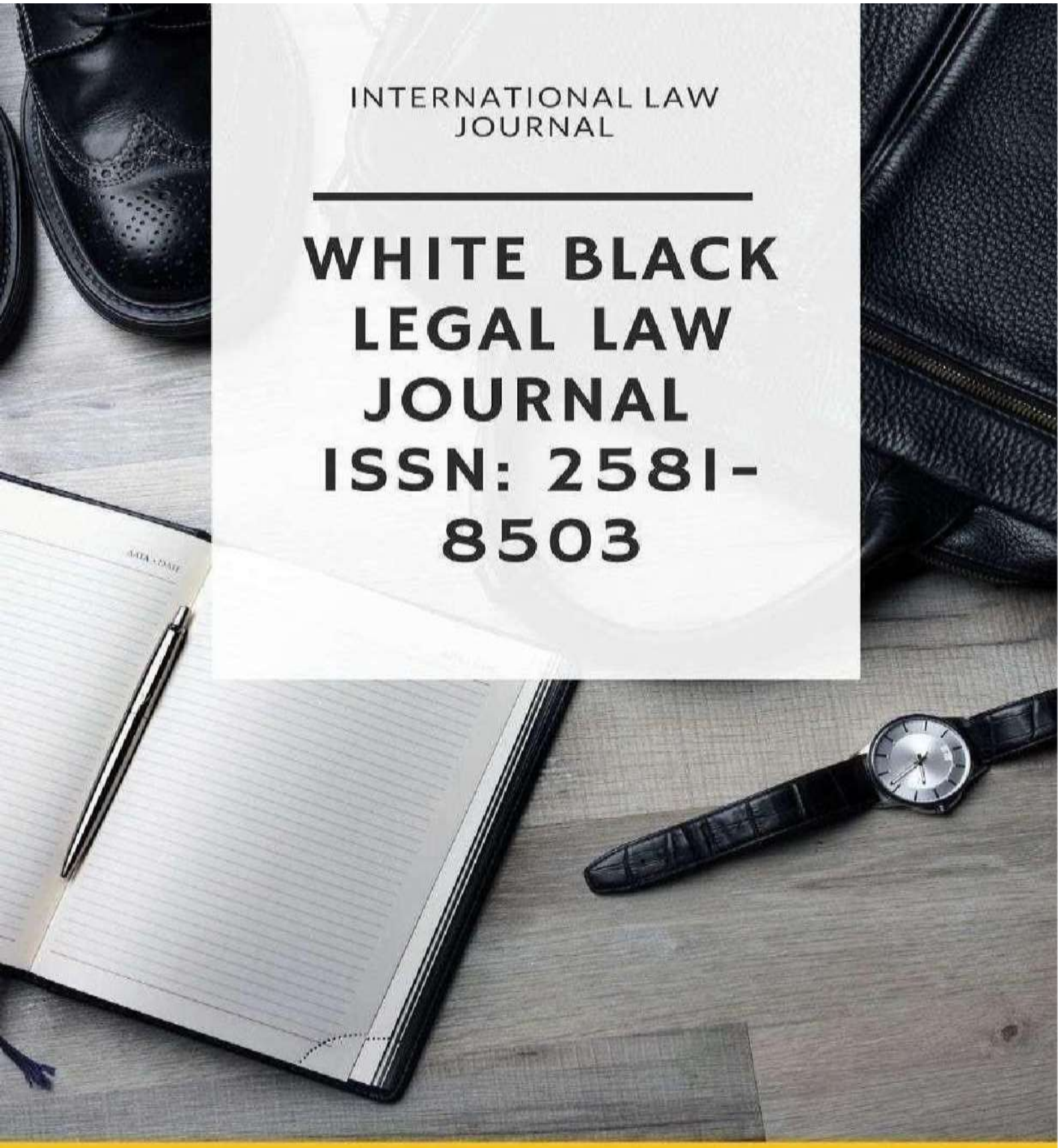

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WHITE BLACK LEGAL is an open access, peer-reviewed and refereed journal provide dedicated to express views on topical legal issues, thereby generating a cross current of ideas on emerging matters. This platform shall also ignite the initiative and desire of young law students to contribute in the field of law. The erudite response of legal luminaries shall be solicited to enable readers to explore challenges that lie before law makers, lawyers and the society at large, in the event of the ever changing social, economic and technological scenario.

With this thought, we hereby present to you

MOUNTAINS OF WASTE, VALLEYS OF NEGLECT: INDIA'S STRUGGLE WITH SUSTAINABLE WASTE MANAGEMENT AND THE ROAD TO SDG 11

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INTRODUCTION

India's rapidly expanding cities and growing prosperity have collided with an alarming deficit in sustainable waste management, leading to grave environmental, social, and public health consequences.[1] Each day, Indian municipalities generate over 170,000 tonnes of solid waste, but more than half of this staggering volume ends up either unprocessed in landfills, burnt in the open, or polluting waterways and soils, contributing to air toxicity, disease, and community distress.[2] The problem is not only visible in the sprawling urban slums or the peaks of legacy dump sites like Delhi's Ghazipur landfill, but also in the mounting plastic debris littering rural roads and the toxic haze that hangs over agricultural districts during crop burning season[3].

