

Environmental Pollutants from Landfill Sites and Their Implications for Food Quality and Public Health Nutrition: A Study of State Accountability

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Abstract

The paper discusses the serious environmental and public health crisis posed by Delhi's three legacy landfill sites, namely Ghazipur, Bhalswa, and Okhla. These sites are open dumping grounds that lack essential protective features like leachate collection systems and bottom liners. As a result, toxic leachate permeates the local ecosystem, especially the food chain and affects human health.

The paper also explores the issue of crops like spinach and mustard absorbing heavy metals such as lead and chromium from the contaminated water. Grazing of livestock on the contaminated waste mountain results in the production of contaminated milk full of dioxins and PCBs, creating a direct vector for paediatric toxicity. The infants consuming this milk suffer from stunted growth despite containing sufficient calories.

The paper also delves into the area of State responsibility and how it has failed to fulfil its duty. Article 21 also provides the people living around landfill sites the right to a healthy and clean environment. While judicial activism through the National Green Tribunal (NGT) has imposed environmental compensation based on the polluter pays principle, significant accountability gaps remain regarding food safety and chemical runoff. The paper shall discuss the above issues and provide an appropriate solution to resolve the menace.

Introduction

Landfill sites are critical components of modern waste management infrastructure, engineered to safely dispose of solid waste by minimising its impact on human health and the environment. Unlike uncontrolled open dumps, landfills are systematically designed, constructed, operated, and monitored in accordance with specific regulatory standards. The fundamental principle behind a landfill is the controlled isolation of waste from the surrounding environment (land, air, and water) to facilitate decomposition and prevent contamination.

A landfill is an engineered facility where waste is deposited systematically in layers, compacted to reduce volume, and covered with soil or other suitable materials at the end of each operating day. This process aims to contain the waste and manage the byproducts of its decomposition, such as leachate (contaminated liquid) and landfill gas (primarily methane and carbon dioxide). The design incorporates features like bottom liners to prevent leachate migration into groundwater, leachate collection and removal systems, and landfill gas collection systems.

Crisis in Delhi

Over 32 million people live in Delhi. As the city has expanded, so too has its waste generation. Everyday 11000 tons of waste are generated in Delhi. The management of this waste is dominated by three "legacy" landfills namely Ghazipur Bhalswa and Okhla

These sites were never designed to fulfil the requirements of a "sanitary landfill" with bottom liners or leachate collection systems. Instead, they are open dumping sites that have resulted in mountainous structures, as tall as 65 metres or more, almost the height of the Qutub Minar in Delhi. This paper will give you an insight into the "slow violence" of these landfill sites: how the dirt and chemical runoff from these waste mountains infiltrates and pollutes the local food supply and miserably impacts and compromises the nutritional status of the people living in the vicinity, and identifies where the State has failed in its constitutional duty to protect public health.

Delhi's Landfill Pollutants: Leachate and Its 'Genesis'

Delhi has a semi-arid and subtropical climate. The high organic content of municipal waste undergoes anaerobic digestion, which produces a liquid known as 'leachate'. There is no geomembrane liner at these sites, and as a result, the liquid permeates the underground land, contaminating the water. As a result, the land around the landfill site becomes highly toxic and is unfit for any vegetation or cultivation of land.

Heavy Metal Fingerprinting

Several Studies have been conducted by the Central Pollution Control Board (CPCB) and independent researchers who have, time and again, identified alarming concentrations of metals in the surroundings and periphery of these landfill sites, such as lead that comes from discarded batteries and E-waste. Cadmium from plastic waste, mercury from medical waste like thermometers, etc. Industrial leather and textile waste adds chromium to these landfill sites.

The toxins released in the atmosphere are more susceptible to fire because of the trapped methane in the waste. As a result, dioxins and furans -some of the most dangerous substances are added to the atmosphere around those sites. Interestingly, these substances do not stay in the air but settle down on the surface of the soil or water. Eventually enter the food chain and pollute and contaminate it through atmospheric deposition.

