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India, Water and Sanitation

A Dream Of A Clean India

In August of 2017, a new Bollywood movie called "Toilet: A Love Story" was released. The film related the story of a woman who leaves the man she married on the first day of their marriage due to his lack of a toilet. The husband spends the rest of the movie fighting against the traditions of his community and values of India by building her a toilet. Although this movie may seem silly and the stuff of fairytales, this is the reality that many communities living in India have to face. Due to cultural barriers and lack of proper leadership, India, for many years, has had poor sanitation and access to water. In fact, according to the World Factbook, only 36.9% of the total population has access to improved sanitation (World Factbook, 2018). This means that the rest of the population is not ensured hygienic separation from fecal matter and harmful diseases. To assist the people of India, it is necessary to utilize new technology, work with community leaders, and encourage the government's program.

India is a country in South Asia with a very diverse territory next to Pakistan, Afghanistan, China, Bangladesh, Myanmar, and Tibet. In the north lie the snowy Himalayan Mountains and the country is bordered in the south by the vast Indian Ocean. The nation has a population of 1,281,935,911 people, making it the 2nd largest population in the world. 60.5% of the land has been cultivated and large majority of the population lives in these rural, agricultural communities. The main crops produced by these farms are rice, wheat, and spices (World Factbook, 2018). The small sizes of the farms could actually be causing a low productivity as 80% of individual farms are less than 2 hectares or about 2 international rugby fields. As there is no reliable access to water, 50% of all crops depend on rainfall (The Wall Street Journal, 2011). The large rural population in India as well as the centuries old traditions means that changes in lifestyle are difficult.

A typical Indian family focuses on collectivism or the idea of giving the group priority over the individual. Many families live in an extended family system, so generations of relatives could all be living in one house. Three meals are eaten each day and would include a starch or meat, vegetables, chutney, and rice or a flatbread called naan. The society is very traditional and patriarchal; in rural communities especially, women are given very little power (Net Industries, 2018). There is a very stark difference between the urban and rural portions of India. Only 4.2% of India's GDP is spent on medical care so the 70% of the population living in rural communities often has limited or no access to hospitals and clinics. In contrast, the urban population has the cutting edge technology in medicine and better doctors (Forbes India, 2014). As for education, schooling is taken very seriously in India. Many urban schools encourage a strict schedule where students must take exams to go to the next grade and have extra school both before and after school. In rural communities, access to school systems is much more limited. Some schools are built under bridges or wherever possible to provide a basic education. Women are often restricted from even the most fundamental aspects of education. The World Bank has donated over 2

million dollars to help India in its education yet the literacy rate is still just a little over 71% (The World Bank, 2011). Overall, the major barriers that a typical family would face are low incomes, a huge family, and most detrimentally - poor sanitation.

According to the New York Times, over 65 million Indian children under age 5 are affected by malnutrition, not because they are not being fed enough, but rather because of the bacterial diseases they come into contact with. The reason for these diseases is because around 50% or 620 million people defecate outdoors in India. Bacteria from faeces is easily transmitted to kids and adults through water streams or fields for food, causing malnutrition. This malnutrition or stunting causes cognitive disorders, an increased likelihood of getting heart attacks or strokes, and even a shorter lifespan (New York Times, 2014). In addition to the public health risk, in many rural communities the lack of proper toilets is a public security issues. As many people defecate in an open field, women often wait until night to go more privately. Unfortunately, the unprotected young women are often the victims of rape and murder. The situation has gotten so bad that in October of 2014, prime minister Narendra Modi launched a five year program called "Swachh Bharat" or "Clean India" which promised to eradicate open defecations by 2019. The goal is to ensure that every person in India has access to a toilet and doesn't have to resort to defecating in the open. However, it has been a difficult process to create sewage systems and toilets all throughout India.

In urban communities, the area is densely populated. As cities develop and grow, everything is built on top of each other making it difficult for new sewage systems to be built. In Assi Ghat, a city by the Ganges River, engineers can't add to the sewers because "the old pipes in the ground were not designed to deal with the current population" and it's difficult to "uproot" everyone to try and put together a temporary solution (Global Challenge, 2016). In addition, there are not enough sanitation facilities to treat the waste so a lot of fecal matter is dumped into rivers. Clearly, it is necessary to provide city citizens with toilets, have a proper place to treat the waste, and finally dispose of the fecal matter in an appropriate way.

For rural communities, the problem is more than just access to toilets; it's also age-old traditions that provide barriers to proper sanitation. In Hinduism, the religion that a majority of the population practices, there is a traditional Hindu caste system that still is seen in society. Hindus are segregated into Brahmins, Kshatriyas, Vaishyas, Shudras, and the Dalits or untouchables (BBC, 2017). Traditionally, only the untouchables are the ones who are supposed to remove waste. This deters other groups from making a seemingly shameful change from the traditions. In addition, a study led by Diane Coffey, an economist at Princeton, found that "even among households with a working latrine, more than 40% reported that at least one family member preferred to defecate in the open. Those with a government-built toilet were especially likely to choose a bush instead" (The Economist, 2014). Century old values say that defecating near the home is impure. Finding ways to build toilets that will actually be used is the challenge for rural community.