Despite improvements in surface-level cleanliness through campaigns like Swachh Bharat Abhiyan, the structural gaps in India's waste management system persist.[4] Failure to ensure systematic waste segregation at source, chronic underfunding of civic infrastructure, and insufficient incorporation of the informal waste-picking sector have resulted in a fundamental mismatch between policy ambitions and ground realities.[5] These deficiencies not only undermine the health and dignity of millions living and working in proximity to unmanaged

[1] Vajiram & Ravi, *Waste Management in India, Facts, Challenges*, Vajiram & Ravi (26 August 2025) https://vajiramandravi.com/current-affairs/waste-management-in-india/.
[2] The Indian Express, *Top 10 Dirtiest City in India 2025: Bengaluru, Chennai*, (31 October 2025) https://indianexpress.com/article/trending/top-10-listing/top-10-dirtiest-city-in-india-2025-10338199/.
[3] Ibid.
[4] India Water Portal, *India Proposes New Rules to Enhance Solid Waste Management*, India Water Portal (20 December 2024) https://www.indiawaterportal.org/governance-and-policy/governance/india-proposes-new-rules-to-enhance-solid-waste-management.
[5] GKToday, *India's Solid Waste Management Challenges and Reforms*, GKToday (25 September 2025) https://www.gktoday.in/indias-solid-waste-management-challenges-and-reforms-2025/.

waste, but also threaten India's progress toward Sustainable Development Goal 11 (SDG 11), which calls for making cities and human settlements "inclusive, safe, resilient and sustainable".[6]

This article investigates the roots and repercussions of India's waste crisis, exploring recent legal interventions, evolving policy frameworks, and the lived human stories behind the statistics—ultimately arguing that genuine sustainability demands systemic, participatory, and humane reform on an urgent national scale.[7]

THE SCALE AND SCOPE OF THE CRISIS

India stands at a critical juncture in its waste management journey. The scale of the country's waste crisis is staggering: with over 170,000 tonnes of solid waste generated each day, India has reached an average per capita waste generation rate of 0.34 to 0.7 kg per person per day, projected to double by 2025 as urban populations continue to grow rapidly.[8] While official estimates claim over 90% waste collection coverage in urban centers, less than 30% of that waste is scientifically processed or recycled[9] The remaining waste finds its way into open dumps, unsafe landfills, or the atmosphere via unregulated burning. Much of the untreated urban waste forms the foundations of enormous "garbage mountains," such as Delhi's Ghazipur landfill—which is now nearly as tall as the Qutub Minar and visible from kilometers away.[10] These hazardous sites not only mar the cityscape in Delhi, Bengaluru, and Ranchi, but also threaten air and water quality, public health, and local ecosystems on an unprecedented scale[11]

Urban and rural realities

In India's urban areas, the waste problem is driven by explosive population growth, rising

[6] EcoSustain Expo, *India's Solid Waste Management Policy and Its Role in Boosting MSW Recycling*, EcoSustain Expo (7 May 2025) https://ecosustainexpo.in/indias-solid-waste-management-policy-and-its-role-in-boosting-msw-recycling/.
[7] Insights on India, *India's Waste Management Crisis*, Insights on India (29 April 2025) https://www.insightsonindia.com/2025/04/30/indias-waste-management-crisis/.
[8] Clean India Journal, *India to Generate 0.7kg Waste Per Person Per Day: by 2025* (26 November 2024) https://cleanindiajournal.com/india-to-generate-0-7kgwaste-per-person-per-day-by-2025-report/.
[9] Vajiram & Ravi, *Waste Management in India, Facts, Challenges* (26 August 2025) https://vajiramandravi.com/current-affairs/waste-management-in-india/.
[10] The Indian Express, *Top 10 Dirtiest City in India 2025: Bengaluru, Chennai* (31 October 2025) https://indianexpress.com/article/trending/top-10-listing/top-10-dirtiest-city-in-india-2025-10338199/.
[11] Scrap Eco, *Waste Management Trends for a Sustainable 2025* (2 March 2025) https://www.scrapeco.in/the-future-of-waste-management-trends-to-watch-in-2025/.

consumerism, and sprawling, often-unplanned urban expansion. Urban India is expected to generate 165 million tonnes of waste annually by 2030, up from 62 million tonnes annually today.[12] This escalation has outpaced the capacity of most civic authorities, resulting in widespread contract failures, inadequate segregation at source, and limited scientific treatment or recycling facilities.[13] Studies show that even cities with nominal "door-to-door" collection often fail to ensure segregation, and a substantial proportion of recyclables are lost to landfills, missing the opportunity for resource recovery.[14] Furthermore, legacy waste—piled over decades at more than 3,000 recognized dump sites—remains largely unaccounted for and untreated, exacerbating the crisis.[15] In metros such as Delhi, out of more than 14,000 tonnes of municipal solid waste generated daily, at least 3,000 tonnes go unprocessed, adding daily to growing landfill sites and breaching environmental safety norms.[16]

In contrast, rural areas face their own array of challenges. Organized waste collection is almost entirely absent in most villages and small towns, leaving households to rely on open dumping, burning, or disposal in local water bodies. This results in visible environmental degradation and increases the risk of vector-borne diseases.[17] Rural waste is often organic-rich but is interspersed with non-biodegradable packaging, plastics, and agricultural chemicals. Crop residue burning becomes a regular feature in several states, leading to annual spikes in air pollution that affect large parts of northern India, worsening lung and cardiovascular health outcomes.[18] Compounding these issues is the lack of infrastructure, public awareness, and systematic recycling networks in India's rural hinterland, further widening the urban-rural waste divide.[19]

