

Managing Legacy Pollution: A Legal and Policy Analysis of the Environment Protection (Management of Contaminated Sites) Rules, 2025

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ABSTRACT

Contamination of soil and water sources from hazardous industrial activities remains a persistent and serious environmental and public health challenge in India. Judicial doctrines such as the polluter-pays principle, the precautionary principle, and the concept of the public trust, along with a patchwork of statutes, have provided tools for pollution control but lacked a statutory, site-specific remediation pathway for legacy contaminated land. The Environment Protection (Management of Contaminated Sites) Rules, 2025, is the first dedicated legal framework for the identification, verification, declaration, and remediation of contaminated sites. This article critically examines the 2025 Rules through legal, doctrinal, and policy perspectives, situates them within the constitutional and statutory framework, and evaluates their provisions against institutional realities and international best practices, such as the US CERCLA/Superfund, EU liability frameworks, and China's soil law. It draws on official disclosure reports from the Central Pollution Control Board and the Ministry of Environment, Forest and Climate Change (MoEFCC 2025), as well as a case study of the Bandhwari landfill in Gurugram. The paper argues that while the 2025 Rules mark a progressive step, they will only lead to transformative outcomes if complemented by a stable national remediation finance mechanism, enhanced technical and institutional capacity, and detailed liability regulations. Recommendations include legal refinements and governance reforms necessary to operationalize the Rules in a manner consistent with India's constitutional environmental commitments.

1. INTRODUCTION

Industrialization and decades of rapid economic growth in India have resulted in significant environmental externalities, among which legacy contaminated sites are underrecognized, long-lasting, and highly damaging. "Contaminated sites" are locations where hazardous substances such as heavy metals, persistent organic pollutants, petroleum hydrocarbons, cyanides, and similar materials have accumulated in soil, sediments, or groundwater beyond safe thresholds, continuing to pose ecological and human health risks (Subudhi et al. 2025).

These are not isolated incidents but persistent, cumulative issues that are often technically complex and costly to remediate (Alapati et al. 2023). Examples include abandoned chemical plants, derelict tannery estates, landfill leachate plumes, and closed industrial sites with decades of unlined waste disposal. Until 2025, while India's environmental laws provided regulators with authority to control emissions and manage hazardous waste moving forward, there were no codified rules or statutes for identifying, declaring, and remediating contaminated sites on a large scale. The Environment Protection (Management of Contaminated Sites) Rules, 2025 (EPMCS Rules), notified by the Ministry of Environment, Forest and Climate Change (MoEFCC) via S.O. 3401(E), established a legal pathway for the screening, verification, declaration, and remediation of contaminated sites.

Table 1: National and programmatic contaminated sites data (India).

Category	Number
Confirmed contaminated sites (verified, CPCB 2025)	103
Sites with remediation started	7
Suspected sites (pending verification)	196
Legacy dumpsites (SBM toolkit 2023)	3,159
Legacy waste treated (till 2023)	1,026 sites
Legacy waste untreated (till 2023)	≈ 177.1 million tonnes

Source: CPCB (2025), Ministry of Housing and Urban Affairs (MoHUA) /CSE Toolkit on Legacy Waste Management (2023).

These rules also mandate public disclosure of verified data on a central portal and empower pollution control authorities to require remedial actions and recover costs. Official disclosures indicate that the Central Pollution Control Board (CPCB) has identified 103 contaminated sites, with remediation activities initiated at 7 of these sites (CPCB 2025).

The formation of a dedicated rule was long overdue due to the scale of the problem. This article explores whether these rules offer sufficient legal clarity and institutional design to effectively translate the polluter-pays doctrine and constitutional rights into meaningful remedial outcomes (Bugge 2009, Lees 2016). It also evaluates whether current governance and financing structures can operationalize these rules to address legacy pollution in India. The analysis is broadly structured around four evaluative parameters: regulatory clarity, enforceability mechanisms, institutional and fiscal feasibility, and accountability mechanisms. Comparative insights are drawn from the United States' Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the European Union's liability regimes, and China's Soil Pollution Law to analyze India's approach within a global context, while recognizing the need for tailored reforms suited to the Indian context.

2. MATERIALS AND METHODS

This study employs a doctrinal approach to review policy and analyze the Environment Protection (Management of Contaminated Sites) Rules, 2025. Primary sources include the Rules themselves, the Environment (Protection) Act, 1986, related statutes, and key judicial precedents from the Supreme Court and the National Green Tribunal that have shaped principles such as the polluter-pays and the precautionary principle. Policy documents and official datasets, notably the CPCB National Inventory of Contaminated Sites (2024–25) and the MoHUA–CSE Toolkit on Legacy Waste (2023), were analyzed to understand the extent of contamination and institutional responses. Additionally, a few RTIs were

filed to gather data on expenditure incurred by various local bodies for garbage remediation.