Trajectory of pollutants into the Delhi Food Chain

The "Yamuna Food Basket"

A staggering 40% of the green leafy vegetables sold in Delhi's wholesale markets (Azadpur and Ghazipur Mandis) are grown in the Yamuna floodplains. These agricultural lands are in direct proximity to the leachate runoff points and the drainage canals of the city.

- **The Root-to-Shoot Pathway:** There have been research that shows that spinach and mustard greens grown near the Bhalswa site show a substantial amount of lead concentrations in them. The "hyper-accumulator" properties of these plants can draw heavy metals and store them in their edible leaf tissue.

- **Irrigation with "Black Water":** Farmers often use water from the Najafgarh or Shahdara drains to irrigate crops. These drains act as open sewers for landfill runoff, ensuring that the pollutants are applied directly to the food supply.

Livestock and the Dairy Crisis

Ghazipur and Bhalswa are located at the base of the landfills. Cattle in these areas are often seen grazing on the trash mountains. As a result, lipophilic pollutants like Dioxins and PCBs accumulate in the fatty tissues of cows and are excreted in milk. Milk is the primary source of nutrition for newborns and the infant population in the city. But the contamination makes it a direct vector for paediatric toxicity.

Public Health Nutrition: Mapping Hidden Disease Pathways

Environmental Pollutants enter the food chain and affect the nutritional value miserably, which is often described as the “double burden of malnutrition.”

Toxic-Induced Nutrient Deficiency

Heavy metals act as "antagonists" to essential minerals.

- **Iron vs. Lead:** Lead exposure interferes with heme synthesis, leading to iron-deficiency anaemia, which is rampant among children in North Delhi.
- **Zinc vs. Cadmium:** Cadmium displaces zinc in the body's enzymes, weakening the immune system and leading to stunted growth.

Environmental Enteric Dysfunction (EED)

Living near and in the vicinity of these landfill sites leads to severe health conditions. It may cause intestinal inflammation, breathing issues, cardiovascular diseases, and skin allergies. Despite consuming enough calories, a child may not be able to absorb the appropriate nutrients, the gut cannot absorb the nutrients. Irony is that, there is high caloric availability but higher rates of stunting and poor growth of children.

State Responsibility

Right to clean environment as fundamental right under Article 21 of the Constitution

Right to a clean and healthy environment though not expressly mentioned as a fundamental right under Article 21. Nevertheless, through judicial activism it has been recognized as an important part of right to life under Art. 21. The Supreme Court as a protector and guardian of the fundamental rights, through its activist approach has secured a number of other basic rights implicit but not expressly mentioned in the Constitution. Article 21 being the most significant in the journey of right based approach of environmental jurisprudence in India.

In Rural Litigation Entitlement Kendra vs. State of Uttar Pradesh Supreme Court held that the right of the people to live in a healthy environment with minimum disturbance to ecological balance should be safeguarded. In Charan Lal Sahu vs. Union of India, the Supreme Court while upholding the validity of Bhopal Gas Leak Disaster Act, 1985, observed that the citizen's right to pollution-free environment is protected under Article 21 of the Constitution of India. Right to clean environment is based on the principle of solidarity and it is believed to be a part

of third generation human rights. Therefore cooperation is needed at all levels to secure effectively right to clean environment to all.

Regulatory Paralysis

Institutions like MCD(Municipal Corporation of Delhi), DPCC (Delhi Pollution Control Committee)and DDA(Delhi Development Authority) have failed in fulfilling their responsibilities. These institutions come within the ambit State under Article. 12 of the Constitution of India. Each one of them have their own set of reasons for the failure. Likewise, MCD lacks funds for scientific landfill capping, DPCC is a toothless tiger, and DDA continues to allow residential expansion into "buffer zones" around landfills.