[12] Next IAS, *Waste Management in India: Facts, Challenges & Solutions* (11 September 2024) https://www.nextias.com/blog/waste-management-in-india/.
[13] Vajiram & Ravi, *Waste Management in India, Facts, Challenges* (26 August 2025) https://vajiramandravi.com/current-affairs/waste-management-in-india/.
[14] Karikala, *Waste Management in India: Best Practices and Leading Issues* (5 February 2025) https://www.karikala.in/blog/waste-management-in-india/.
[15] NITI Aayog, *Waste-Wise Cities* (December 2021) https://www.niti.gov.in/sites/default/files/2021-12/Waste-Wise-Cities.pdf.
[16] Scrap Eco, *Waste Management Trends for a Sustainable 2025* (2 March 2025) https://www.scrapeco.in/the-future-of-waste-management-trends-to-watch-in-2025/.
[17] Earth5R, *Waste Management in India: Challenges, Innovations, and Solutions* (9 April 2025) https://earth5r.org/waste-management-india-solutions/.
[18] GKToday, *India's Solid Waste Management Challenges and Reforms* (25 September 2025) https://www.gktoday.in/indias-solid-waste-management-challenges-and-reforms-2025/.
[19] IRJMS, R Dubey, *Municipal Solid Waste Management in an Urban Setting in India*, International Research Journal of Management Science (January 2025) https://www.irjms.com/wp-content/uploads/2025/01/Manuscript_IRJMS_02411_WS.pdf.

COMPOSITION OF INDIA'S WASTE

India's municipal solid waste management continues to face enormous challenges as urbanization accelerates. By 2025, the country's daily per capita waste generation is expected to reach 0.7 kg, nearly double the figure from just a decade ago.[20] Despite the existence of the Swachh Bharat Mission and nation-wide rules that mandate segregation, nearly 43 million tonnes out of the 62 million tonnes of waste produced annually are collected, and only about 12 million tonnes are scientifically processed—leaving vast amounts dumped in open sites or subject to burning.[21] As a result, Indian cities are struggling to keep up, with massive landfills expanding at an alarming rate and environmental hazards mounting every year.[22] The problem isn't limited to cities; rural areas contribute substantial organic and plastic waste to this growing crisis, facing persistent gaps in basic waste collection and processing infrastructure.[23] This widening urban-rural differential, combined with changes in the composition and volume of waste, means India must urgently innovate on both policy and practice to achieve genuinely sustainable waste management.[24]

RECENT POLICY FRAMEWORKS & RULES

India's regulatory approach to solid waste management has undergone a significant transformation over the past twenty-five years, moving steadily from reactive, litigation-driven mandates to a robust, legislation-based architecture designed to integrate sustainability, technology, and accountability across every stage of the waste management lifecycle.[25] The journey began in 2000, following landmark Supreme Court interventions that made it imperative for the central government to regulate and standardize municipal waste management throughout India. This judicial activism led to the first comprehensive Municipal Solid Waste (MSW) (Management and Handling) Rules, 2000, which mandated systematic collection, segregation, transportation, and disposal of waste by urban local bodies.[26]

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[20] Clean India Journal, *India to Generate 0.7kg Waste Per Person Per Day: by 2025* (26 November 2024) https://cleanindiajournal.com/india-to-generate-0-7kgwaste-per-person-per-day-by-2025-report/.
[21] Vajiram & Ravi, *Waste Management in India, Facts, Challenges* (26 August 2025) https://vajiramandravi.com/current-affairs/waste-management-in-india/.
[22] Scrap Eco, *Waste Management Trends for a Sustainable 2025* (2 March 2025) https://www.scrapeco.in/the-future-of-waste-management-trends-to-watch-in-2025/.
[23] Drishti IAS, *India's Waste Management Challenge* (30 April 2025) https://www.drishtiias.com/daily-updates/daily-news-analysis/india-s-waste-management-challenge.
[24] Ibid.
[25] ExamGuru, *Draft 2025 Solid Waste Management* (25 September 2025) https://examguru.co.in/current-affairs/article/draft-2025-solid-waste-management.
[26] Vision IAS, *Draft Solid Waste Management Rules, 2024* (21 January 2025) https://visionias.in/current-affairs/monthly-magazine/2025-01-22/environment/draft-solid-waste-management-rules-2024.

Recognizing the rapidly evolving nature and scale of the country's waste problem, the Ministry of Environment, Forest, and Climate Change (MoEFCC) introduced the Solid Waste Management Rules, 2016—an ambitious update that replaced the earlier framework.[27] The 2016 Rules were transformative: they made source segregation by generators compulsory, extended the compliance net to special economic zones, industrial clusters, and rural areas, and laid out obligations for institutional and commercial establishments, construction and demolition (C&D) sites, and bulk waste generators such as hotels, market associations, and residential complexes.[28] Importantly, the rules introduced the "polluter pays" principle, requiring the imposition of environmental compensation on violators, and recognized the role of the informal waste sector and ragpickers.[29]

