

## Environmental Impacts and Mitigation Strategies of the Current Landfill Site in Gurugram, Haryana

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### Abstract

The term "municipal solid waste" refers to waste that is collected by the municipality and includes construction and demolition debris as well as industrial, commercial, and residential waste. Urbanization and growing living standards have resulted in a rise in the amount and complexity of municipal solid waste. In developing countries like India, open dumpsites are common due to a lack of skilled labor and a limited budget for waste disposal. The definition of dumping is a location utilized to dispose of solid waste without regard to environmental restrictions. The facilities for waste collection and disposal have not received much attention. The current research aims to evaluate the environmental impacts and mitigating strategies of the current landfill site in Gurugram. To collect the necessary data, formal and informal interviews with residents and government representatives, landfill site inspections, and observations were made. Collection of secondary data that includes facts on the landfill site, management and design, and the location's physical, biological, geophysical, and land use characteristics. The handling and management of scavenging or informal waste collection, insufficient collection coverage, inconsistent collection, burning and other challenges all contribute to the status of waste management. Moreover, research and literature relating to municipal solid waste management are lacking in Gurugram. The current study's findings may be useful for waste management authorities and city planners in developing an efficient solid waste management system with all available analyses of pros and cons.



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### Keywords

Degradation;  
Environment;  
Landfill Site;  
Mitigation;  
Solid Waste.

### Introduction


An efficient approach for evaluating the effects of a project's many sectors and activities on environmental components is the evaluation of

environmental impacts.<sup>1</sup> Based on the results of this assessment, solutions are then provided to lessen any adverse consequences. Since the beginning of civilization, environmental pollution has been

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a problem, and because of the unchecked growth of the industrialized world, the threat is only getting worse.<sup>2</sup>

Solid waste is a substance that cannot be effectively used without proper processing. It is leftover waste from a variety of processes that may or may not be useful. The composition of solid waste varies depending on several variables, such as the local climate, socioeconomic status, and family size.<sup>3-5</sup> The generation of Municipal Solid Waste (MSW) is a problem that worries people everywhere. MSW has become more prevalent and more complicated in composition because of urbanization and rising living standards.<sup>6-8</sup>

Due to the conventional way of collecting and disposing of solid wastes, India often sees a significant reduction in environmental conditions.<sup>9-12</sup> In developing countries like India, open dumpsites are common due to a lack of skilled labor and a limited budget for garbage disposal. The definition of dumping is "a location utilized to dispose of solid waste without regard to environmental restrictions."

Urban waste management is now a significant issue in cities.<sup>13-14</sup> The facilities for waste collection and disposal have not received much attention.<sup>15-17</sup> The aim of the ongoing study is to observe environmental effects and mitigation strategies. MCG entrusted the initiative to Eco-green Energy company. The main objective of the study is to evaluate the environmental and socio-economic impacts of the current disposal site in Gurugram and identify mitigation and abatement measures.

**Study Area**

The present dumping site is in Haryana's Gurgaon Tehsil & District near the village of Bandhwari. Faridabad, located 13.7 kilometers to the east, is the closest railway station. The closest airport is IGI Airport, which is 18.10 kilometers away in the NNW direction. The site receives approximately 1800 TPD of solid waste from the Haryana twin cities of Gurugram and Faridabad. Vehicles either owned by the Municipal Corporation or hired on a contract basis, transport mixed waste from various parts of the cities to the landfill site. The latitudes and longitudes are as follows:

Serial No.	Latitude	Longitude	Area
1.	28°24'89"N	77°10'86"E	30.5 Acres
2.	28°24'13"N	77°10'39"E	
3.	28°24'35"N	77°10'83"E	
4.	28°24'72"N	77°10'54"E	

**Database and Methodology**

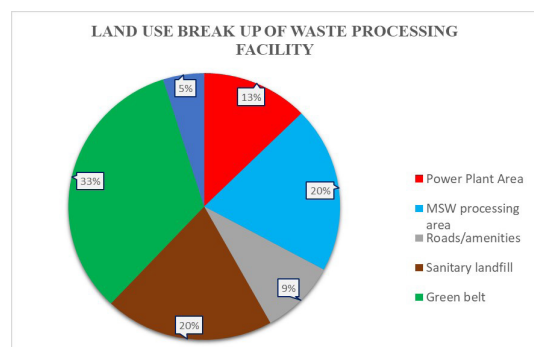
To gather the necessary data, formal and informal interviews with residents and government representatives, landfill site inspections, and observations were made. Collect secondary information about the landfill's location, its management, planning and its physical, ecological, geophysical and land use aspects.