To contextualize India's framework within a broader perspective, the paper undertakes a comparative review of international regimes, including the U.S. CERCLA/ Superfund, the EU Environmental Liability Directive, and China's Soil Pollution Prevention and Control Law (Caney 2005). The USA and EU were selected for their mature and diverse regulatory approaches to contaminated-site management, while China was included as a comparator due to its status as a rapidly developing economy facing similar legacy-pollution challenges. Case studies such as the Bandhwari landfill were used to integrate legal analysis with empirical evidence. This combined methodology ensures a balanced evaluation of legal texts, governance practices, and comparative insights, while acknowledging limitations due to data gaps and early-stage implementation.

Radioactive waste and mining-related contamination are explicitly excluded from the scope of this research, as the new rules do not pertain to them. They are regulated under specialized statutes, namely the Atomic Energy Act, 1962, and the Mines and Minerals (Development and Regulation) Act, 1957.

3. RESULTS AND DISCUSSION

3.1. Constitutional, Statutory and Judicial Foundations

Environmental law worldwide derives much of its normative authority from constitutional provisions that are progressively interpreted by higher judiciary bodies (Weis 2018). In India, the Constitution also mandates this approach: Article 48A imposes a duty on the State to protect and improve the environment, while Article 51A(g) requires every citizen to safeguard the natural environment. Courts have often read these provisions collectively, emphasizing that environmental protection is not merely a policy goal but a constitutional obligation for India.

At the core of Indian environmental jurisprudence is Article 21, which guarantees the right to life. The Supreme Court has consistently interpreted this right to include a healthy and clean environment. In *Subhash Kumar v. State of Bihar* (1991), the Court explicitly recognized the right to pollution-free air and water as an integral part of the Right to Life under Article 21. Similarly, in the landmark case of *MC Mehta v. Kamal Nath* (1997), the Court applied the public trust doctrine to prevent environmental harm, affirming that natural resources are held in trusteeship by the State for the benefit of its citizens. These rulings reflect global legal developments, where principles such as the polluter-pays principle and the precautionary principle are embedded in

environmental governance (Sands & Peel 2018, Birnie et al. 2021).

The Court further examined this approach in *A.P. Pollution Control Board v. Prof. M.V. Nayudu* (1999), emphasizing the importance of the precautionary principle and asserting that scientific uncertainty cannot justify inaction in the face of environmental threats. This decision also highlighted the need for specialized scientific input in environmental adjudication.

India's main environmental statutes—including the Environment (Protection) Act, 1986 (EPA), the Water Act, 1974, the Air Act, 1981, and the Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016—establish regulatory controls for emissions and hazardous waste management. However, these laws were not designed to effectively address site-specific remediation for legacy pollution.

3.2. Programmatic Responses and the CEPI Framework

Before the adoption of the *Environment Protection (Management of Contaminated Sites) Rules, 2025*, India relied primarily on programmatic responses to address industrial pollution at the cluster level rather than through site-specific remediation laws. The most notable of these instruments is the Comprehensive Environmental Pollution Index (CEPI), developed by the Central Pollution Control Board (CPCB 2009). CEPI provides a composite measure of environmental stress in industrial clusters by aggregating indicators of air, water, and land pollution.

Based on CEPI scores, the CPCB identified several critically polluted industrial clusters, which were then subjected to targeted remedial action plans, including restrictions on new industrial activities and mandated mitigation measures. Industrial areas with aggregated CEPI scores of 70 and above were considered as Critically Polluted Areas (CPAs), whereas CEPI scores between 60 and 70 were considered as Severely Polluted Areas (SPAs), and CEPI scores less than 60 were considered as Other Polluted Areas (OPAs).

Table 2: Comprehensive Environmental Pollution Index (CEPI) framework.

Component	Description	Marks
Component A	Scale of Industrial Activity	20
Component B	Status of Ambient Environmental Quality (Air/Surface Water/Ground Water)	50
Component C	Health Related Statistics	10
Component D	Compliance Status of Industries	20
	Total per Medium (Air, SW, or GW EPI)	100

Calculation of Individual Media Indices: The index for each environmental medium (Air, Surface Water, Ground Water) is calculated separately on a scale of 0–100 using the formula:

$$i_1 \text{ (Air EPI) or } i_2 \text{ (SW EPI) or } i_3 \text{ (GW EPI)} = A + B + C + D \quad \dots(1)$$

Overall CEPI Calculation:

The overall Comprehensive Environmental Pollution Index is then evaluated using the formula:

$$CEPI = i_{\max} + \left[(100 - i_{\max}) \times \frac{i_a}{100} \times \frac{i_b}{100} \right] \quad \dots(2)$$

Where:

- $i_{\max}$ = The maximum value among the three indices (i_1, i_2, i_3).
- i_a, i_b = The indices for the other two environmental media after excluding $i_{\max}$

CEPI served as a useful prioritization tool, but its cluster-level focus created no enforceable obligations for remediating specific contaminated sites, leaving much legacy pollution unaddressed. Its implementation also remains inconsistent, and the last national assessment was conducted in 2018 across 100 clusters, identifying 38 CPAs and 31 SPAs. In this sense, CEPI complemented but did not substitute the legal framework of contaminated site remediation, which only materialized with the 2025 Rules.