The policy landscape has continued to evolve with the introduction of draft Solid Waste Management Rules in 2024 and further updates proposed for 2025. The Draft SWM Rules, 2024, signify a paradigm shift, incorporating feedback from states, municipalities, civil society, and experts through platforms such as the Centre for Science and Environment (CSE) and SWaCH.[30] The 2024 draft introduces four-way mandatory segregation at source (wet, dry, domestic hazardous, and sanitary waste), and mandates that bulk waste generators process and treat waste on-site. The applicability of these rules is expanded to cover rural Gram Panchayats and informal sector contributors, recognizing the rural-urban continuum and addressing gaps in earlier frameworks.[31] With the inclusion of agricultural waste management and restrictions on open burning, the focus has shifted toward lifecycle-based solutions and circular economy strategies that incentivize waste minimization and resource recovery.[32]

The Draft SWM Rules, 2024, also emphasize the integration of technology by introducing digital monitoring mechanisms and real-time compliance reporting. Municipalities and institutions are required to adopt digital registers for waste tracking, enabling transparent

[27] Lawrbit, *Solid Waste Management Rules 2024 & Circular Economy Guide* (14 May 2025) https://www.lawrbit.com/article/draft-solid-waste-management-rules-2024/.
[28] Times of India, *Centre proposes new rules to manage solid waste across the country* (14 December 2024) https://timesofindia.indiatimes.com/india/centre-proposes-new-rules-to-manage-solid-waste-across-the-country-with-effect-from-october-1-next-year/articleshow/116343031.cms.
[29] IAS Gyan, *Solid Waste Management Rules 2024: Key Features & Benefits* (31 December 2024) https://www.iasgyan.in/daily-current-affairs/solid-waste-management-rules-2024.
[30] Centre for Science and Environment, *Draft Solid Waste Management Rules 2024* (13 January 2025) https://www.cseindia.org/draft-solid-waste-management-rules-2024-12572.
[31] Lawrbit, *Solid Waste Management Rules 2024 & Circular Economy Guide* (14 May 2025) https://www.lawrbit.com/article/draft-solid-waste-management-rules-2024/.
[32] Ibid.

enforcement and stronger data-driven planning.[33] Enhanced penalty provisions and regular third-party audits further strengthen the compliance mechanism, while environmental compensation is calibrated to better deter errant stakeholders.

The year of 2025 is also witnessing the introduction of dedicated Construction and Demolition (C&D) Waste Management Rules, and targeted amendments to the Battery Waste and Plastic Waste Management Rules.[34] For example, the C&D rules now require extended producer responsibility (EPR) for construction firms, with mandatory digital tracking, infrastructure certification, and minimal recycled content requirements in building materials[35] The amendments to the Battery Waste Management Rules, 2025, focus on digital labeling and traceability, easing compliance through QR codes while tightening environmental norms.[36] Similarly, the amended Plastic Waste Management Rules (2025) specify a phased ban on certain single-use plastics, a compulsory minimum recycled-content mandate, and digital documentation of plastic waste flows.[37]

Collectively, these legislative efforts reflect India's growing commitment to transform its waste management regime into a transparent, participatory, and circular system that aligns not just with national ambitions but also with Sustainable Development Goals (SDGs), particularly SDG 11, 12, and 13. The new frameworks aim to build a future where waste is seen as a resource—one managed through a partnership between citizens, the private sector, and government, deeply supported by robust laws and digital innovation.

JUDICIAL OVERSIGHT: LANDMARK JUDGEMENTS

Judicial intervention has played a pivotal role in shaping the landscape of waste management law and enforcement in India, setting important legal precedents and compelling government agencies to act decisively in the public interest. The Supreme Court's 2025 directive in the iconic MC Mehta case stands out as a turning point in the nation's ongoing battle against urban

[33] Ibid.
[34] Lawrbit, *Construction & Demolition Waste Management Rules, (2025)* (2 July 2025) https://www.lawrbit.com/article/construction-demolition-waste-management-rules-2025/.
[35] Ibid.
[36] Indian Chemical Regulation, *India Publishes Battery Waste Management Amendment Rules 2025* (15 April 2025) https://indianchemicalregulation.com/india-publishes-battery-waste-management-amendment-rules-2025-key-updates-and-compliance-requirements/.
[37] ReCircle, *2025 Amendments in India's Plastic Waste Management Rules: Transparency & Traceability* (28 October 2025) https://recircle.in/understanding-the-2025-amendments-in-indias-plastic-waste-management-rules-transparency-traceability/.

waste mismanagement. Sparked by yet another bout of hazardous air quality and devastating landfill fires in Delhi, the Court drew directly on Article 21 of the Constitution (the right to life, interpreted to include a clean environment) and invoked the foundational "polluter pays" and "precautionary principles," both of which have become pillars of India's environmental jurisprudence.[38]

On 26 April 2025, the Supreme Court ordered all municipal corporations in the National Capital Region (NCR) to achieve 100% waste segregation at source and ensure scientific disposal by December 31, 2025. The order emphasized that the entire NCR—including Delhi, parts of Haryana, Rajasthan, and Uttar Pradesh—must install decentralized processing units in every district, making segregation and scientific processing a non-negotiable standard.[39] Non-compliance invites hefty penalties: ₹5,000 for individuals and up to ₹1 lakh for bulk waste generators. To ensure rigorous follow-through and accountability, the court established a monitoring committee led by a retired High Court judge, charged with conducting monthly progress reviews and reporting directly to the bench.[40]

