toilets from the two blocks, pumping out the sewage, cleaning the surrounding areas, making any necessary repairs to the walls of the complexes, and installing new BasicSHIT composting toilets. Government funding will also contribute to the compensation of CMC members and toilet caretakers.

The program team will lay out a plan for the Delhi Jal (Water) Board to incorporate into their annual budget the capital costs of any construction updates to the toilet blocks, water and electricity supply, and salaries of CMC members and toilet caretakers. Sanitation has been given a high priority through various government efforts in India over the last several years, presenting a window of opportunity where government partners can be convinced of this program's efficacy and their role in funding it.

6.5 Program Plan

As evidenced throughout this thesis, sanitation programs achieve long-term success only when the people they are built for are meaningfully engaged in the entire process. Community participation builds knowledge among stakeholders, can create lasting partnerships, and produces programs that are successful in addressing the relevant needs of the community (Nelson et al., 2021). To foster their participation, MKT residents will be engaged in all phases of the program: planning, design, construction, decision-making, service delivery, and long-term maintenance.

6.5.1 Preliminary Data Collection

To begin, a needs assessment will be conducted by the program team to understand residents' exact sanitation needs, and the barriers and assets related to sanitation that already exist in the community. As the team conducts this assessment, they will administer in tandem a community health survey to identify current rates of waterborne diseases among camp residents, and other impacts of poor sanitation, prior to the construction of new toilets.

6.5.2 Town-Halls

Following the preliminary data collection, a series of at least three town-hall style meetings will be held to formally introduce the program and stakeholder groups to the community, and to serve as brainstorming sessions. Sessions will be hosted near the camp, and food will be provided at town-halls to incentivize residents' attendance.

BasicSHIT team members will facilitate the town-halls, where emphasis will be given to uplifting voices from the margins: women, children, those differently abled, and the elderly. With the help of one local partner, a non-profit called the Urban Management Centre, community members will be engaged in a participatory design process during town-halls to identify what they want from their new toilets. Based on this and the needs assessment, BasicSHIT will work to adjust their toilet model to include the design specifications that meet both the wants and the needs of residents.

Representatives from each of the relevant government authorities will be identified and invited to each town-hall meeting. Through a strategy of mutual respect and understanding, partnerships across the various groups can be built. The Urban Management Centre will engage local government representatives and the community in peer-to-peer exchanges to foster a sense of trust and begin relationship building between the groups. The Centre will also provide capacity building training and technical assistance to government partners as the program rolls out.

One of the other local partners for this program, SEWA (Self-Employed Women's Association), will conduct a gender-role analysis during the town-halls. Gender-role analysis will allow residents to explore power dynamics in their community and encourage them to consider the ways gender impacts their sanitation behaviors and experiences. Through various exercises, women and girls will get the chance to share their stories to an audience of their male family members and neighbors. Men and boys from the community will be invited to respond and share their own stories. SEWA will steer the ensuing conversation to cover topics like women's empowerment, the importance of entrepreneurship and self-reliance, and how uplifting women can improve everyone's overall well-being.

6.5.3 Community Management Committees

Through the gender-role analysis, ideally, a consensus will emerge that women from the camp will be the ones to lead the new sanitation program. Residents will be asked during the final town-hall to nominate a group of 15-20 women leaders to form their Community Management Committee (CMC). SEWA will assist with this nomination process. From its inception in India in the 1970s, SEWA has successfully worked within communities to identify women amongst them who possess leadership qualities. SEWA then works with these women to help them become agents of change for their communities, through hands-on training to build their leadership capacity and entrepreneurial skills (SEWA Bharat, 2022).

Members of the Community Management Committee will be trained by SEWA in leadership, self-organizing, and financial management. Once the women from the CMC are trained and feel confident in their skills, they will host recurring meetings and on-going discussions with government partners to demonstrate their capabilities for community-management, and to provide consistent updates on their progress. They will negotiate with government officials to agree on adequate compensation for their work as CMC members, including various benefits like legal aid, food rations, and mobile data recharges. These meetings will help to forge strong relationships between the government authorities, the community, and the program team.