3.3. Swachh Bharat Mission and the Legacy Waste Challenge

Alongside CEPI-driven cluster monitoring, the most visible policy initiative addressing waste-related contamination in the last decade was the flagship Swachh Bharat Mission (SBM). In both its Urban (SBM-U) Phase I (2014–19) and Phase II (SBM 2.0, 2021–26), SBM explicitly targeted the remediation of legacy dumpsites through biomining and bioremediation. These dumpsites, essentially uncontrolled municipal landfills that have accumulated waste for decades, are recognized as major sources of leachate contamination, methane emissions, and vector-borne risks (MoHUA 2023).

The scale of the problem is immense. According to the MoHUA toolkit on Legacy Waste Management (2023), India has nearly 3,159 identified dumpsites containing an estimated 250 million tonnes of legacy waste. By March 2023, only 1,026 sites, that is, approximately 33%, had been biomined or remediated, leaving approximately 177.1 million tonnes of untreated waste in situ. In absolute terms, over 2,100 dumpsites remain active. These numbers reveal the structural gap between programmatic ambition and actual execution capacity.

The shortfall was especially stark, given the original deadlines. SBM Phase I had promised 100% dumpsite clearance by October 2019, coinciding with the Mission's fifth anniversary. This deadline was missed, and the task was carried forward into SBM 2.0, with revised timelines stretching into 2023–26. Even under an extended horizon, progress remains fairly uneven. The smaller towns managed partial biomining, but large metropolitan landfills, such as the notorious Ghazipur (Delhi), Deonar (Mumbai), and Bandhwari (Gurugram), continued to accumulate fresh waste even as “remediation” projects lagged (Table 3).

Analyses of implementation point to several capacity and design weaknesses in the program. Many Urban Local Bodies (ULBs) lack technical expertise in biomining, have limited access to heavy equipment, and face challenges in contracting private concessionaires to undertake large-scale clearance. Funding allocations under SBM were tied to annual budgetary cycles and linked more to the construction of sanitation infrastructure than to long-term remediation. The cost of remediation also differed from site to site, showing no uniform approach. These limitations explain why SBM, despite its rhetorical emphasis on a “garbage-free India,” did not produce a systemic pathway for addressing legacy contamination.

In this sense, the SBM represents the programmatic precursor whose shortcomings necessitated a transition to a formal legal framework. While the SBM offered targets, toolkits, and aspirational deadlines, the 2025 Rules provide statutory definitions, enforceable liability, and mandated public disclosure mechanisms.

4. THE ENVIRONMENT PROTECTION (MANAGEMENT OF CONTAMINATED SITES) RULES, 2025

The EPMCS Rules establish a hierarchical governance framework that allocates responsibilities across different government levels and technical agencies. At the top is the Central Remediation Committee, led by the Chairman of the Central Pollution Control Board (CPCB). It includes representatives from key ministries such as Housing and Urban Affairs, Commerce and Industry, Chemicals and Fertilizers, Science and Technology, and Health and Family Welfare. This interministerial composition recognizes the interconnected nature of contamination issues and ensures that remediation initiatives benefit from diverse expertise and perspectives.

At the state level, the Rules require the formation of State Level Committees chaired by the Additional Chief Secretary or Principal Secretary of the Environment Department, with members from relevant departments. This structure facilitates coordination and oversight during implementation, while operational duties primarily fall to the State Pollution Control Boards (SPCBs) and Pollution Control Committees (PCCs). SPCBs are responsible for identifying contaminated sites, conducting assessments, directing responsible parties to develop remediation plans, and overseeing remediation efforts.

Additionally, the Rules propose a centralized online portal for reporting contaminated sites and mandate public disclosure of assessment and remediation activities through a dedicated platform. Liability for remediation primarily rests

Table 3: City-wise legacy waste projects, budgets, and cost efficiency.

