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From Trash to Trouble: The Impact of Solid Waste Dumping in India

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ABSTRACT

Solid waste dumping has become a pressing environmental and public health issue in India, with far-reaching impacts on ecosystems, human health, and socio-economic development. This paper examines the detrimental effects of solid waste dumping in India, analyzing its environmental consequences, public health risks, and socio-economic implications. Drawing on existing research, case studies, and policy analysis, the paper explores the drivers of solid waste dumping, its impacts on local communities, and the challenges and opportunities for sustainable waste management solutions.

Key words: *Solid Waste, Dumping yard, Waste Disposal, Pollution*

Introduction

Municipal solid waste generation has increased as a result of the rapid growth of urbanization and industrialization (Reddy, 2021). India has made several technological advancements, but it is still lagging behind in creating a hygienic way to dispose of municipal solid waste (Siddiqua *et al.,* 2022). Open dumping is the primary method of disposal in the majority of India, despite the existence of constructed landfills in a few places (Zhu *et al.,* 2008). Open dumping is a serious threat to the ecosystem since it spreads several diseases and degrades the beauty of the surrounding area. Ground water is contaminated and soil conditions are deteriorated by the leachate produced by the dumping of waste (Omang *et al.,* 2021; TERI, 2022). In India, the inappropriate disposal of solid waste, including industrial, construction and demolition, municipal and electronic trash, has resulted in a deluge of environmental and public health issues (Negi *et al.,* 2020; Gour and Singh, 2023). Thus this paper analyses the impact of public health and ecological issues due to solid waste dumping across India.

Solid waste disposal: The India Scenario

According to the 2011 census, India had 1.21 billion people which represents 17.7% of global population. In 2021, India generated 160,038.9 tons of solid waste per day on an average; 95% of this waste was collected and transferred to disposal sites (Shahab and Anjum, 2022). Over 37% of the nation's urban population lives in its more than 53 metropolitan cities, each with a population of one million or more (MHUA, 2021). About 79,956.3 TPD (50.00%) was processed and treated by all types of waste treatment facilities before disposal, 29,427.2 TPD (18.40%) was disposed of directly in a landfill, and the remaining 50,655.4 TPD (31.70%) was unaccounted (CPCB, 2021). According to Kumar *et al.* (2017), by 2025, trash creation in urban India is expected to increase by approximately four to six times, per capita, reaching 0.7 kilogram per day. CPCB (2018) provides a clear illustration of the

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trends in trash generation and the percentage growth of the most populous metropolitan areas with a population of one million or more. It should be noted that garbage generation in metro areas is increasing at a very high percentage.

Ecological impacts

Open dumps release methane from decomposition of biodegradable waste under anaerobic conditions which causes fires and explosions and is a major contributor to global warming (Singh, 2023). Janani *et al.* (2019) observed that the heaps of waste lying uncovered and untreated in dumping site are extremely dangerous to the environment. In addition, associated odour and leachate issues are also reported from various dumping sites across India (CSE, 2020). Abubakar *et al.* (2022) recorded the environmental sustainability impacts of solid waste management practices in the global south. Uncontrolled waste disposal on the outskirts of towns and cities has resulted in overflowing landfills which are not only difficult to clean up due to the careless dumping process, but they also pose a serious threat to the environment because they pollute ground water and contribute to global warming. Burning garbage produces air pollution through higher emissions of Total Suspended Particulate (TSP) and Particulate Matter (PM) 10, which can occasionally be equated to vehicle emissions (Gupta et al., 1998). The per capita municipal solid waste (MSW) generation for the top 10 most populous Indian cities and their trend over the years denotes that the MSW generation per capita is steadily increasing (Dutta and Jinsart, 2020). Mohan and Joseph (2021) documented the potential hazards due to municipal solid waste open dumping in India. Untreated sewage is the most significant source of water contamination in Pune as per observations of Sawant *et al.* (2023). Meena *et al.* (2023) observed that urban local bodies (ULBs) in India have a big challenge in handling huge quantities of MSW; due to high density of population and insufficient infrastructure.

Public health impacts

Singh *et al.* (2021) recorded a significantly higher incidence of respiratory illness and eye infection among the solid waste exposed group than non-exposed group. People living near solid waste disposal sites have adverse health outcomes like allergy, asthma, skin irritation and other gastro intestinal