Before the program can move to the toilet construction phase, the CMC will need to decide several items, depicted in table 1 below:

Table 1. Community Management Committee Items

Item:	Considerations:
Toilet operations and maintenance (O & M)	<ul style="list-style-type: none"> • Who will form the internal toilet caretaker team to carry out every day O & M for the new toilet blocks? • How many people are needed on the caretaker team? • How will duties be rotated per caretaker? • What is adequate compensation for the internal caretaker team? • Who will train the caretaker team and when? • What hours of operation should the toilet blocks be open? • How will the condition of the toilets be monitored overtime?
Toilet security	<ul style="list-style-type: none"> • Should each toilet block be staffed with a security person? • If so, how many security people are needed? • How much will they be paid?
Monthly user fees/Startup fund	<ul style="list-style-type: none"> • What monthly user charge per family is feasible for most camp residents? • How much should residents be asked to contribute to an initial startup fund? • Are there other ways to generate funds besides from the community?
Financial management	<ul style="list-style-type: none"> • How will user fees and startup funds be collected, and by whom? • Where will this money be held? • Who will oversee disbursements?
Logistics	<ul style="list-style-type: none"> • How long does CMC tenure last? • How are new CMC members recruited/chosen? • How often does the CMC meet, and where?

6.5.4 Plastic Collection

BasicSHIT's products are created entirely out of recycled plastic, in pursuit of their mission to catalyze the circular economy. One of their toilet units is made from over 8,000 plastic bottles. This represents a special opportunity for further community involvement, as plastic products are used by almost everyone.

At the beginning of the program, during the first town-hall, camp residents will be asked to save their used plastic products for three months. Every two weeks, members of BasicSHIT's team will collect this plastic from the community. After three months of this, the collected plastic that would have gone to waste will instead be shredded and compressed into the construction material that BasicSHIT uses in their products. This very construction material is what will later be used to build the new toilets in the camp. Photos of the BasicSHIT toilet made with this recycled plastic material can be found in Appendix 2.

BasicSHIT will host demonstrations of their plastic shredding process to show residents how exactly their construction material is made. If residents feel that their own plastic waste has contributed to the formation of their toilets, then they will be more likely to see the new toilets as truly theirs, as something that they have control and a say over.

The plastic contribution process along with well-planned collaboration and meaningful co-production, co-planning, and co-management of the intervention with the community can effectively foster their sense of ownership. Ownership is a community's degree of control and sense of possession over a service, and ultimately impacts the outcomes of a program (Nelson et al., 2021). A secure sense of ownership over an implemented WASH service is crucial to the community's investment in and commitment to its preservation (Nelson et al., 2021).

6.5.5 New Toilet Blocks

This program is made particularly viable by the fact that there is already designated land and some infrastructure for toilets available in the camp area. To update the existing public toilet blocks into new community toilets, the unhygienic toilets will need to be deconstructed and the area must be cleaned. Men from the community and hired wage-laborers will take apart the existing toilets and remove the scrap materials. Then, a privately contracted service provider will vacuum out the sewage under the toilets. All people involved in this work will be supplied with proper personal protective equipment like hazard suits, industrial masks, gloves, and goggles, as well as heavy duty cleaning supplies.

Once the old blocks are demolished and the space has been cleared for new toilets, about five months into the program, BasicSHIT toilet installation will occur over the course of one week. Their toilets can be assembled in just fifteen minutes, as they are a jigsaw puzzle-style design that can be put together on-site by two to four people with the help of the instruction manual (Aggarwal, 2021). Members of the community at large will be encouraged to watch and partake in the toilet assembly. As they physically put the pieces of the toilet together, residents will be reminded of the contribution that their plastic made to these toilets, enhancing their sense of ownership over them. BasicSHIT will also provide hand washing stations in the blocks, for which water will be pumped in by the Delhi Jal Board.