**Result and Discussion**

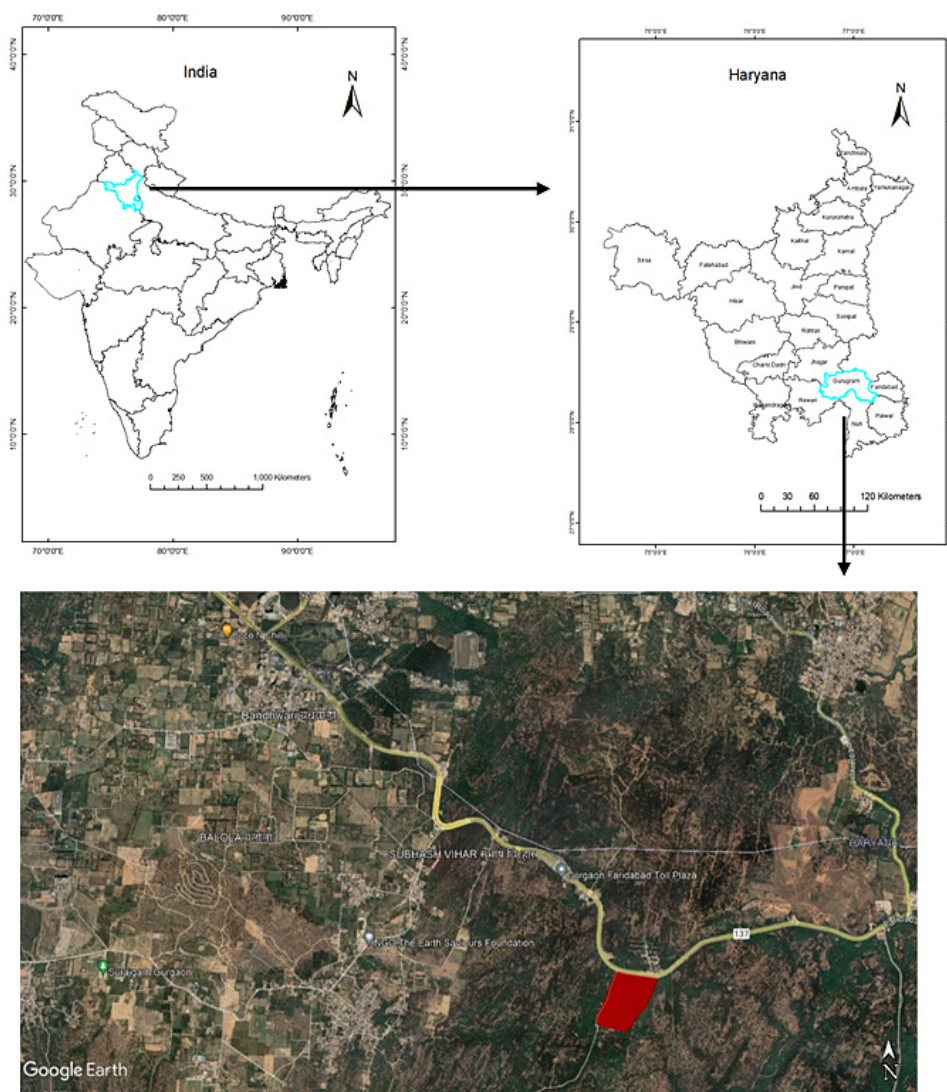
**Land Use Break Up of Processing Facility**

Land use break-up is an important aspect of any waste disposal facility. The facility in Gurugram has acquired a total area of 1,22,510 sq. meters (Fig. 2). Green belt shared an area of 40,500 sq. meters (33 percent). It is an area covered with trees for environmental balance. Each takes up 20% of the total area for the municipal solid waste (MSW)

processing area (24,700 sq. m.) and the sanitary landfill (24680 sq m).