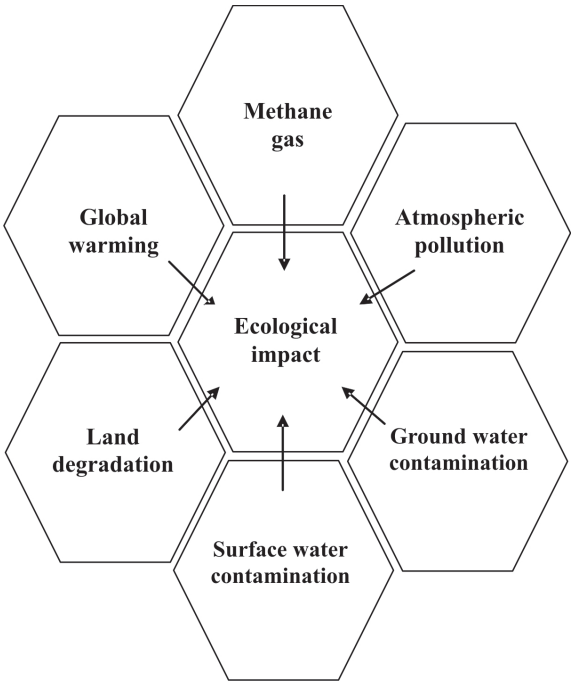

Fig. 1. Ecological impacts of solid waste dumping

diseases (De and Debnath, 2016). The relation between solid waste disposal sites and vector borne diseases like Dengue was well established (Vidyavathy, 2018). The role of plastic debris in waste dumps which encourage arthropod-borne disease by providing a habitat for vectors and shelter to anthropophilic and medically important species, and associated disease burden was well documented (Maquart *et al.*, 2022). Puri *et al.* (2008) evaluated solid-waste management in Jalandhar city and its impact on community health. Observations from Kanpur show that children pose considerable non-carcinogenic health risk, but adults are under non-potential health risk where prolonged exposure has damaging consequences like kidney failure and constipation, etc. (Dixit *et al.*, 2023). In short, the danger of diseases carried by vectors is increased when solid waste is dumped because it provides breeding grounds for disease-carrying insects like flies, mosquitoes and rats. Insufficient waste management techniques foster the growth of pests and pathogens, resulting in the spread of illnesses like cholera, typhoid, dengue fever, and malaria. There are serious health concerns to the public from the development of diseases linked to the dumping of solid waste, especially in areas where residents live close to dumpsites.

Open waste dumping and Climate change

Open waste dumping significantly contributes to climate change through the release of greenhouse gases (GHGs), primarily methane (CH_4) and carbon dioxide (CO_2). Chaudhary *et al.* (2021) observed that underreporting and open burning are the two largest challenges for sustainable waste management in India. The relationship between open waste dumping and climate change are given below,

- **Methane emissions**: Methane is a powerful greenhouse gas that has a 22-times more global warming potential substantially larger than that of CO_2. Significant amounts of methane are released into the environment by open garbage dumping sites, especially by landfills without adequate gas collecting devices. Open trash disposal releases methane emissions into the atmosphere, which intensifies the greenhouse effect and traps heat in the atmosphere to cause global warming. Kaushal and Sharma (2016) documented increased methane emission rates from open dumps in Kanpur. According to Singh (2023) the waste sector contributed about 2.7 per cent to total GHG emissions in India in 2016 alone. The states of Uttar Pradesh, Maharashtra, Gujarat, Andhra Pradesh, Tamil Nadu and West Bengal contribute to 55.5% of the total Waste sector emissions from 2005 to 2018 in India (Mishra *et al.,* 2022).
- **Landfill gas production**: The major anthropogenic sources of methane emissions in the world are landfills, where microbiological activity produces the gas. Methane leaks into the atmosphere and fuels climate change if there are insufficient procedures in place for collecting and managing it. Methane production in landfills is influenced by a number of variables, such as the kind of trash, moisture content, temperature and landfill design and management techniques. The extent of landfill gas recovery and its utilization in India was recorded by Siddiqui and Khan (2011).
- **Contribution to greenhouse gas inventory**: Open waste dumping is a major source of anthropogenic emissions and is included in both national and global greenhouse gas inventories. Open dumping of solid waste is common in India, especially in peri-urban and urban regions with inadequate infrastructure for trash management. The methane released by open waste disposal facilities adds to the overall greenhouse gas emissions of India, intensifying the effects of climate change at both the national and international levels.
- **Climate feedback loops**: The environmental effects of open waste dumping can be made worse by climate change, which can lead to feedback loops that increase greenhouse gas emissions. For instance, the breakdown of organic waste in landfills might occur more quickly due to increased temperatures brought on by climate change, which increases the production of methane. Furthermore, severe weather conditions like flooding and heavy rain can harm landfill infrastructure and release methane that has been stored, increasing greenhouse gas emissions from waste disposal facilities.
- **E-waste and climate change**

E-waste, is electrical and electronic equipment, whole or in part, discarded as waste by consumers (individual or bulk) as well as rejects from manufacturing, refurbishment and repair processes. According to CPCB estimates, India generates 77,1225 tonnes of e-waste generated in 2018-19 alone (Biswas and Singh, 2020). Fawole *et al.* (2023) elaborated the climate change implications of electronic waste and strategies for sustainable management.

Conclusion

In conclusion, the disposal of solid waste in India has a significant negative influence on biodiversity, soil, water, air quality and human health. Comprehensive waste management plans that incorporate recycling, efficient disposal, waste reduction and pollution control are necessary to address these burgeoning issues. In order to protect ecosystems, conserve natural resources and advance sustainable development in India, steps must be taken immediately to lessen the negative effects of solid waste disposal. In spite of initiatives to increase public awareness on environmental preservation and garbage management, many Indian villages and people remain ignorant of appropriate waste disposal techniques. The improper disposal of waste, such as illegal dumping and littering, is facilitated by cultural attitudes about waste and a lack of education and outreach efforts. Reducing methane emissions, promoting sustainable waste management techniques and moving toward a circular economy model that limits waste generation and promotes resource recovery are all necessary to address the climate

change implications of open waste disposal. Furthermore, the complex relationship between climate change and solid waste is highlighted, showing how inappropriate recycling and disposal methods significantly increase India's greenhouse gas emissions with global ramifications.

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