Significantly, the Supreme Court's directive recognized the crucial contributions of informal waste pickers, mandating their integration into formal municipal waste management as a means to boost segregation and recycling rates while ensuring social justice for marginalized workers.[41] The decision explicitly linked the right to a clean environment to the preservation of human life, referencing the Court's own milestone verdicts—Subhash Kumar v. State of Bihar (1991), which set the precedent that Article 21 protects the right to a clean environment, and Vellore Citizens' Welfare Forum v. Union of India (1996), which introduced the Polluter Pays and Precautionary Principles into Indian law.[42]

[38] Doon Law Mentor, *MC Mehta Case: Supreme Court Orders 100% Waste Management in Delhi NCR* (28 April 2025) https://doonlawmentor.com/mc-mehta-case-supreme-court-orders-100-waste-management-in-delhi-ncr-2025/.
[39] LawBeat, *Important Environmental Law Orders and Judgments Passed in 2024* (16 January 2025) https://www.barandbench.com/columns/important-environmental-law-orders-and-judgments-passed-in-2024.
[40] LawBeat, *SC Directs NCR States to Appoint Senior Nodal Officers for 100% Waste Segregation Compliance* (23 April 2025) https://lawbeat.in/top-stories/sc-directs-ncr-states-appoint-senior-nodal-officers-100-waste-segregation-compliance.
[41] Doon Law Mentor, *MC Mehta Case: Supreme Court Orders 100% Waste Management in Delhi NCR* (28 April 2025) https://doonlawmentor.com/mc-mehta-case-supreme-court-orders-100-waste-management-in-delhi-ncr-2025/.
[42] Supreme Court Observer, *Subhash Kumar v. State of Bihar* (1991) https://www.scobserver.in/journal/delhi-pollution-crisis-will-initiate-contempt-against-delhi-govt-if-solid-waste-management-data-not-given-warns-sc/.

Beyond the Supreme Court, the National Green Tribunal (NGT) continues its activist role, often acting as an environmental sentinel where local authorities falter. In October 2025, the NGT ordered the closure of a notorious dhalao (garbage dump) near AIIMS, Delhi, after determining it posed grave health and environmental hazards to the densely populated hospital zone.[43] The Tribunal's bench, citing reports from the Delhi Pollution Control Committee and the Central Pollution Control Board, found overwhelming evidence of non-compliance—spillage, foul odour, lack of segregation, and unsafe manual sorting by ragpickers. NGT's order gave the Municipal Corporation of Delhi just six months to close the dump and threatened future officials with personal accountability for non-compliance, a striking signal to other cities facing similar problems.[44]

These directives are not issued in isolation. The judiciary has repeatedly admonished state authorities for bureaucratic complacency and threatened contempt proceedings for incomplete or inaccurate compliance reporting, expressing mounting impatience with excuses for inertia and delays.[45] Together, these decisions establish that environmental rights are not abstract ideals—they must be enforced daily, and the courts will ensure laws are not only made but meaningfully implemented across India.[46]

IMPLEMENTATION GAPS: GROUND REALITIES

Despite India's progressive policy frameworks, ground-level implementation of solid waste management remains critically deficient, as evidenced in numerous recent research studies and peer-reviewed analyses. As of 2025, though collection coverage in urban India exceeds 90%, only around 54% of waste is actually subjected to scientific treatment, while roughly 22% remains unaccounted for due to inefficiencies and leakages in supply chains. These "missing" waste streams typically end up in open landfills, public spaces, or are burned—creating significant risks to human health, groundwater, and air quality.[47]

[43] LawBeat, *NGT Orders Closure of Garbage Dump Near AIIMS Delhi for Violating Waste Management Norms* (26 October 2025) https://lawbeat.in/news-updates/ngt-orders-closure-of-garbage-dump-near-aiims-delhi-for-violating-waste-management-norms-1536101.

[44] NewsDrum, *NGT Directs MCD to Close Dhalao Near AIIMS* (27 October 2025) https://www.newsdrum.in/national/ngt-directs-mcd-to-close-dhalao-near-aiims-10598214.

[45] Supreme Court Observer, *Delhi Pollution Crisis: Will Initiate Contempt Against Delhi Govt if Solid Waste Management Data Not Given, Warns SC* (16 December 2024) https://www.scobserver.in/journal/delhi-pollution-crisis-will-initiate-contempt-against-delhi-govt-if-solid-waste-management-data-not-given-warns-sc/.

[46] Narayana IAS Academy, *Waste Management Issue in India* (30 April 2025) https://navigator.narayanaiasacademy.com/current-affairs/2025-04-30/waste-management-issue-in-india.

[47] Earth5R, *Waste Management in India: Challenges, Innovations, and Solutions* (2025) https://earth5r.org/waste-management-india-solutions/.

Research by the Council on Energy, Environment and Water (CEEW) and others highlights that persistent infrastructure gaps are a core reason for this disconnect. Even India's million-plus cities, which collectively generate almost half of all urban waste, struggle with inadequate and under-maintained material recovery facilities, limited transfer stations, and fragmented waste transport logistics.[48] Cities like Prayagraj, for instance, demonstrate that while door-to-door collection has improved, the lack of decentralized processing units and efficient segregation at source means mixed waste continues to be dumped in landfills, missing the opportunity for resource recovery and recycling.[49]

Another major implementation gap stems from unreliable data and reporting. Comprehensive waste audits are infrequently conducted, and what is reported to central agencies often overstates the level of waste actually treated or recycled.[50] This leads to "inflated" compliance claims and undermines evidence-based planning, resource allocation, and investment in new facilities.[51]