The two newly constructed toilet blocks will be designated as community blocks, not open for public use. This will be enforced by issuing each camp resident a membership card, in both a digital form on a mobile phone app, and in a physical hard copy, that they use to gain entry to their block. One will be a women's toilet block and the other a men's.

6.5.6 Dry Composting Toilets

A key feature that distinguishes this community-managed sanitation program from other approaches will be the use of dry composting toilets from BasicSHIT. A dry composting toilet is a basic sanitation solution that does not rely on the availability of water, and does not need a connection to a sewer system or septic tank. These toilets are situated squarely on top of underground pits that have been lined with bricks and layered with activated charcoal, limestone, red worms and sawdust (Aggarwal, 2021). Figure 3 depicts this toilet and the pit underneath.

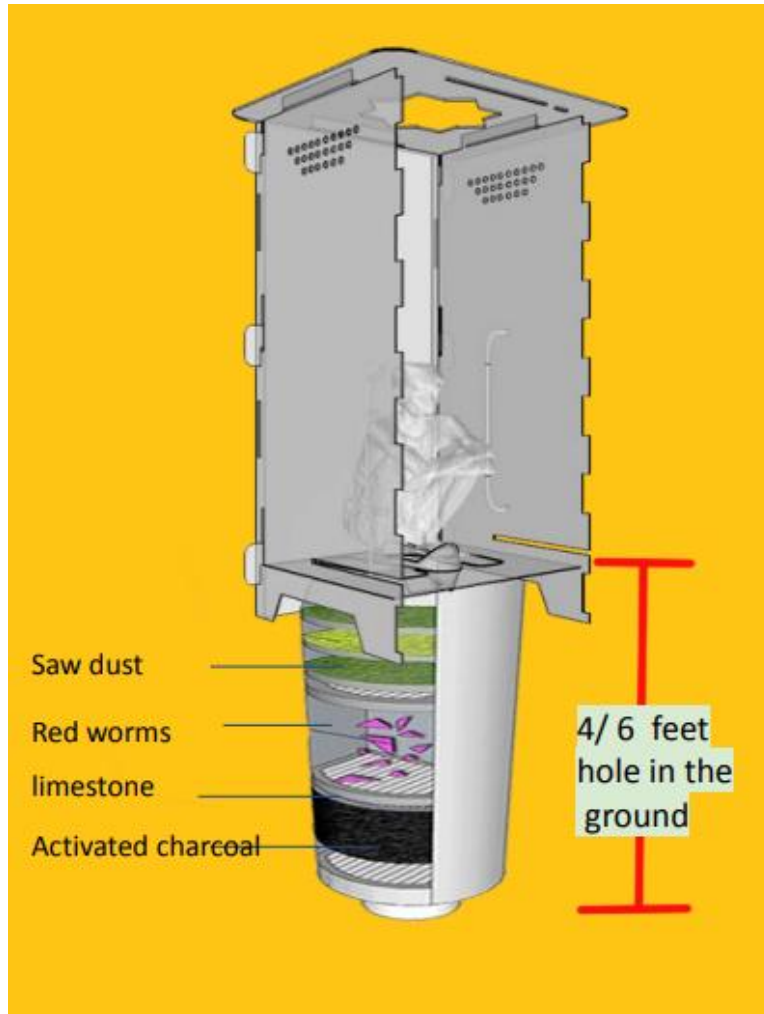


Figure 4. BasicSHIT Toilet and Pit, Source: Aggarwal, 2021

Instead of flushing waste down with water, users release feces and urine directly into the pits below, which have a capacity of six to seven months if 350 people are using the toilet per day (Aggarwal, 2021). After defecation, the user deposits scoops of sawdust on top of their waste. Sawdust is a bulking agent that creates a dehydrating environment and air gaps for aerobic bacteria to break down human waste and kill off pathogens (Aggarwal, 2021). If used correctly, the dry composting toilet desiccates human waste and transforms it into safe-to-handle compost, not sewage (Aggarwal, 2021). When the pits fill up, users themselves can safely and easily remove

the compost from the toilets. Not creating sewage means that the use of these toilets does not depend on the availability of a networked sewer system nor on private desludging services. Dry composting systems save roughly 200 liters of water per day, making them the ideal solution for the context of this camp (Aggarwal, 2021).