**Fig. 2: Land use break up of waste processing facility**  
 Source: Municipal Corporation Gurugram, 2021



**Fig. 1: Study Area**

#### **Brief on Waste Processing**

- Municipal solid waste is first unloaded into the pit, where it is retained for two days to drain excess leachate.
- After the leachate has been removed, the large-sized RDF (>80mm) is collected for processing via primary segregation.
- The portion of waste that is under 80 mm is made up of a combination of organic and inorganic waste that is kept in bio-drying pits to reduce moisture through digestion.
- Municipal solid waste is piled in trapezoidal-shaped solid waste pits, sprayed with inoculums, and rotated regularly to ensure optimal temperature regulation and aeration.
- Systematic rotating of the material speeds up the breakdown of the organic fraction by mixing the various components and aerating the mixture. Seven days are the retention period for bio-drying and moisture reduction.
- Moisture is diminished, and leachate from the bio-drying process is gathered in the collecting pit for further processing.
- This waste heap is put into the mechanical sorting system's hopper on the seventh day.
- Trommels are used to sort municipal solid waste into light RDF (Refused Derived Fuel)

- and dense compost using two screens. Additionally, hefty inert material is filtered out here.
- RDF material larger than 20 mm is kept on hand as fuel for power plants.
- Compostable material that is 20 mm thick is delivered to the curing area to continue maturing, stabilize, and be refined into the necessary marketable specification.



Picture 1: Garbage mountain at landfill site



Picture 2: Crossing vehicles nearby the landfill site

(04 August-2022)

#### Impact on the Water Environment

There is a potential risk of groundwater contamination throughout the operating period, especially during rainy seasons when surface runoff seeps into the finished and operational landfill cells. The water that is contained in the landfill cells will also gravitationally float downwards and maybe reach the subsurface water table. If managed poorly, sewage generated by workers' domestic activities on the working site might have an impact on groundwater resources. The management plan ensures that the quality of the groundwater is periodically monitored for pollution during the project's operating phase.

#### Mitigation Measures

Leachate should be effectively processed at a Leachate Treatment Plant and used in floor cleaning, construction and vehicle cleaning.

- The leachate from the existing landfill should be collected using a geosynthetic clay liner system. A geotextile is a sheet of woven or nonwoven material that is more resistant to damage from penetration than a geomembrane and impermeable to liquids.
- The landfill should be covered with a final cover system that improves surface drainage, infiltrates water, and encourages surface plants.

- Surface runoff from the landfill site is collected and removed by a surface water drainage pipe.
- A system for monitoring the environment that regularly collects and evaluates samples of the air, surface water, soil gas, and groundwater in the vicinity of the landfill site.

#### Impact on Land Environment

SWM Rules (2016), together with CPCB and MoEF & CC standards, were followed to build the current landfill. The garbage dump has minimal impact on the habitats of surface and groundwater. The liner system keeps leachate out of the groundwater. Leachate generated by the landfill must be collected and used once more to reduce dust in the leachate holding tank. Excess leachate must be carefully handled, for example, in a spray dryer.

#### Mitigation Measures

- All the plant complex's hazardous and solid wastes should be carefully collected, stored, and disposed of.
- In the case of spills, which are entirely contained and decontaminated, the whole dumping site area is fully drained, preventing any pollutants from leaking. As a result, the landfill site's soil quality was unaffected.