Societal engagement remains another weak link. While some urban studies find high self-reported rates of household segregation, closer investigation reveals that sanitary waste and plastics are often mixed with compostables, especially in socio-economically vulnerable groups.[52] Public awareness campaigns, though frequent, struggle against longstanding habits, socioeconomic disparities, and limited enforcement—resulting in less than 65% of urban households practicing sanitary disposal, and far lower rates for true three-way segregation (wet, dry, hazardous plastic).[53]

For India's vast rural population, the situation is even more stark. Rural and peri-urban areas

[48] A Hamdan et al., "Assessing municipal solid waste in Indian smart cities," *Heliyon*, 11(7): e1151, (2025) https://www.sciencedirect.com/science/article/pii/S240584402501151X.
[49] R Dubey, "Municipal Solid Waste Management in an Urban Setting in Prayagraj City, India," *International Research Journal of Management Science* (2025) https://www.irjms.com/wp-content/uploads/2025/01/Manuscript_IRJMS_02411_WS.pdf.
[50] A Hamdan et al., "Assessing municipal solid waste in Indian smart cities," *Heliyon*, 11(7): e1151, (2025) https://www.sciencedirect.com/science/article/pii/S240584402501151X
[51] VRS Cheela et al., "Pathways to sustainable waste management in Indian smart cities: A review," *Sustainable Cities and Society* 68: 102786 (2021) https://www.sciencedirect.com/science/article/pii/S2226585621000364.
[52] Abhiharshan SB, Samudyatha UC, "Practices and Determinants of Household Solid Waste Management: A Cross-Sectional Study in Urban Karnataka, South India," *Natl J Community Med* 16(7): 319-326 (2025) https://www.njcmindia.com/index.php/file/article/view/5576.
[53] NITI Aayog, "Promoting Behaviour Change for Strengthening Waste Segregation at Source: Policy Guidelines" (2022) https://www.niti.gov.in/sites/default/files/2021-12/PromotingBehaviourChange-forStrengtheningWasteSegregation-at-Source-PolicyGuidelines.pdf.

are routinely excluded from organized municipal waste management systems, lacking even basic curbside collection. Instead, open dumping and waste burning during "burning season" remain routine, releasing dangerous pollutants and contributing to annual spikes in respiratory illness, especially in northern states.[54] Weak rural governance, limited budgets, and a lack of technical support impede the deployment of sustainable solutions on the village level, further exacerbating rural-urban disparities and undermining India's environmental and public health goals.[55]

In sum, closing the gap between strong national policy and on-ground reality demands integrated innovation—investment in decentralized processing, robust infrastructure, reliable data management, and context-specific public engagement strategies supported by local governance and behavioral science.

SDG 11: SUSTAINABLE CITIES AND COMMUNITIES PERSPECTIVE

Achieving Sustainable Development Goal 11 (SDG 11)—which calls for inclusive, safe, resilient, and sustainable cities—is fundamentally dependent on India's ability to reform its waste management systems.[56] SDG Indicator 11.6.1 measures the proportion of urban solid waste regularly collected and appropriately disposed, yet most Indian cities continue to fall short of this universal coverage milestone[57] Recent research by the Council on Energy, Environment and Water (CEEW) shows that while cities like Indore and Surat have made notable progress in systematic waste management and decentralized treatment, the majority of urban India still relies on outdated collection, dumping, and informal disposal practices.[58] This non-compliance not only fails SDG monitoring requirements but also has direct health impacts: overflowing landfills release hazardous leachate, contaminate soil and water, and create breeding grounds for vectors like flies and rodents, which contribute to spikes in disease and

[54] Clean India Journal, *India to Generate 0.7kg Waste Per Person Per Day: by 2025* (2024) https://cleanindiajournal.com/india-to-generate-0-7kgwaste-per-person-per-day-by-2025-report/.
[55] Earth5R, *Waste Management in India: Challenges, Innovations, and Solutions* (2025) https://earth5r.org/waste-management-india-solutions/.
[56] United Nations India, *SDG 11: Sustainable Cities and Communities—Progress Report, 2025* https://india.un.org/en/sdgs/11.
[57] CEEW (Council on Energy, Environment, and Water), *Tailoring Solid Waste Management in India: Learnings from Cities with a Million-plus Population* (2022) https://www.ceew.in/sites/default/files/CEEW-Tailoring-Waste-Management-web-file.pdf.
[58] A Hamdan et al., "Assessing municipal solid waste in Indian smart cities," *Heliyon*, 11(7): e1151, (2025) https://www.sciencedirect.com/science/article/pii/S240584402501151X.

public health emergencies.[59]

The challenge is intensified by India's rapid urbanization and changing waste streams. Peer-reviewed studies demonstrate that unmanaged urban waste, especially plastics and electronic waste, increases the risk of heavy metal and persistent organic pollutant contamination—undermining urban livability and disproportionately affecting informal and low-income settlements.[60] These risks are magnified as cities edge into peri-urban and rural areas, where landfill expansion encroaches on agricultural land and water resources.[61]

From an economic and sustainability perspective, robust waste management underpins resource efficiency and supports circular economy models. Evidence from million-plus cities shows that investment in material recovery facilities, composting programs, and plastic recycling can divert up to 45% of waste from landfills, simultaneously creating formal sector jobs and supplying renewable feedstocks for local industries.[62] Such initiatives, if scaled nationally, could reduce reliance on virgin resource extraction and curb associated emissions—contributing both to SDG 11 and SDG 12 on responsible consumption and production.[63]

Yet social inclusion remains pivotal. SDG 11 emphasizes public participation in urban governance, and scholars argue that empowering women, informal sector waste pickers, and local community groups to co-design waste solutions leads to higher segregation rates, more innovative reuse programs, and greater resilience in local systems.[64] This "inclusive governance" approach not only advances sustainability, but also promotes social equity and

[59] S Gautam et al., "Sustainable Management of Landfill Sites in India: Addressing Environmental, Health, and Socioeconomic Challenges," *Current World Environment*, 19(1): 19-32 (2024) https://cwejournal.org/vol1no1/psustainable-management-of-landfill-sites-in-india-addressing-environmental-health-and-socioeconomic-challengesp.