After one year of continued and correct use of the dry composting toilets, the CMC and caretaker team can use the compost that has harvested under their toilets. The CMC and other interested community members will be trained by the BasicSHIT team in how to empty the compost, and its potential for income generation. They can decide if they want to partner with local farmers and sell the compost as fertilizer, or if they want to apply it to a community garden in their camp.

6.5.7 Monitoring

Three months after the new community toilet blocks are developed, the program team will conduct a post-toilet construction health survey to determine whether there has been any significant reduction in rates of waterborne illness in the camp. The results of this survey will be compared to those from the pre-toilet construction survey. A pre-and post-test evaluation will help the program team and the community determine whether the expected reduction in rates of waterborne disease occurred as an outcome of the program or not. Other data collected in this survey will include rates of toilet usage to determine if the community is actually using the new toilets.

Consistent with community-based planning, design, and implementation processes, this program will also apply community-based monitoring mechanisms. These mechanisms will take various forms, including satisfaction surveys. In the six months after the new toilets are

constructed, the CMC will be asked to run monthly user satisfaction surveys to monitor the acceptability, accessibility, quality, correct use, and user traffic of the new toilets for camp residents. The CMC will write the survey with the support and technical assistance of SEWA and BasicSHIT. They will decide how to deliver this, such as on mobile devices using an online survey, or on paper. After each round of the survey, the CMC, program team, and stakeholders will collectively analyze the results and decide the best course of action to address user concerns.

Another form of community-based monitoring will be toilet scorecards. On the back of each toilet stall will be a QR code that users can scan with their cell phones. This will take them to a short questionnaire where they can indicate the condition of the toilet as it currently stands, and comment on the adequacy of the caretaker team in daily cleaning. The scorecard results will be assessed and addressed at weekly CMC meetings.

The program team will also hire an evaluation consulting firm before implementation to assist with designing an impact evaluation for this program. The impact evaluation will seek to answer questions about the long-term impact of the program, based on what the community and government stakeholders identify as important and valuable.

6.6 Considerations

6.6.1 Shared Facilities: Safely Managed or Not?

It should be noted that shared sanitation facilities, like the ones proposed by this program, are not currently included in the definition of a safely managed sanitation service used by the United Nations. Excluding shared sanitation from the definition of a safely managed sanitation

facility is justified, usually, by the fact that they often lack maintenance and cleaning, and can quickly become sites of fecal-oral transmission of diseases (Mara, 2016).

However, research from various urban and rural sanitation programs poses evidence that under certain conditions, shared sanitation facilities can be safely managed services. They may in fact be the most feasible sanitation option for densely populated slums and urban settlements where constructing functional household toilets is not practical, such as in the MKT camp (Mara, 2016).

The roll-out of this community-managed toilet program will include data collection on the status of the shared toilets months after their installation. These data will show whether a community-based operations and maintenance mechanism is enough to keep shared toilets in good condition. Based on these findings, a determination can be made about whether shared facilities in the MKT camp can be considered safely managed. If so, this program can potentially add to the growing body of evidence demonstrating that shared facilities can be safely managed sanitation options.

6.6.2 Program Limitations

Like any public health program, the one I have outlined in this thesis has its limitations. The program depends on the local government's willingness to participate and engage with the MKT camp residents. Without their approval, updating the existing toilet blocks into community toilets will not be possible. The contentious nature of land and property rights in Delhi make it difficult to predict the government's stance on a program like this.

An important dimension of sanitation in India, as noted earlier in this thesis, is caste. Sanitation work, including toilet cleaning and operations, is heavily stigmatized and looked down on. The program I have proposed will need to work within this understanding of cultural

considerations. The community may find it offensive to even suggest that they take on the work of cleaning and maintaining the new toilet blocks. Caution must be taken to ensure that the role of Dalits in sanitation work is not perpetuated by this program, and that instead, a compromise can be found.