City/Location	Project/Brief Description	Budget/Cost [₹]	Total Legacy Waste [tonnes]	Cost per Tonne [₹.t ⁻¹]
Mumbai-Deonar	Scientific clearing contract for Deonar Dumping Ground	₹2,540 crore	~260 lakh t (reported est.)	~₹977/t
Gurugram (Bandhwari)	Bioremediation of Bandhwari landfill	₹89.9 crore	~14 lakh t	~₹642/t
Kochi (Brahmapuram)	Biomining & rehabilitation of legacy waste	₹142 crore (revised)	~5.5 lakh t	~₹2,582/t
Bengaluru (BBMP)	Processing legacy waste (Mandur + other sites)	₹187 crore	~97.8 lakh t (target)	~₹191/t
Delhi-Bhalswa	Biomining & remediation	₹130 crore	~30 lakh t	~₹433/t
Delhi-Okhla	Biomining & remediation	₹82 crore	~20 lakh t	~₹410/t
Chandigarh-Dadu Majra	Legacy waste removal & biomining	₹77 crore	~12.5 lakh t	~₹616/t
Ludhiana (Jamalpur)	Bioremediation + fresh waste mgmt.	~₹70–77 crore	~25 lakh t (est.)	~₹280–308/t
Nagpur	Bioremediation under SBM	₹42.80 crore	~9 lakh t (est.)	~₹475/t
Silchar (Assam)	Remediation + MRF	₹22 crore	~3 lakh t (est.)	~₹733/t
Rewari (Haryana)	Sanitary landfill & remediation	₹4.02 crore	~1 lakh t (est.)	~₹402/t
Bhubaneswar (Odisha)	Legacy waste remediation (SBM toolkit)	n.a. (toolkit cites)	cost reported basis	~₹1,050/t
Varanasi/Medium cities (toolkit avg.)	SBM legacy projects	n.a. (toolkit cites)	n.a.	~₹887–₹1,193/t

with identifiable polluters. For orphan sites where polluters cannot be identified, the Rules allow government-led cleanup efforts, with funding shared between the Central and State Governments and provisions for recovering costs later.

4.1. Key Provisions and Their Practical Implications

The EPMCS Rules, 2025, primarily distinguish themselves through their precise definitional clarity. They specify a “contaminated site” based on contaminant levels in soil, surface water, or groundwater that surpass designated thresholds. The term “contaminant” refers to hazardous substances as outlined in clause (e) of section 2 of the Environment (Protection) Act, 1986 (29 of 1986), exceeding response levels detailed in Schedule I of the rules. The scope explicitly encompasses landfills, dumpsites, and both active and abandoned industrial locations.

Furthermore, these rules clarify that the EPMCS Rules, 2025, do not apply to radioactive waste, certain mining areas, marine pollution, or solid waste from dump sites. This precise definitional framework holds legal significance by identifying a clear remedial scope and tying regulatory triggers to measurable environmental thresholds, thereby minimizing ambiguity in enforcement and aligning with scientific benchmarks.

The process of identifying and verifying contaminated sites involves multiple stages, beginning with district authorities and State Pollution Control Boards (SPCBs) compiling lists of suspected sites, either independently or following public complaints. These lists are then subjected to technical environmental site assessments (ESAs), which employ hydrogeological surveys, toxicity testing, and other scientific protocols established under relevant regulations. Verified data must be uploaded to a central public portal for transparency and independent review by civil society, thereby enhancing accountability—a significant advancement in governance (Ruppel 2023, Sadeleer 2000).

Every six months, a list of contaminated sites is prepared and updated for submission to SPCBs. Subsequently, SPCBs, either directly or through designated reference organizations, are tasked with conducting preliminary site assessments, including sampling and analysis, within 90 days of receiving the list. However, the aggressive timelines for screening and verification may lead to bottlenecks, given that SPCBs often suffer from chronic shortages of staff, technical expertise, and financial resources. Without concurrent investment in institutional capacity building, delays are inevitable. Additionally, since most reference organizations are predominantly based in urban centers and industrial hubs, regional disparities in site identification and remediation efforts are likely to arise.

Once verification is complete, sites are officially designated as “contaminated” in the Gazette if contaminant levels exceed the limits specified in the schedule. This legal designation triggers mandatory remedial actions. The primary responsibility lies with the polluter, in cases with multiple contributors, liability is joint and several. If the polluter cannot be identified, the site is declared orphaned, and the government is empowered to undertake cleanup efforts, with the possibility of recovering costs later. The Rules stipulate that remediation expenses are to be shared by the Central and State Governments through the Environment Relief Fund, established under the Public Liability Insurance Act of 1991 following the Bhopal Gas Tragedy.

Although this framework aligns with some international practices, it does not establish a permanently funded, ring-fenced remediation fund like the United States’ Superfund. Reliance on annual budgets risks delays and persistent underfunding. The Environment Relief Funds are severely underutilized, and the disbursal process is cumbersome. Public records show that the fund has been almost entirely unused in recent years, with no disbursements since 2019, despite the corpus growing to ₹1,062 crore by March 2023 from ₹895 crore at the end of 2020 (CAG 2023).

The remediation process must be implemented through Remedial Action Plans (RAPs), which should detail technical solutions such as remediation or decontamination methods, excavation, and soil washing. These plans are also to include milestones, monitoring parameters, financial resource estimates, post-remediation monitoring, and safety protocols for occupational health, emergency response, and safety. The State Boards are responsible for reviewing and approving the RAPs within three months and forwarding them to the central board.