[60] J Singh et al., "Plastic Waste Management in India: Challenges and Opportunities," *Resources, Conservation and Recycling*, 188: 106553 (2022) https://www.sciencedirect.com/science/article/pii/S0921344922003311.

[61] R Dubey, "Municipal Solid Waste Management in an Urban Setting in Prayagraj City, India," *International Research Journal of Management Science* (2025) https://www.irjms.com/wp-content/uploads/2025/01/Manuscript_IRJMS_02411_WS.pdf.

[62] Earth5R, *Waste Management in India: Challenges, Innovations, and Solutions* (2025) https://earth5r.org/waste-management-india-solutions/.

[63] MOHUA, *Circular Economy in Municipal Solid and Liquid Waste Management* (2025) https://mohua.gov.in/pdf/627b825fd31b3Circular-Economy-in-waste-management-FINAL.pdf

[64] NITI Aayog, "Promoting Behaviour Change for Strengthening Waste Segregation at Source: Policy Guidelines" (2022) https://www.niti.gov.in/sites/default/files/2021-12/PromotingBehaviourChange-forStrengtheningWasteSegregation-at-Source-PolicyGuidelines.pdf.

livelihood security—integral to building truly sustainable cities and communities in India.[65]

HUMAN STORIES: LIVING AMONG WASTE

Living among India's waste is more than an environmental crisis; it is a profoundly human story marked by resilience, exclusion, and often invisible labor. For an estimated 1.5 to 4 million informal waste pickers—many from marginalized castes and minority communities—life on the fringes of India's "garbage mountains" is fraught with daily risks but also with a deep sense of agency and contribution.[66] These workers, who recover and segregate recyclables, provide up to 20% of urban waste management's total value and are estimated to save municipal corporations millions in landfill and transport cos.[67] However, research continually documents systemic hazards: waste pickers commonly face respiratory diseases, infections, injuries from sharp objects, and heat stress that can push worksite temperatures above 65°C during peak summer.[68]

Fieldwork in Ghaziabad and Delhi's landfill settlements shows alarming rates of bronchitis, asthma, and skin disorders among children and adults living within two kilometers of dumping sites.[69] Leachate and contaminated groundwater, often carrying nitrates, fecal coliforms, and heavy metals, are common near such settlements, leading to seasonal spikes in typhoid, "blue baby syndrome," and even cancers.[70] For many, the labor is generational: women and children often participate in sorting and collection, their schooling and health compromised by economic necessity and social stigma.

Against this backdrop, inspiring models of dignity and leadership are emerging. In Ambikapur,

[65] Abhiharshan SB, Samudyatha UC, "Practices and Determinants of Household Solid Waste Management: A Cross-Sectional Study in Urban Karnataka, South India," *Natl J Community Med* 16(7): 319-326 (2025) https://www.njcmindia.com/index.php/file/article/view/5576.
[66] WIEGO, "Waste Pickers—Informal Workers in the Waste Sector: India Profile," (2025) https://www.wiego.org/informal-economy/occupational-groups/waste-pickers/.
[67] 3ie, "Improving Lives of Waste Pickers in India: Insights from the Saamuhika Shakti Initiative in Bengaluru," (2022) https://www.3ieimpact.org/research/improving-lives-waste-pickers-india.
[68] Al Jazeera, "New Delhi's Garbage Mountains Become Heat Bombs for India's Waste Pickers," (13 August 2025) https://www.aljazeera.com/features/2025/8/14/how-new-delhis-garbage-mountains-become-heat-bombs-for-waste-pickers.
[69] P.K., "Informal Urban Livelihoods and Environmental Inequality: Occupational Health Risks Among Waste Pickers in Ghaziabad, India," *GeoJournal of Tourism and Geosites* 61(3): 1859–1874 (2025) https://gtg.webhost.uoradea.ro/PDF/GTG-3-2025/gtg.61344-1554.pdf.
[70] S. Gautam et al., "Sustainable Management of Landfill Sites in India: Addressing Environmental, Health, and Socioeconomic Challenges," *Current World Environment* 19(1): 19-32 (2024) https://cwejournal.org/vol1no1/psustainable-management-of-landfill-sites-in-india-addressing-environmental-health-and-socioeconomic-challengesp.

Chhattisgarh, a women-led waste management initiative has transformed livelihoods, offering new income, recognition, and leadership opportunities to more than 400 women who now run decentralized sorting and recycling operations.[71] Studies on programs like "Paryavarna Sakhi" and SHG-led efforts in Udupi and Karnataka underscore the power of empowering women not just as workers, but as decision-makers—improving safety, ensuring inclusive practices, and uplifting families.[72] Still, these models face their own challenges: protective gloves and masks are often shunned due to discomfort, and systemic social biases persist.