Lastly, as participatory as it has been designed to be, this program may suffer from limited community engagement and reach. I can only predict what conditions and which incentives will motivate participation from community members. Elevating the voices of children, the elderly, and the differently-abled in the community may not be as simple as inviting them to the table. The development of this program is constrained by my limited understanding of their realities and daily lives. Hence, it is vital that local partners are involved from the beginning, who can more easily connect with residents and build a sense of trust and comfort around the program. Local partners can then elicit and encourage participation from the community.

7.0 Conclusion

The state of public health relies on infrastructure like safe sanitation, to keep human feces away from human contact. Those who live without this infrastructure suffer from negative health impacts. They often live in urban areas where people are densely compacted, elevating individual health problems to ones that affect entire communities. The situation in the Majnu Ka Tila camp is an example of this.

Fearing religious persecution in neighboring Pakistan, roughly 700 people migrated to the Majnu Ka Tila area of the outskirts of Delhi in 2012 to seek refuge. Rather than finding better opportunities or stronger social support in India, these people have spent the past decade living in poor conditions in a makeshift camp, with limited basic services. Particularly, this community goes through their daily lives without access to functioning and hygienic sanitation.

Previously built by the municipal government, two public toilet blocks near the camp sit in a state of dysfunction and filth. The toilets have no provision for the management of human waste, instead allowing fecal sludge to accumulate and overflow into the surrounding area. Perpetuating this unsanitary condition is the absence of a daily caretaker or any maintenance oversight.

Consequently, the people living in this camp have been forced to openly defecate on the banks of the nearby Yamuna River and on street sides, subjecting them to verbal abuse from the public and passersby. Not only does this instill fear and humiliation in camp residents, it decreases their sense of dignity.

Open defecation and the ejection of raw sewage from the nearby toilets means residents' environments easily become awash with untreated human waste, causing frequent bouts of

diarrhea and other waterborne diseases in the camp. Without a private and clean space to properly manage their menstrual hygiene, women face added challenges to their monthly menstruation.

To address this public health problem, I have proposed in this thesis an approach that uses several participatory mechanisms for a community-designed, built, and managed sanitation program. Engaging the community in the design, construction, management and oversight of the new toilets will ensure that the intervention meets their needs and wants.

To elicit community participation and leadership, multiple town-hall sessions will be conducted at the start of the program. Local partners will help with relationship building between stakeholder groups, and will provide training and skills development for government partners and women leaders in the community.

A team of these women leaders will then form the Community Management Committee (CMC) that will be tasked with the long-term management of the new toilet blocks. They will appoint a team of toilet caretakers from the community who will be responsible for the daily maintenance of the toilets. Through financial management training and hands-on guidance from local partners, the CMC will generate and manage the funds needed keep these toilets operable over the long run.

The program will update the existing infrastructure in the camp to create community toilet blocks fitted with dry composting toilets from the Delhi-based organization called BasicSHIT. Dry composting systems do not rely on fecal sludge emptying, nor on a connection to a sewage network. They are waterless and flush-less, reducing the burden on water supply in the camp.

Moreover, BasicSHIT's toilets are made entirely out of recycled plastic, making them an environmentally-friendly, sustainable sanitation option for the context of this camp. Residents will

be involved in the plastic collection process and will see their waste plastic become part of the construction material for their new toilets.

Based on preliminary observations of the community, and an understanding of successful sanitation programs, I have proposed a pilot public health program suited for the specific context of the Majnu Ka Tila camp and its residents. The program is meant to be further designed, developed, implemented, and sustained by the community. Through careful planning, this program can work to empower women from the camp, while refraining from perpetuating the role of Dalit people in sanitation work in India.

Appendix A

Images of the BasicSHIT toilet and women from the MKT camp assembling it from July 2022:



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