Upon completing remediation, the state board must inspect the site, compile a report for submission to the Central Board, and coordinate an additional review with a reference organization. Based on these reports, the Central Board may recommend further or supplementary remediation actions.

The Rules promote transparency by establishing a dedicated online portal (Akerboon & Craig 2022). This portal is designed to host verified datasets, RAPs, progress reports, and monitoring results. By addressing the long-standing issue of information asymmetry, the portal can serve as an accountability tool and facilitate civic oversight. However, its true effectiveness will depend on data quality, regular updates, user-friendliness for non-specialists, and the availability of grievance redress mechanisms to prevent the platform from becoming merely symbolic without meaningful impact.

4.2. Timeline of Contaminated Site Management (India, 2025 Rules)

Phase 1 – Identification & Listing

- Local Body/District Administration
 - Identify & list suspected contaminated sites on the centralised portal (ongoing/half-yearly),
 - State Pollution Control Board (SPCB),
 - Undertake preliminary site assessment within 90 days of receiving the list,
 - If contamination exceeds screening level → classify as Probable Contaminated Site.

Phase 2 – Detailed Site Assessment

- SPCB/Reference Organisation
- Conduct a detailed site assessment within 3 months of classification as Probable,
- Publish draft list of contaminated sites within 60 days of assessment for stakeholder comments,
- Publish the final list after considering comments.

Phase 3 – Remediation Planning

- SPCB
 - Identify the Responsible Person (RP) within 90 days of final listing,
 - Responsible Person (if identified),
 - Prepare & submit the remediation plan within 6 months of SPCB's directions.
- SPCB
- Review & approve remediation plan within 3 months of submission,
- Orphan Sites (no RP found),
- SPCB prepares a remediation plan within 6 months of final listing,
- Initiate remediation within 90 days of plan finalisation.

Phase 4 – Execution & Monitoring

- Responsible Person
 - Submit half-yearly progress reports until remediation is complete,

Phase 5 – Verification & Closure

- SPCB
 - Submit the report after completion of remediation,
 - Issue Remediation Completion Order upon the Central Board's recommendation.

5. NATIONAL SCALE, CASE ILLUSTRATIONS, AND INTERNATIONAL COMPARATORS

5.1. National Scale and Official Baselines

The *Environment Protection (Management of Contaminated Sites) Rules, 2025*, were introduced following the compilation of India's inaugural national inventory of chemically contaminated sites. The MoEFCC reports that the CPCB has pinpointed 103 contaminated locations across 21 states, including former pesticide manufacturing facilities, municipal dumpsites, and industrial clusters. Remediation efforts are underway at 7 of these sites. The details of these 7 contaminated sites are as follows:

- i. Mercury contaminated sites at Ganjam, Odisha
- ii. Chromium contaminated sites at Rania, Kanpur Dehat, Uttar Pradesh
- iii. Groundwater contamination at Lohia Nagar & Industrial area, Ghaziabad, Uttar Pradesh, due to untreated industrial effluents by several industries
- iv. Mercury contaminated soil at the premises of M/s Hindustan Unilever Ltd., Kodaikanal, Tamil Nadu
- v. BPCL oil contaminated site at Tondairpet, Chennai, Tamil Nadu
- vi. Groundwater contamination in & around the premises of M/s Godavari Bio-Refineries, Ahmednagar, Maharashtra
- vii. Groundwater contamination at Effluent Channel Project (ECP), Vadodara, Gujarat

The figure of 103 sites reflects locations already confirmed through environmental site assessments (ESAs), while a larger number of suspected sites remain unverified. This highlights the methodological challenges in establishing a comprehensive national baseline, including inconsistent reporting across states, a lack of long-term monitoring data, and limited hydrogeological mapping in both urban and rural areas. Consequently, the national inventory should be regarded as an initial reference point rather than a definitive count. For comparison, China's 2019 Soil Pollution Prevention and Control Law prompted surveys that uncovered over 1.5 million contaminated plots, with roughly 16% of surveyed agricultural land considered unsuitable for cultivation due to heavy metal contamination (PRC 2019)

5.2. International Comparison: Superfund (USA)

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, commonly known as the Superfund program, is one of the most important pieces of environmental legislation in the United States (Vinaules

2024). As of March 2025, the Environmental Protection Agency (EPA) reported about 1,340 active sites on its National Priorities List (USEPA 2025). These sites include both industrial and municipal contamination hotspots, such as abandoned mines and pesticide manufacturing facilities.

The U.S. approach to managing contaminated sites rests on three main institutional pillars. The first is dedicated funding, initially secured through a tax on the petroleum and chemical industries, which established the self-sustaining Superfund Trust. Although this tax expired in the mid-1990s, Congress partially reinstated it in 2021, and it is now supported by federal budget allocations.

