

Landfill Fires and Mitigation

The Kochi landfill site around Brahmapuram, Kerala that recently caught fire is a stark reminder that Indian cities need to be prepared for more such incidents as summer approaches. Landfills are sites where waste materials are deposited, compacted, and covered with soil for long-term storage. These sites are designed to prevent contamination of the surrounding environment by isolating the waste from groundwater, surface water, and air.

Why do Landfills Catch Fire?

Unprocessed Waste:

- It is expected to process the wet and dry waste separately and to have the recovered by-products recycled. But the rate of processing in India's cities is far lower than the rate of waste generation, so unprocessed waste remains in open landfills for long periods.
- India's municipalities have been collecting more than 95% of the waste generated in cities but the efficiency of waste-processing is 30-40% at best.

High Calorific Value:

- The openly disposed waste includes flammable material like low-quality plastics, which have a relatively higher calorific value, and rags and clothes.
- In summer, the biodegradable fraction composts much faster, increasing the temperature of the heap to beyond 70-80° C.
- Indian municipal solid waste consists of about 60% biodegradable material, 25% non-biodegradable material and 15% inert materials, like silt and stone.
- Higher temperature + flammable material = a chance for the landfill to catch fire. Some fires have been known to go on for months.

Hot Weather:

- In hot and dry weather conditions, waste materials can become dry and more flammable, increasing the risk of a fire.

Impact of Landfill Fires:

- **Air Pollution:** When a landfill fire burns, it releases harmful gases and particles into the air, including carbon monoxide, sulfur dioxide, nitrogen oxides, and volatile organic compounds (VOCs). These pollutants can cause respiratory problems, exacerbate asthma and other lung conditions, and contribute to smog and acid rain.
- **Groundwater Contamination:** Landfill fires can release toxic chemicals and heavy metals into the groundwater, which can contaminate nearby water sources and potentially harm aquatic ecosystems.
- **Soil Contamination:** Landfill fires can also release harmful chemicals and heavy metals into the soil, which can harm plant growth and contaminate crops.
- **Economic Impact:** Landfill fires can result in significant cleanup costs for local governments, as well as economic losses for nearby businesses and property owners.

Management of Landfill Fires:

➤ **Permanent Solution:**

Capping and Closing Landfills:

- Completely cap the material using soil and close landfills in a scientific manner.
- This solution is unsuitable in the Indian context as the land can't be used again for other purposes.
- Closed landfills have specific standard operating procedures, including managing the methane emissions.

Bioremediation:

- Clear the piles of waste through Bioremediation.
 - Bioremediation is the use of either naturally occurring or deliberately introduced microorganisms to consume and break down environmental pollutants, in order to clean a polluted site.
- However, implementing a bioremediation project usually takes up to two or three years, necessitating a short-term solution for landfill fires in the summer.

➤ **Immediate Solution:**

- The first immediate action is to divide a site into blocks depending on the nature of the waste.
- At each site, blocks with fresh waste should be separated from blocks with flammable material.
 - Blocks that have been capped using soil are less likely to catch fire, so portions like these should also be separated out.
 - The different blocks should ideally be separated using a drain or soil bund and a layer of soil should cap each block.
 - This reduces the chance of fires spreading across blocks within the same landfill.
- Next, the most vulnerable part of the landfill, the portion with lots of plastics and cloth, should be capped with soil.
 - The fresh waste block shouldn't be capped but enough moisture should be provided by sprinkling water which will help cool the waste heap.
- Once a site has been divided into blocks, the landfill operator should classify incoming waste on arrival to the site and dispose of it in designated blocks rather than dumping mixed fractions.
- Already segregated non-recyclable and non-biodegradable waste should be sent to cement kilns instead of being allowed to accumulate.
 - Dry grass material and dry trees from the site should also be cleared immediately.

Way Forward

- The permanent and essential solution is to ensure cities have a systematic waste-processing system where wet and dry waste are processed separately and their by-products treated accordingly (recycling, soil enrichment, etc.).

- This will need multiple stakeholders, including municipalities and waste-processing unit operators, to cooperate.
- Considering India's summer has already begun, municipalities must implement short-term measures to prevent fire outbreaks while also focusing on long-term solutions to improve solid waste management.

Reference

1. <https://www.drishtias.com/daily-updates/daily-news-analysis/landfill-fires-and-mitigation>