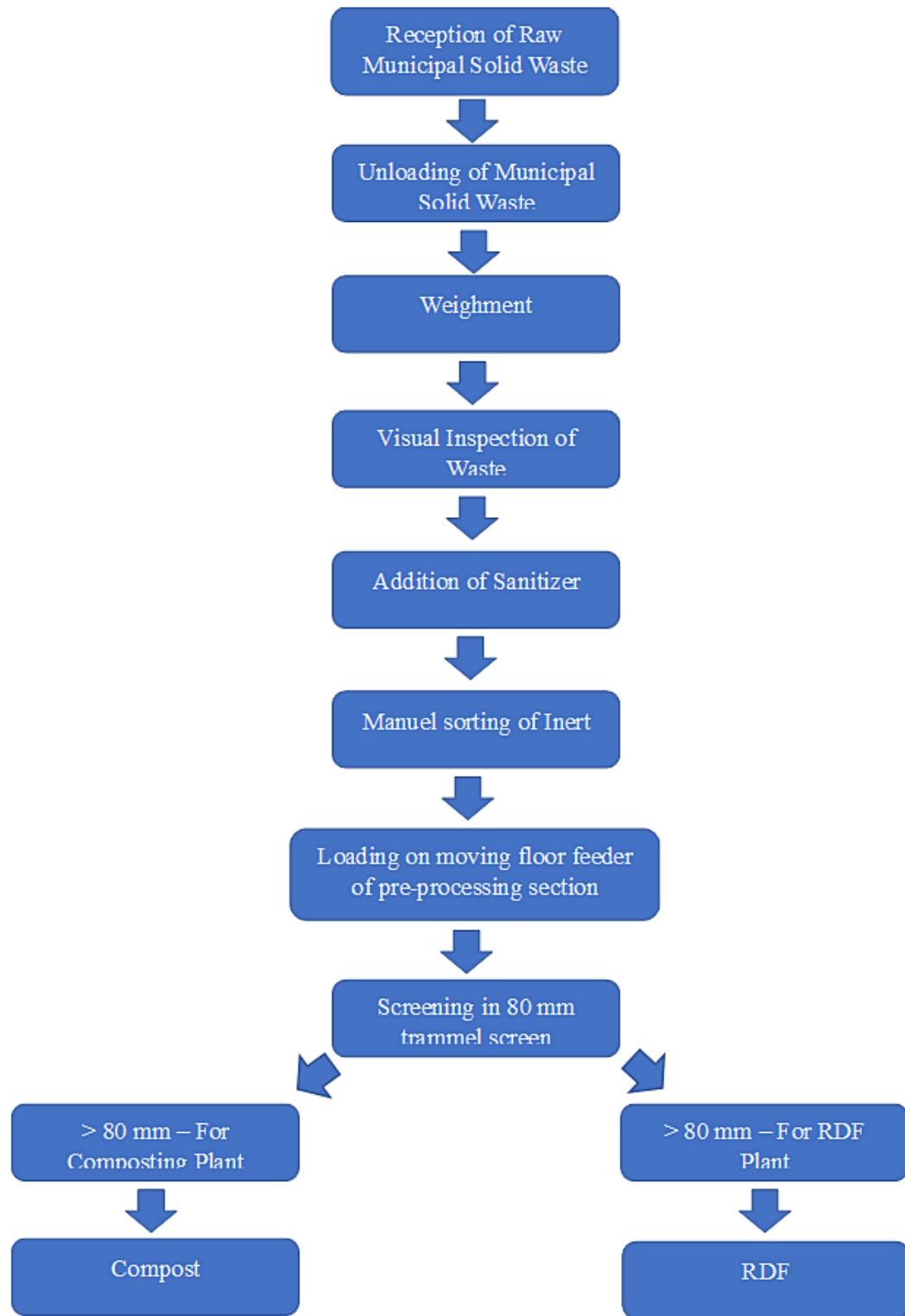


Fig. 3: Waste process flow at the processing facility

### Impact on Air Environment

Moving vehicles and tractors hauling waste to the landfill site are the main producers of fugitive dust during this period. Tractors and garbage trucks that are being unloaded generate suspended particles. Furthermore, fugitive materials are generated when a wheel loader is used to level the deposited solid waste.

Tractors and trucks used to transport waste each day are responsible for the generation of gaseous pollutants. Methane and ammonia are two gases that the sanitary landfill is expected to emit. Methane and carbon dioxide concentrations have been seen for the intended gas collection system, according to the most recent data.

### Mitigation measures

- To avoid dirt spills during travel, tractors and haulage trucks used for rubbish hauling must be completely covered with tarpaulins.
- The CPCB recommends that a thick green belt with climatologically adaptable fast-growing floral species being established around the landfill site.

Water spraying on the primary roads in the site area is one of the key dust-suppression techniques that should be implemented.

### Odor

One of the biggest worries of folks who live near the facility is odor. Taking this into account, the facility is built so that the odor would be kept inside its walls. The odor issue at the dumping site can be solved using herbal insecticides.

### Flue Gas Treatment System (FGCS)

The term FGCS refers to several procedures used for untreated combustion gas to significantly reduce the number of dangerous pollutants that are released into the atmosphere. The following contaminants are removed from flue gas during this cleaning process, which calls for several different resources like water, steam, and chemicals.

1. Removing NO<sub>x</sub>.
2. Pollution from gases is removed.
3. Mercury and the hazardous chemical dioxin are removed.
4. Removal of particles.

Physical and chemical techniques are needed to remove the aforementioned components. In general, particulate matter is removed using physical means, while other substances are eliminated through chemical reactions, adsorption on activated carbon's surface, or through the use of fabric filters.

### Impact of Noise and Vibrations

Compactors, trucks, JCBs, and the use of machinery and DG (Diesel Generator) sets all produce noise and vibration.