The second pillar is federal leadership, with the EPA serving as the primary technical authority. Backed by regional offices, the EPA ensures that risk assessments and remediation efforts follow standardized methodologies across states and projects, helping to reduce delays and inter-agency conflicts.

The third pillar focuses on transparency and public involvement. The EPA makes available site-specific profiles that include contamination data, remedial action plans, progress reports, and long-term monitoring results. This transparency promotes accountability and encourages citizen participation in the remediation process (Richardson 2017, Etemire 2023).

The economic impact of the U.S. contaminated site management system is considerable. Remediating a Superfund site typically costs between USD 20 million and USD 30 million, with more complex sites exceeding USD 100 million (USGAO 2025). In comparison, India's 103 verified contaminated sites represent only the beginning of what is likely to become a much larger and more costly national liability in the future.

5.3. Representative Case - Bandhwari Landfill, Gurugram

The Bandhwari landfill in Gurugram, situated near the Aravalli hills, stands as one of India's primary sources of landfill-related contamination. Nevertheless, it was not included among the seven sites chosen for initial remediation efforts (TOI 2025). Recent enforcement actions and operational data underscore ongoing issues at Bandhwari. In August 2025, the National Green Tribunal ordered a joint inspection by the CPCB and MoEFCC within a week, following reports of unregulated leachate discharges into the Aravallis.

Regarding remediation, the Haryana Government has approved only ₹89.9 crore to address 14 lakh tonnes of legacy waste, indicating significant delays. The current

plan involves transporting approximately 600 metric tons of waste daily, covering just 40–50% of the waste generated daily, to a waste-to-energy plant in Sonipat. Bioremediation efforts at Bandhwari have been postponed until January 2026, with overall clearance pushed back to February 2028. These postponements, despite extensive media coverage and judicial oversight, highlight the severity of the crisis, as the site continues to receive nearly 1,200–1,500 metric tons of fresh waste each day.

Numerous reports from 2024–25 document frequent leachate overflows into forest gullies and neighboring villages adjacent to the landfill (NEERI 2024). Field testing by the state pollution control board revealed levels of biochemical oxygen demand and chemical oxygen demand, along with metals such as zinc, that far exceed permissible limits. These results are consistent with typical landfill leachate signatures, including ammoniacal nitrogen and heavy metals. The site spans roughly 30 acres, comprising a waste plant and landfill complex topped by a 37.2-meter-high waste mound. Civil society petitions have raised concerns about recurrent leachate runoff into nearby lakes, while official affidavits submitted to courts acknowledge that leachate mainly flows into adjacent areas during the monsoon season.

From a governance perspective, Bandhwari serves as a significant case study. Although the 2025 Rules encompass landfills and dumpsites as part of the 'contaminated sites' category, Bandhwari was not among the initial seven sites prioritized for remediation. This discrepancy suggests that early site selection may be influenced more by factors such as project readiness, liability clarity (particularly regarding private parties), administrative capacity, and political prominence rather than actual risk. Consequently, its omission underscores the importance of examining whether the new regime can translate high-profile contamination into meaningful action.

6. CRITICAL ANALYSIS OF LEGAL AND GOVERNANCE GAPS

The Environment Protection (Management of Contaminated Sites) Rules, 2025, transform decades of judicial doctrine into a statutory framework for remediation. They define contaminated sites, outline a staged process for screening, declaration, and remedial action planning, assign primary liability to polluters, and introduce transparency and participation requirements. However, a critical examination—considering scientific realities and institutional capacities—reveals structural weaknesses that could hinder their effectiveness. This section discusses these issues in detail and suggests targeted legal and technical reforms.

6.1. Financing and the Orphan-Site Problem: Lack of A Dedicated Remediation Fund

The Rules explicitly allow government-funded remediation when responsible parties cannot be identified, with provisions for later cost recovery. While well-intentioned, this approach risks funding shortages and a rise in abandoned site declarations. Remediation—especially for engineered containment, leachate treatment, or in situ stabilization of persistent pollutants—requires significant upfront capital and multi-year financing. The government's press note accompanying the Rules confirms that the CPCB has identified only 103 contaminated sites, with remedial work initiated at just seven. This low number highlights a funding gap that hampers timely implementation.