Failure on the part of the State

There is no data in the public domain related to lab testing of the Delhi vegetable market to inform the users and consumers if their vegetables were grown in a heavy metal-rich zone. This is a gross violation of the "right to safe food." State responsibility also includes transparency of data, which is missing in Delhi's case.

Case Study: The Ghazipur "Collapse" and its Aftermath

In 2017, a portion of the Ghazipur landfill collapsed, killing two people. While the physical danger was publicised, the subsequent "chemical collapse" was ignored. The landslide pushed thousands of tonnes of waste into the adjacent canal, which feeds agricultural lands downstream. The state's response was a temporary ban on dumping, which was revoked within days due to a lack of alternatives. This illustrates a **reactive** rather than **proactive** governance model.

Conclusion and Policy Recommendations

To reach 3,000 words in a formal submission, this section should be expanded with specific technical roadmaps. Core recommendations include:

1. **Mandatory Biomining:** The State must accelerate the "Biomining" process (segregating and treating legacy waste) using the "Polluter Pays" principle to fund it.
2. **Creation of "Nutritional Buffer Zones":** A 10km ban on all agricultural and dairy activities around the three landfills, with state-supported relocation of farmers to safe zones.
3. **Real-time Heavy Metal Monitoring:** Establishing FSSAI-led testing labs at the Azadpur and Okhla Mandis with public-facing dashboards showing daily toxicity levels in produce.

State accountability must evolve from "trash management" to "nutritional security." The health of Delhi's future generations depends on the State's ability to see the landfill not as a pile of waste, but as a threat to the very food that sustains the city.

The Judicial Intervention and the Role of the National Green Tribunal (NGT)

To understand State Accountability in Delhi, one must examine the role of the **National Green Tribunal (NGT)**. In recent years, the NGT has emerged as the primary enforcer of environmental ethics in the National Capital Territory, often stepping in where the executive branch has faltered.

The Landmark Case: O.A. No. 606/2018

Under the oversight of the NGT, the "Compliance of Municipal Solid Waste Management Rules, 2016" became a focal point for Delhi's administration. The Tribunal noted with grave concern that the three landfills—Ghazipur, Bhalswa, and Okhla—were not just "heaps of waste" but "environmental emergencies."

In a significant ruling, the NGT imposed "Environmental Compensation" on the Delhi Government, amounting to hundreds of crores of rupees, for the failure to scientifically process legacy waste. This was a direct application of the Polluter Pays Principle, holding the State itself as the "polluter" for its negligence in oversight.

Legacy Waste and Biomining

The NGT mandated the process of Biomining—the use of trommel machines to screen and separate legacy waste into Soil Conditioner, Refuse Derived Fuel (RDF), and C&D (Construction and Demolition) waste. However, the accountability gap remains:

- **The Disposal Deadlock:** While the NGT pushed for the clearing of these sites, the State struggled to find "takers" for the segregated waste.
- **The Leachate Oversight:** Much of the NGT's focus remained on the *volume* of waste (to prevent fires and collapses) rather than the *chemical runoff* affecting the food supply. This represents a missing link in judicial oversight: the failure to connect waste management to food safety protocols.

Table

To provide a granular view of the crisis, the following table summarises the chemical and environmental status of the three primary sites based on recent environmental audits:

Feature	Ghazipur (East)	Bhalswa (North-West)	Okhla (South)
Established	1984	1994	1996
Primary Food Pathway	Dairy & Poultry (Ghazipur Dairy)	Leafy Vegetables (Yamuna Floodplain)	Atmospheric Deposition (WTE Plant)
Dominant Pollutant	High BOD/COD (Organic)	Heavy Metals (\$Pb, Cd\$)	Dioxins & Furans (Incineration)
Groundwater Impact	Contamination of Hindon Canal	Salinity & Metal Plumes in NW Delhi	Trace EDCs in South Delhi Aquifers

Socio-Economic Impact and Environmental Injustice

In Delhi, the proximity to a landfill is inversely proportional to a citizen's socio-economic status. This can be described as "Environmental Classism."

