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# Health Hazards of Solid Waste Landfills in Delhi

***Research Question:*** What is the human health burden of solid waste landfills on waste workers and populations residing near landfills in Delhi?

## *Introduction*

Delhi produces 10,000 metric tons daily; this amount is predicted to double in five years due to both, heavier urban consumption patterns and population rise (Brown, 2016). Due to lacking solid waste management infrastructure, this waste is dumped in large landfills around the city. Waste pickers then scavenge though these mountains of unsorted waste in attempts to earn money by selling their recyclable findings. Communities of waste workers lack social mobility and are severely marginalized by municipalities and the general public. As a result of the social stigma attached to waste work, waste workers receive little to no benefit for their labor in extremely hazardous conditions. This paper investigates the link between the hazard of municipal solid waste (MSW) and the disease burden in marginalized communities of waste workers and populations residing near landfills in Delhi.

## *Social Determinants of Health for Waste Pickers*

Waste workers are among the most marginalized of groups in Indian society. Many of the workers are underage, illiterate, migrants, extremely poor and part of the lowest caste. There are about 100,000 waste pickers in Delhi alone. A study surveyed a large number of Delhi's waste workers to find that the majority of them were migrant workers from neighboring states, illiterate, lacking permanent housing, and disproportionately lower caste or Muslim. Waste

workers are clearly segmented by ethnicity, built on a long and painful history of caste-based discrimination (Hayami et al., 2006).

Delhi—as a megacity with a booming population, expanding area, and incoming migration—houses many urban slums, mainly populated by poor migrants who have moved in from neighboring states. This has made the North-East District of Delhi the most densely populated district where a business of recycling waste can thrive (Hayami et al., 2006).

Without a formal legal structure within the municipality, the waste pickers tend to be self-employed recyclable waste traders. Because of a caste-based social stigma that is attached to waste work in India, waste workers deal with severe discrimination. Along with the many physical diseases waste workers suffer as a result of the toxic components in the landfills, they also deal with extortion from police and government agencies. Additionally, waste working communities are often plagued by alcoholism, literacy and drug abuse (UNEP, 2005). Many of the children working on the landfill sites in Delhi are orphans, making them extremely vulnerable to sexual abuse or trafficking (ILO, 2004).

This damaging informal sector actually plays an imperative role in a many developing cities' recycling rates. Without the contributions of the waste pickers in Delhi's waste management system, the city would have to come up with a alternative model to dispose of waste or deal with many additional effects of environmental degradation. A study estimated the public cost saving resulting from informal waste collection by waste workers and found significant external benefits of these workers relative to their private incomes. Without the recycling services provided by the workers, Delhi would require significant increases in the public cost to maintain the city's environment (Hayami, et al., 2006). Despite fulfilling a much-needed public service, waste workers are not paid by the municipality nor respected by the public

(Hayami et al., 2006).

***Health Burden of Solid Waste***

MSW in urban areas creates a number of public health hazards. It can clog drains and create stagnant water for mosquito and insert breeding during the rainy reasons. Upon incineration, a frequency disposal method in developing cities, it can contribute heavily to the urban air pollution load. The leachate, the liquid that drains from a landfill, pollutes the nearby soil and water, further contributing to health hazards. The waste attracts insects and rodents that serve as vectors for the spread of diseases such as cholera and dengue fever. Nearby residents often use water polluted by MSW waste for bathing, growing food, and drinking, thereby exposing them to a number of contaminants and disease agents. (Alam, 2013).

Leachate varies highly in content depending on the waste site, but in general it contains organic and inorganic chemicals, bacteria, viruses, and many unidentified toxicants. These toxicants are generally a variety of heavy metals, such as Pb, Hg, Fe, Cd, Mn, As, Zn, Ni, and Cr, several polychlorinated dibenzofurans (PCDFs), persistent organic pollutants (POPs), polyaromatic hydrocarbons (PAHs), and dioxins (Bakare et al., 2012). The U.S. Public Health Service identified 22 human diseases that are linked to improper MSWM (Alam, 2013). Since Delhi, like many other developing cities, does not implement safety standards for waste work, waste workers are not protected from direct contact with the MSW, creating a serious health hazard that has been recorded in several studies (Ncube, 2016).