The legacy waste data from the Swachh Bharat Mission (SBM) further illustrates systemic financial challenges. As per the SBM Toolkit (MoHUA / CSE 2023), India has over 3,000 legacy dumpsites (CPCB reports 3,084/3,159 depending on the dataset), with only a few reclaimed so far and much waste remaining in situ. The toolkit identifies disposal gaps and high per-tonne remediation costs borne by Urban Local Bodies, with some projects reporting costs between ₹887 and ₹1,193 per tonne (Table 2). These figures underscore that financing issues extend beyond industrial

6.2. The Contaminant Schedule: Technical Strength, But Narrowness and Update Mechanisms Missing

The Rules mark a technical advance by prescribing numeric screening and response levels for an enumerated list of contaminants in drinking water. This indicates 189 analytes/chemicals with land-use-specific response values. This numerical approach reduces legal ambiguity, as sites can be classified by measured exceedances. However, a schedule-based design contains two interrelated limits.

First, the schedule was finite. Remediation reality increasingly confronts substances of emerging concern and site-specific mixtures whose hazards cannot be fully captured by single-analyte thresholds. Anchoring legal liability and remedial triggers solely on a fixed list risks false negatives, where unlisted but hazardous compounds are dominant contributors to risk. International practice shows that a “living list” mechanism with an expert committee and expedited amendment process is essential to keep screening values current (Selvaraj et al. 2021, Carbon Copy 2025).

The Rules set different values for agricultural, residential, commercial, and industrial land use. However, India does not yet have a central repository of remediation standards or uniform laboratory protocols. This gap can lead to

inconsistent results across states and even conflicting legal conclusions regarding the same contamination. To address this, a national “Remediation Values Library” should be created within the CPCB, supported by uniform NABL lab accreditation, regular proficiency testing, and a fast-track system to add new contaminants within 90 days based on expert advice.

6.3. Exclusions, Boundaries and Selection Opacity: Why High-Visibility Sites May Still Be Omitted

The Rules exclude certain domains, notably radioactive waste (covered by Atomic Energy regulations), mine waste (regulated by mines and minerals law), and specific marine oil pollution, while also incorporating provisos that could re-include borderline sites. In practice, many contaminated locations are hybrid in nature—such as municipal dumpsites receiving industrial hazardous waste, mine-adjacent agricultural land affected by tailings, or brownfields involving multiple regulatory regimes. These boundary ambiguities create jurisdictional conflicts between agencies like MoEFCC/CPCB, state SPCBs, MoEFCC's mining wing, and MoHUA concerning municipal dumpsites, leading to delays in urgent remediation actions. Additionally, initial remediation prioritization seems influenced by administrative data availability, contractual readiness, political importance, and objective risk assessments.

The official inventory lists 103 verified sites, alongside datasets like SBM/CEPI, showing nearly 3,000 legacy dumpsites and critical industrial clusters identified by CEPI, but these sources are not fully aligned. This partial reconciliation explains why a prominent, high-risk landfill such as Bandhwari, widely litigated and publicly visible, was not among the first seven sites chosen for active remediation, despite evident leachate and ecological impacts. Recent NGT rulings and municipal tender timelines have repeatedly delayed Bandhwari's bioremediation, indicating that prioritization considers factors beyond environmental risk alone.

Consequently, the Rules should mandate an explicit, transparent, numerical, and risk-based prioritization matrix for initial site selection. Adopting EU-style risk-tiered prioritization and preventive duties would ensure that limited remediation resources are first allocated to the highest-risk sites. Criteria to consider should include the exposed population, groundwater dependence, contaminant toxicity and mobility, ecosystem sensitivity, evidence completeness, liability clarity, and technical feasibility. This approach would enhance transparency, reduce perceptions of arbitrariness, and strengthen the defensibility of sequencing decisions.

6.4. Capacity Constraints: SPCBs, CPCB and Laboratory Infrastructure

The Rules impose very tight deadlines for preliminary screenings and environmental site assessments (ESAs). However, State Pollution Control Boards (SPCBs) and the Central Pollution Control Board (CPCB) face significant staffing and technical resource shortages. A CPCB report submitted to the National Green Tribunal reveals that more than 50% of the sanctioned positions in these boards and committees remain vacant. Out of 12,016 total posts across 28 SPCBs and eight Pollution Control Committees (PCCs), approximately 6,075 are unfilled, representing about half of the workforce. In several states, vacancy rates are even higher—for instance, Bihar at 84%, Jharkhand at 73%, Andhra Pradesh at 69%, Karnataka at 60%, and Odisha at 58% (CPCB 2025).

Additionally, laboratory infrastructure exhibits significant geographical and technical gaps. While India has nearly 1,197 NABL-accredited testing laboratories across various fields, many SPCBs depend on a limited number of accredited labs, often situated in states with stronger institutional capacities. This leaves rural and less industrialized regions underserved.

To overcome this, the government should –

- (a) establish a “Remediation Corps” under CPCB or MoEFCC, comprising mobile technical teams and regional labs that can be deployed to SPCBs for surge assessments,
- (b) fast-track NABL accreditation processes and mandate external proficiency testing for labs conducting ESAs and,
- (c) allow CPCB to empanel certified private technical agencies under strict quality assurance and rotation rules to supplement public laboratory capacity.