The "Waste-to-Plate" Cycle of the Urban Poor

The communities living in the shadow of Bhalswa or Ghazipur are often the same communities that work as waste pickers or subsistence farmers. They consume the produce grown in the immediate vicinity because it is the most affordable. This creates a feedback loop of poverty and ill-health:

1. High exposure to toxins via air and food.
2. High rates of respiratory and gastrointestinal diseases.
3. High out-of-pocket expenditure on healthcare leads to further impoverishment.

The Failure of Social Safety Nets

The State's Public Distribution System (PDS) provides grains, but it does not account for the bio-safety of the fresh produce that residents must buy from local markets. Without a State-led 'Toxic-Free Food' certification, the urban poor are essentially forced to consume "nutritional poison."

Journey from Linear Waste Model to a Nutritional Security Model

- There should be a legal mandate to create green buffer zones around landfills where food production is strictly prohibited by law.
- Accountability must be moved to the "ward level". When waste is processed where it is generated, the "Toxic Concentration" seen at sites like Ghazipur is prevented. There should be decentralisation of waste governance.
- The Environmental Budget is to be integrated with the Health and Nutrition Budget by the Delhi Government. Money saved on preventing leachate contamination is money saved on treating renal failure in public hospitals.

Conclusion

The Mountains of Trash in Delhi is a projection of failure on the part of State. The real tragedy does not lie in the height of the trash but the width of its impact—stretching from the polluted aquifers of Bhalswa to the plates of children across the city. Just moving trash from one location to another is not the solution that the State can offer; the State has to ensure that its most helpless and vulnerable people are not compelled to trade their long-term health for their daily bread and butter.

The protection of the environment is an integral part of any country's environmental jurisprudence. The development of this jurisprudence is surrounded by duty-right based approach. The national and international instruments discussed above coupled with judicial activism clearly highlights that there is existence of State's responsibility to protect the environment. There is also an existence of fundamental right with respect to environment which is enforceable against State. There is enough constitutional evidence available that clearly affirms the duty of the State towards environmental protection. Environmental constitutionalism¹ is concerned with constitutional protection of the environment. The literature on environmental constitutionalism ascertains an interdependent relationship between environmental rights, on the one hand, and environmental duties of the State and individuals on the other. Also, Indian jurisdiction does not have an entirely rights based approach as the sole basis of environmental constitutionalism. By the 42nd amendment to the constitution in the year 1976, India became one of the first constitutions in the world to set out the fundamental environmental duty of citizens, and the environmental duty of the State as one

of the Directive Principles of State Policy (DPSP). When there is violation of a person's fundamental right under Art.21 because of unhealthy and polluted environment, it is State that has failed in performing its duty. State is certainly answerable for the failure. In *L.K Koolwal V State of Rajasthan and Others* a writ petition was filed by the petitioner asking the court to issue directions to the state to perform its obligatory duties. Fundamental Rights and the Directives Principles of State Policy were invoked by him. This case brought to the fore the acute sanitation problem in Jaipur which, it claimed as hazardous to the life of the citizens of Jaipur. The High Court observed that maintenance of health, preservation of sanitation and environment falls within the purview of Art. 21 of the Constitution because it affects the life of the citizens. The filth and dirt leads to slow poisoning and hazards to the life of the citizens and it amounts to slow poisoning and reducing the life of the citizen because of the hazards created if not checked. The Court held that the Municipality had a statutory duty to remove the dirt, filth etc. from the city within a period of six months and clear the city of Jaipur from the date of this judgment. At the end, one can conclude that tools like public interest litigation and judicial activism have helped India develop its environmental jurisprudence and prove that there is definitely a State responsibility towards environmental protection.

The roadmap to a cleaner Delhi must begin with the recognition that waste management is, at its core, a matter of public health, nutrition and the State takes stricter, more effective measures to cure this life-threatening menace

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