Direct contact with leachate has shown to be a serious public health hazard. A study assessing the genotoxicity of a municipal sludge leachate gathered from a dumpsite near Lucknow, India, tested the effects of the leachate on the somatic tissues and organs of mice. The results showed a significant increase in DNA damage in organs and tissues of treated mice

compared to the negative control. Of all organs, the extent of the DNA damage on the bone marrow was highest, followed by liver. The study also found that the municipal sludge leachate induced oxidative stress in the liver of these mice. These results can suggest potential effects of leachate exposure on humans (Bakare et al., 2012). Several other studies similarly report on the genotoxicity of solid waste leachates, implying the significance of heavy metals as a potential cause of DNA damage (Bakare et al., 2012).

In Delhi specifically, leachate exposure poses a serious threat. A study assessing the environmental contamination of municipal solid waste (MSW) landfills in terms of leachate in Delhi found many dangerous compounds, most prominently polycyclic aromatic hydrocarbons (PAHs) and phthalate esters. Using human risk assessment methodology, the scientists found evidence for significant cytotoxic and genotoxic effects of leachates and statistically significant DNA damage. Even though their environmental assessment found low concentrations of proven carcinogenic PAHs, the mixture of contaminants in leachates was found to be toxic enough to produce synergistic cytotoxicity and genotoxicity in humans (Ghosh, 2015).

In addition to leachate exposure posing a grave threat, the ambient air around landfill sites is also extremely detrimental to human health. A study, conducted in a municipal landfill plant in China, assessed the human health risk of volatile compounds in the ambient air around the site. Results showed that the cumulative carcinogenic risk was exceeded, particularly during the summer season. Individually very few of the volatile compounds posed a significant carcinogenic threat alone, but the mixture of compounds produced at the site taken together posed a serious carcinogenic risk (Mustafa, 2017).

Such exposures produce a magnified health risk to certain vulnerable groups within already marginalized populations. For example, women and children are particularly susceptible

to the negative health effects of MSW. A study done in several major metropolitan cities in India investigated the status of contamination of organohalogen compounds (OCs), such as polychlorinated biphenyls (PCBs) and brominated flame retardant (BFRs), in human milk samples from several locations in India. The results displayed levels of OCs were significantly higher in the milk of mothers living in and around municipal solid waste dumping sites as compared to other locations. Results also showed evidence for region-specific pathways since the congener profiles of PCBs and BFRs were different between samples from the dumping site mothers and the general population. The study concluded that the estimated infant health risk well exceeded the threshold value, indicating a serious risk for infants near solid waste landfills (Devanathan, 2012).

All such studies test the effects of direct exposure to SMW; however, MSW has shown to be a health hazard for communities living farther away as well. A study looked at the health impacts of solid waste disposal in developing cities though an in depth case study of the Granville Brook Dumpsite in Freetown, Sierra Leone. Their results showed that nearby and far away residents of solid waste landfill sites suffered a variety of disease related to the surrounding conditions. They found that proximity to the landfill increased disease burden of malaria, chest pains, diarrhea, cholera, and irritation of the skin, nose and eyes. These diseases were all found to be linked to the pollution from the landfill. This is exacerbated in the rainy season when the air and water and ground water pollution is more severe and spreads farther. Furthermore, in the dry season, the smoke from the incineration of waste at the dumpsite is a significant source of pollution, even for people living farther away from the dumpsite. They concluded that these health impacts are comparable to most solid waste disposal sites in similarly developing cities, such as Delhi. (Sankoh et al., 2013).

Overall, MSW poses a serious public health threat, most considerably for waste workers. This is certainly true in Delhi, with its lacking SMW management system and marginalized waste working communities. A study assessing the respiratory and general health of nearly 100 ragpickers from landfill sites in Delhi, while controlling for drug use, concluded that ragpickers suffer from a several of health problems related to their occupation. Ragpickers had worse respiratory symptoms and impaired lung function as compared to controls. Additionally, they had relatively higher prevalence of low hemoglobin, high circulating eosinophil and monocyte counts, unhealthy gums, frequent diarrhea, and dermatitis. Their mucus was tested to indicate comparatively higher inflammation as well as significant cellular changes in the airways (Ray, 2004).