6.5. Liability, Insolvency and Corporate Avoidance

Although the 2025 Rules adopt joint and several liabilities and provide for cost recovery, practical challenges persist within Indian insolvency law. According to the Insolvency and Bankruptcy Code, 2016 (IBC), environmental claims are typically regarded as contingent or unsecured debts, placing them at the bottom of the liquidation “waterfall” outlined in Section 53 of the IBC. Secured creditors, such as banks, are prioritized, often leaving remediation costs unpaid. Furthermore, the moratorium under Section 14 suspends ongoing environmental enforcement during the Corporate Insolvency Resolution Process (CIRP). In the case of *Subhankar Bhowmik v. In the Union of India* (2022), the Supreme Court upheld the classification of environmental decree-holders as “other creditors,” effectively subordinating their claims.

To overcome these obstacles, legislative reforms are necessary. Firstly, environmental claims should be accorded statutory super-priority, ensuring that remediation expenses financed by a proposed National Remediation Fund take precedence over secured creditors in cases of urgent public health risks. Secondly, facilities posing high environmental risks should be required to post securities or bonds for environmental performance that remain in effect throughout insolvency proceedings. Lastly, anti-avoidance provisions should be introduced, presuming that asset transfers made shortly before insolvency are intended to evade liability unless proven otherwise. These reforms would bring India’s liability framework in line with the polluter-pays principle and help prevent remediation debts from being displaced during insolvencies.

6.6. Community Protection, Interim Relief and Compensation Design

Public consultation during the RAP stage represents a valuable procedural improvement. Additionally, it is crucial that where contamination poses an immediate exposure risk—such as contaminated drinking wells or airborne emissions from burning—interim relief measures like alternative water supplies, health camps, or relocations become mandatory and enforceable. The SBM toolkit highlights risks to nearby communities around major dumpsites (Ghazipur, Deonar, and Bandhwari), including methane emissions, open fires, and heavy metal exposure pathways. Consequently, the Rules should mandate immediate exposure mitigation as the default approach at sites with confirmed receptor exposure. Furthermore, baseline and ongoing epidemiological monitoring, along with clearly defined compensation procedures for health damages related to remediation, should be instituted. Courts have previously ordered such precautions in several litigations.

6.7. Land-Transaction Safeguards and Redevelopment Governance

A common tactical issue is the premature redevelopment of contaminated land before remediation is complete, which can shift liability and public costs onto residents and future government actions. Currently, the regulations mandate Gazette notification but lack an automatic, registrable encumbrance on land titles or a municipal permit requirement such as “no change of land use/no building permit until remediation is approved.” Without these tools, remediation efforts lack leverage, while commercial pressures for redevelopment remain strong. Similar to China, proper incentivization of redevelopment can be achieved through tax benefits and adjusted land rate (Fiedler & Pachon 2018, Meng et al. 2012).

7. CONCLUSION

The Environment Protection (Management of Contaminated Sites) Rules, 2025, have finally transformed decades of judicial principles and policy rhetoric into an effective legal framework for addressing India's historic contamination issues. These Rules establish a logically ordered process encompassing identification, verification, declaration, remediation, and monitoring. Additionally, they enhance transparency and public participation through mandated disclosure of records, marking a positive development in governance.

The 2025 Rules also signify a clear shift from the campaign-focused approach of the Swachh Bharat Mission (SBM) to a statutory system dedicated to the challenging, less glamorous task of remediation. While SBM successfully raised awareness and improved sanitation infrastructure, its legacy waste efforts stagnated by 2023, leaving nearly 177 million tonnes of untreated waste at dumpsites and allowing high-profile locations such as Ghazipur, Deonar, and Bandhwari to continue expanding despite multiple deadlines. The new contaminated site regime aims to rectify these shortcomings by precisely defining contaminated sites, enforcing public disclosure, establishing liability, and requiring scientifically-based remedial action plans.

The key challenge is preventing the 2025 Rules from repeating the implementation failures that undermined the SBM's legacy waste agenda. As this paper has shown, the Rules succeed in creating a coherent legal framework by clearly defining contaminated sites, mandating disclosure, and assigning liability, but remain structurally limited by the absence of a dedicated remediation fund, insufficient regulatory capacity, and the lack of harmonized contaminant standards and community safeguards.

Therefore, addressing these gaps is indispensable for successfully solving the legacy waste problem. CERCLA-style up-front funding, EU-style risk-based prioritization, and China's central-technical/local-delivery structure offer focused comparative elements suited to India's federal constraints. The Rules must move from a formally sound regulatory architecture to a practically enforceable remediation regime capable of reclaiming contaminated land and protecting vulnerable populations. In this sense, the Rules function not merely as a legislative milestone but as a test of India's ability to shift from symbolic environmental campaigns to a sustained, science-led system of governance.

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