### Mitigation Measures

According to OSHA's (Occupational Safety and Health Administration) damage risk standards for hearing, noise exposure for 8 hours per day at a level up to 90 dB is permitted. It should be mentioned in this context that

- The expected noise levels in populated areas should be lower than the CPCB's guidelines for residential zones.
- The continuous presence of employees is not necessary for locations where noise is produced continuously. Therefore, it is not advisable to expose the employees to excessive noise levels consistently.
- Due to occupational concerns, the noise level at important locations warrants attention, and employees must be provided with suitable protection to lessen the impact of noise levels. Job rotation and the availability of earmuffs in noisy settings are two examples of mitigating strategies.
- The landfill location should be surrounded by a plantation.

### Impact on Biological Environment

#### Biota and Habitat Destruction

The negative ecological effects are not always irreversible. To accommodate the noxious 1800 TPD of solid waste, hundreds of trees were cut down. As a result, nearby animals like leopards, nilgais, palm civets, and rhesus macaques suffer badly and occasionally perish in traffic accidents near to the dumping site. While conducting the field survey, some local people stated that their domestic animals falling sick and dying. Some people have been diagnosed with chronic diseases like cancer

asthma and skin diseases, because of the hazardous environmental circumstances.

#### Mitigation Measures

- A green belt should be built around the dump site to reduce noise that travels beyond the facility's perimeter and to offer a habitat for small animals and birds.
- Except for approach/service roads, no additional operations should be scheduled in the green buffer.
- Workers need to be mindful of animals.
- No unlawful hunting or poaching should be permitted at the area.

#### Impact on Socio-Economic Environment

Noise, dust, and odor issues may have an impact on socioeconomics and may also have an effect on community health and safety.

#### Impact on Community Health

Residents that reside close to the dumpsite can notice an increase in traffic, noise, odor, and air pollution. The noise generated by several types of machinery operating, rotating composting pads, and moving vehicles during trash loading and unloading may affect the health of persons nearby.

#### Odor Nuisance

One of the primary issues that the inhabitants in the area of the dump site are worried about is the smell. However, because the facility's architecture was built so that the odor will be kept inside the facility's limits, the consequences due to factory annoyance have been anticipated to be minimal. There is therefore minimal chance of odor.

#### Higher Traffic

The area is seeing localized congestion and disruptions in traffic flow because of the increased traffic.

#### Mitigation Measures

- Implementing good waste handling procedures can significantly lessen offensive smells and their effects.
- The activities should only be carried out during the daytime and should be covered for vehicles/trucks traveling on neighborhood roads.

#### Impact on Workplace Safety and Health

Due to the significant social and economic effects that occupational illnesses and injuries have on people, their families, and their communities, healthy and safe working circumstances are among the most crucial requirements. They also have a negative impact on society's economy because of expenses on medical requirements.

- Injuries caused by careless handling, use, or performance.
- Workplace dangers include loud noises and electric shocks, etc.
- Falling and tripping due to poor fall protection measures.
- Diseases brought on by unsanitary conditions.
- Being exposed to dangerous chemicals, etc.
- Workers occasionally lack the practice of using personal protective equipment, and their refusal to do so may put others in danger.

#### Mitigation Measures

- Workers will be given the PPE (Personal Protective Equipment) they need to utilize on the job.
- During the landfill site's operational period, essential safety precautions should be implemented.

#### Conclusion

- Gurugram is one of the Indian cities that is expanding quickly. The influx of people and the city's quick growth are creating a variety of waste that is endangering the citizens' health and cleanliness. Therefore, effective waste management is crucial.
- A regional sanitary landfill and processing facilities are being built at the landfill site as part of a project for integrated MSWM. The landfill site includes a waste collecting system, a segregation facility, a waste processing unit, and a sanitary landfill. It was designed in line with the SWM standards of 2016.
- The location of the MSW landfill site is in Haryana's Village Bandhwari, Gurugram. Municipal authorities are now managing municipal solid waste, including sorting waste under the Municipal Solid Waste Management Rules 2000 and amendment (2016).

- For the past 20 years, managing solid waste has been a significant concern. However, due to pressures mostly brought on by unrestrained urban expansion, waste management systems are in danger of malfunctioning.
- Most rising nations, particularly India, do not share the same conditions as industrialized nations when it comes to waste management.
- The amount of MSW generated has significantly expanded along with Haryana's population development. The handling of waste and management of scavenging or informal garbage collecting activities, insufficient collection coverage, inconsistent collection services, open dumping, burning, and other challenges all contribute to the

current status of waste management. An essential part of integrated waste management is the long-term disposal of solid waste safely and dependably.

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#### Conflict of Interest

No conflicts of interest are declared by the authors.

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