### *Solid Waste Management Policy*

The rules for management and handling of MSW were put in place in 2000 under the 1986 Environment Protection Act, passed by the Ministry of Environment and Forests of the Government of India. These rules were created after a mandate by the Indian Supreme Court to create a comprehensive policy for collecting and managing solid waste. This law makes no explicit mention of waste pickers or collectors. The result is a largely informal waste processing system that receives little political or public attention (WEIGO, 2017).

### *Solutions*

The solutions to the health hazards of the SWM problems in Delhi can be policy-based, technological, and social.

#### *Policy-based*

New waste policy must address the needs of the informal waste workers. This means that policy must seek to integrate the existing informal waste sector into a formal comprehensive

framework, including new technologies. There is a strong corporate lobby that pushes for privatization of waste collection as a solution to the lacking waste processing infrastructure. Privatization is presented as a cheaper and more efficient option; however allowing a company to have direct control over waste can potentially displace waste workers. The most important reform to be made is allowing waste workers to have a strong representation in matters of waste policy, so that they can implement measures such as segregation of waste at the source, which allows of better waste management and creates significantly better working conditions for waste workers.

Given India's increasingly consumerist societies, there must also be efforts to reduce the amount of waste produced. As of January 2017, Delhi municipalities and the National Green Tribunal (NGT) of India introduced a ban on disposable plastic. This includes cutlery, bags, cups and other forms of single-use plastic. Plants and street vendors that are not able to comply will have to pay fines (Chua, 2017). Additional policies aimed at waste minimization include subsiding biodegradable products and promoting adoption of clean technologies in manufacturing companies by employing regulations (Chikarmane, 2012).

*Technological*

Technological advances can be very helpful in mitigating the health hazards faced by waste workers in Delhi. One such technological solution has already been proposed and approved for the Bhalswa landfill. The North Delhi Municipal Corporation is about to build a waste-to-energy plant in order to deal with the overflowing garbage in the landfill. This is supposed to increase the corporation's waste processing capacity. It will be called the Narela-Bawana plant, and is already running trials (The Hindu, 2016). When it will be fully commissioned, it is predicted to use up to 1,000 MT of waste every day to produce power. The

plant would then process up to 94 percent of the waste that has been accumulating, and the remaining six percent would be used as brick building material. An important part of implementing such new technology is finding funding, which was provided by the national government's Swachh Bharat Mission (The Hindu, 2016). This is an effective solution to improve the technological capacity of waste processing in Delhi, and thereby deal with the number of issues that are propagated by the waste pollution.

*Social*

Political and technological solutions, often neglect to address the environmental injustice of the MSW management issues in Delhi. This is why the most important step will be organizing the waste workers so that they can be empowered to demand safer working conditions. They are most susceptible to the health risks that arise because of MSW, and therefore solutions must target their communities first.

Given the government's inaction and lack of political will, a potential solution to the informal waste issue is organizing the recyclers into Community Based Organizations (CBOs) or Small Enterprises by adopting the informal waste-workers as workers for the formal waste management sector. Another similar solution is forming proper waste workers associations. Several studies have shown the effectiveness of such solutions in Indian cities similar to Delhi (Chikarmane, 2012) (Aparcana, 2016). Furthermore, in December of 2016, over 30,000 sanitation workers started a strike in protest of their unpaid salaries in Delhi. This strike led to some advances in salary payment for the workers, but did not address any of the underlying and root issues that the workers were organizing against (Sharma, 2017). Such unionized networks must be strengthened in order to empower waste workers to demand for environmental justice.

***Conclusion***

Waste management in Delhi is not a singular issue; it is the culmination of a variety of social difficulties that burden the country as a whole. A lacking SMW management system is only a symptom of larger cultural issues. In the midst of these issues, dealing with the human health burden of the marginalized waste workers is priority. As supported by many studies, in Delhi and similar cities, there is a clear link between the hazard of MSW and the disease burden in marginalized communities of waste workers and populations residing near landfills. In order to alleviate or lessen this burden, Delhi must address the lacking solid waste management infrastructure and social stigmatization of waste workers that stems from the caste-based stigmatization of waste workers. Through a number of technological, political, and social interventions, Delhi can mobilize against the culture of indifference around waste. No matter how potentially effective such solutions may be, the central struggle will be to empower the marginalized waste workers so that they can demand for their right to live and work free of the environmental hazards of MSW.

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