LANDFILL REMEDIATION AND HOW IT LINKS TO CLIMATE CHANGE

Dr. Richa Singh
Programme Officer, CSE
Dumpsites in India – current status

• **3159 dumpsites** (according to Central Pollution Control Board) – an offshoot of waste mismanagement for decades

• Roughly **15000 ha** of land is under dumpsites (CPCB) – which is approximately equal to **21,000 football grounds**

• **1300 million tonnes** of legacy waste to be remediated

• Estimated cost of remediation **INR 1,04,000 Crore**

• SBM 2.0 (2021-2026) has a total budget outlay of INR **1,40,000 Crore**

• About **74 per cent** of the entire SBM allocation would be needed for remediation of our dumpsites
Dumpsites in India – current status

Okhla:
- Land occupied: 46 acres of land
- 60 metres
- Total volume: 55.6 lakh tonnes

Ghazipur:
- Land occupied – 70 acres
- Height – 65 m
- Total volume – 140 lac tonnes

Kodungaiyur:
- Land occupied – 258 acres
- Height – 91 m
- Total volume: 64 lakh tonnes

Deonar:
- Land occupied – 326 acres
- Height – 37 m
- Total volume: 120 lac tonnes of waste
Primary and secondary collection and transportation

“Mixed waste” Biodegradable (wet waste) & non-biodegradable (dry waste)

Microbial degradation of wet waste causes GHG EMISSIONS

GHG emissions from Dumpsites

1 ton MSW → Landfill without methane capture → 1610 kg CO₂ equivalents → \( \text{CH}_4 \) → \( \text{CO}_2 \)

FIRE HAZARD

RODENTS & PESTS

BIRD MENACE

PRECIPITATION

DUST

LITTER

WASTE DUMP

LEACHATE

SURFACE WATER CONTAMINATION

GROUND WATER CONTAMINATION
Available options for remediation

**Biomining of dumpsite:**
- entire waste is treated
- entire land is reclaimed
- entire waste fractions are used for gainful applications

**Bio-capping of dumpsite:**
- Leachate collection and treatment
- Land is not recovered, no waste fractions utilized

**Hybrid model (biomining and bio-capping)**
- A fraction of waste is treated
- A fraction of land is reclaimed
- A fraction of waste are used for gainful applications
- Rest of the unused waste is bio-capped
Composition of legacy waste

- Indian dumpsite contains a mix of legacy waste (aged waste) and fresh MSW.
- Characteristics and composition are different – which affects the choice of treatment technology and end use of recovered material.
  - Significant proportion of fine soil like material (50 to 60 per cent);
  - Coarser particles such as broken bricks, masonry, stones etc – 20 to 25 per cent
  - The combustible material ranges between 15 to 18 per cent on weight basis.
  - Other miscellaneous fractions comprising broken glass, metallic fractions such as razors, needles, sanitary waste, batteries and diapers might constitute almost 1-2 per cent in the total waste quantum.
What happens to the ‘reclaimed’ material: where can it be used?

<table>
<thead>
<tr>
<th>Components of legacy waste</th>
<th>Tentative quantities (million tonnes)</th>
<th>Potential applications</th>
<th>Environmental and health hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fine soil like materials</td>
<td>780</td>
<td>Can be used as a earth-filling material, road making, substitute of clay in construction industry</td>
<td>Presence of leachable heavy metals, organics</td>
</tr>
<tr>
<td>Coarser inert materials</td>
<td>260</td>
<td>filling of low-lying areas, aggregates in C&amp;D waste processing industry</td>
<td>Presence of leachable heavy metals, organics</td>
</tr>
<tr>
<td>Scrap polymeric combustible materials</td>
<td>234</td>
<td>RDF, road making</td>
<td>Contamination with inert, ash content, sulphur content</td>
</tr>
<tr>
<td>Hazardous material</td>
<td>26</td>
<td>Disposed of in secured landfills</td>
<td>Can lead to many environmental hazards if not disposed of in a sustainable manner</td>
</tr>
</tbody>
</table>
Challenges in Dumpsite remediation by biomining

**Operational**
- Sale of RDFs, tie-ups with nearest cement plants
- High transportation cost, difficulty in sale of inert fraction

**Infrastructural**
- Availability of space,
- Availability of customised equipment and skilled manpower

**Financial**
- Most of the biomining projects are under-budgeted
- The cost burden for transporting the soil and inerts maybe Rs 4000-5000/MT for 10-50 KM, transportation cost may become exponentially higher than the cost for remediation itself.
Successful Case Studies - Indore

Devguradia city forest
Recovered valuable land of 100 acres worth Rs. 400 crores
RDFs was sent to cement plants and also for road making.
Fine fraction (soil-like material) recovered was used for refilling the ground on the same site where greenery is being developed.
The C&D waste was recovered and sent to C&D processing facility to produce building materials.
The left over about 15% of the waste was sent to secured landfill.

No GHG emission from dumping of waste

Before

Biomining in Indore Dumpsite

After

100-acre dumpsite
15 Lakh MT of legacy waste
Total cost: Rs. 10 crore in the entire process

Image credit: Asheshk Singh
Revenue from carbon credits

- For treatment of organic waste – Indore has installed a 550 TPD bio CNG plant
- 1 tonnes waste treatment by bio CNG plant = 23 carbon credits
- 1 carbon credit = USD 0.45
- Total carbon credit earned by treating 550 tonnes/day = 12,650 carbon credits
  
  = INR 9,52,121.23/ day
  = INR 34,75,24,165/annum

PLUS…..

17,000 kg CNG/day is produced

  = 62,05,000 kg CNG/annum
  = INR 34,74,80,000 (considering price of 1 kg CNG = INR 56)
Roadmap to a zero landfill nation

- Maximum utilization of mined fraction without harming the environment
- Reclamation of maximum land and re-use them
- Complete **ban on landfilling of wet waste and combustible waste** is imposed as a legal mandate
- Scientific landfill to be used only for a negligible amount of residual wastes (rejects) should reach the sanitary landfill (about 10-15% of the total quantity)
- **Fresh wastes are not taken to the dumpsites**
Thank you

Let’s build a zero landfill nation for our future generations...