Fortunately, there are a few solutions that India can implement to fight against its public health and safety crisis. These solutions would all be headed by the government as a continuation of the Swachh Bharat program and would be funded by UNICEF India as well as by small grants from the World Bank. These loans would all be very probable as the World Bank and UNICEF India have already given some money to India for the very reason of improving water sanitation. A continuation of these funds would be highly likely and plausible. Utilizing new technologies and working with community leaders is the key for creating effective change in India.

The first step is proper education for both urban and rural community members about the harms of open defecation. Community leaders and community led programs would be necessary to properly initiate this education. One example of a grassroots movement that has been successful in the past in India is called the Gramalaya Urban and Rural Development Initiatives and Network (GUARDIAN). GUARDIAN provides small loans to rural areas in Indian states to help them grow their water and sanitation access. They also set up training facilities for community members so they understand how latrines and sewage systems work themselves. Nagaraja Prakasam, an independent director of GUARDIAN, explains how a woman with little formal education worked at the research facility for over 15 years and the ease with which she was able to explain the ventilation systems and construction of different models of toilets. In addition, the loans provided by GUARDIAN allow for specialized toilets based on "affordability, availability of space and water, geographical conditions, cultural habits, and access to skilled manpower" to be created, ensuring that each region has a latrine system that works for them (Acumen, 2014). By taking these community led programs and expanding them to a national level, community members would be able to learn from their local leaders and be more agreeable to changes.

In addition, proper use of new technologies as they come up will be very beneficial for Indian sanitation. One helpful invention is the Omni Processor funded by the Bill and Melinda Gates Foundation and created by Janicki Bioenergy. This machine takes sewage water and cleans it out so efficiently that in about five minutes it is transformed into clean drinking water. The low cost and thorough process of the processor could help India save nearly 54 billion dollars a year (Wired, 2015). "Squandered energy" is used to power the machine. Waste products are transported mechanically and are transformed into useful materials from bricks to electricity. In Senegal, this invention has proved to excel as it cuts out interactions between waste and humans. (Design Indaba, 2015). In India, the people could receive these same benefits and potentially provide jobs for local governments, businesses, and community members.

For rural communities, Ecosan toilets could prove to be a worthwhile investment. Without the requirement of water, these toilets are a closed system where the pit of the toilet is filled and sealed. Then the feces is composted and used on farms as users switch to a second pit. The invention is beneficial for both producing healthy food and ensuring no contamination. In the Indian state of Chattisgarh, this project has appeared to be successful. They were able to reduce the cost of building these toilets and successfully encourage families to use them (WaterAid, 2014). Unfortunately, Ecosan toilets are not yet a large scale project. With loans from the World Bank and UNICEF, more of these innovations could be built around rural communities.

As for urban communities, yet another innovation would have to be used to work through their unique problems. As it is difficult for engineers to build new sewers and treatment facilities, decentralized systems and on site septic tanks would be beneficial. The decentralized sewer system use less water, smaller diameter pipes, and are gradually added to a community. In addition, they don't cost as much as larger sewage systems and require smaller waste treatment facilities. Although these are prone to blockage and necessitate proper "neighborhood cooperation", these systems have proven to be successful in Malaysia and Brazil (Boston Consulting Group, 2014). Even more promising are on-site septic tanks which can actually be for a single household or shared between households. The tank treats the waste and allows the liquids to drip into the ground where it should "safely degrade". Leftover solid waste should then be cleaned out as the tank fills. This is a low cost, on-site solution that would not require the creation of a multitude of sewers and pipes. However, it does require proper care by neighborhood members.

Increased access to clean water and fewer diseases in open fields will positively and directly impact Indian agriculture. A reliable source of water will raise farm incomes and directly reduce poverty (The Wall Street Journal, 2011). As erosion continues to occur with deeper tapping of groundwater supplies, the new technology can ensure that farmers continue to have access to water and could even increase the amount of available water. In addition, with a decrease in interactions with fecal matter, the number of kids who are fed well but still have malnutrition due to disease will greatly decrease. Many studies have shown that better sanitation and water access increases public health and the economy as a whole.

Food security is directly linked to water sanitation. Having access to nutritious food is important but people should be able to actually absorb those nutrients. Ensuring that clean water is available and actually used on crops will greatly decrease malnutrition in kids and adults. Many of India's problems, from disease to access to toilets, could be fixed by an emphasis on water sanitation.

Overall, a change in traditions and values is necessary for proper implementation of all solutions. The only way malnutrition, murders, and loss of money can be stopped is if all Indian citizens are properly educated of the harms of open defecation and are given access to latrines. Effective leadership from national to local leaders is also very important. Once that initial step of educating the people has been taken, the government can turn towards a plethora of inventions to invest in. Based on the necessities of the region, different kinds of toilets or sewage systems can be utilized. In crowded areas, low cost and convenient on site septic tanks would have big benefit. In rural areas, the environmentally friendly Ecosan toilets would give communities a source of fertilizer as well as a safe area to defecate. Beginning with the governmental Swachh Bharat program and branching out into a wide variety of community initiatives, Indians can make real change in their country by embracing new innovations and values.

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