Social entrepreneurs and NGOs are piloting innovative insurance, health screening, and living wage models to build economic security and resilience in waste picker settlements, but research stresses that meaningful improvement will require integrating informal workers into city contracts and decision-making as recognized partners—not mere beneficiaries.[73] Ultimately, the stories of India's waste sector are stories of survival and innovation, but true progress will demand that the voices, needs, and dignity of the people closest to the crisis are placed at the heart of reform.

THE ROAD AHEAD: RECOMMENDATIONS

A forward-looking and effective approach to India's waste management challenge must fuse top-down policy rigor with innovative, context-specific grassroots interventions. First, local governments should be empowered and resourced to invest in decentralized waste management infrastructure—particularly small-scale material recovery facilities, composting units, and transfer stations tailored to local conditions.[74] Integrating robust digital monitoring, as called for in the latest 2025 amendments, is crucial for enabling transparent tracking of waste flows and ensuring that segregation, processing, and recycling efforts are actually reaching intended targets.[75] These systems should be paired with strict but smart enforcement: environmental

[71] Mongabay India, "Ambikapur's Women-Led Waste Management System Also Generates Revenue for the City," (29 May 2023) https://india.mongabay.com/2023/05/ambikapurs-women-led-waste-management-system-also-generates-revenue-for-the-city/.
[72] V. Nayak, "Paryavarna Sakhi: Enabling Women-Led Waste Management and Social Entrepreneurship for Sustainable Development," *Indian Journal of Entrepreneurship* 12(4): 157-168 (2023) https://www.indianjournalofentrepreneurship.com/index.php/IJOE/article/view/173569.
[73] Hasiru Dala, "Rising Heat and Waste Workers—Bengaluru" (2025) https://hasirudala.in/wp-content/uploads/2025/08/HW-HD-report_final.pdf.
[74] CEEW (Council on Energy, Environment, and Water), *Tailoring Solid Waste Management in India: Learnings from Cities with a Million-plus Population* (2022) https://www.ceew.in/sites/default/files/CEEW-Tailoring-Waste-Management-web-file.pdf.
[75] ReCircle, "2025 Amendments in India's Plastic Waste Management Rules: Transparency & Traceability" (28 October 2025) https://recircle.in/understanding-the-2025-amendments-in-indias-plastic-waste-management-rules-transparency-traceability/.

compensation penalties for non-compliance must be implemented consistently, but with support for capacity-building so weaker municipalities can improve rather than just face fines.[76]

Strengthening Extended Producer Responsibility (EPR) surges to the top of national priorities: brand owners, importers, and manufacturers must be held responsible for collection, reuse, and recycled content obligations, as outlined in new plastic waste management rules. This creates both accountability and market-driven incentives for a genuinely circular economy.[77]Targeted subsidies, technical assistance, and public-private partnerships can lower barriers for sustainable packaging innovations and help mainstream the use of recycled materials across industries.[78]

Finally, public awareness and participation should be front and centre. Behaviour change campaigns—tailored for urban and rural audiences—must go beyond messaging to build trust, make segregation easy through design and incentives, and empower communities (especially women, waste pickers, and local entrepreneurs) as co-leaders in the waste transformation journey.[79] Only with coordinated action across levels, continuous monitoring, and sustained social inclusion, can India transform its waste crisis into a beacon of sustainable urban development.

CONCLUSION

India's waste management transformation stands at a crossroads, demanding urgent, coordinated action from all sectors of society. While the policy framework and legal mandates now exist, bridging the gap between regulation and meaningful change requires investment in decentralized infrastructure, data transparency, and technology-driven monitoring.[80] Strategic emphasis must be placed on integrating the informal sector into formal systems, scaling public-

[76] India Water Portal, "India Proposes New Rules to Enhance Solid Waste Management," (20 December 2024) https://www.indiawaterportal.org/governance-and-policy/governance/india-proposes-new-rules-to-enhance-solid-waste-management.
[77] ReCircle, "2025 Amendments in India's Plastic Waste Management Rules: Transparency & Traceability" (28 October 2025) https://recircle.in/understanding-the-2025-amendments-in-indias-plastic-waste-management-rules-transparency-traceability/.
[78] Policy Brief 2025, TERI School of Advanced Studies, "Developing Integrated Solid Waste Management Systems," (January 2025) https://icwmr.terisas.ac.in/images/Policy%20Document.pdf.
[79] NITI Aayog, "Promoting Behaviour Change for Strengthening Waste Segregation at Source: Policy Guidelines" (2022) https://www.niti.gov.in/sites/default/files/2021-12/PromotingBehaviourChange-forStrengtheningWasteSegregation-at-Source-PolicyGuidelines.pdf.
[80] Earth5R, *Waste Management in India: Challenges, Innovations, and Solutions* (2025) https://earth5r.org/waste-management-india-solutions/.

private partnerships for innovation, and reinforcing the Extended Producer Responsibility regime to ensure that manufacturers, brands, and consumers contribute responsibly to the waste lifecycle.[81] Above all, sustained political will, targeted financing, and genuine community participation—from urban collectives to rural self-help groups—are indispensable. Ultimately, turning India's waste crisis into an opportunity means not only reducing environmental burdens, but also unlocking social and economic value for the next generation.[82]

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