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Greenwashing: Looking Beyond Eco-Friendly Labels

Real sustainability demands systemic changes, transparency, and verifiable actions. As consumers, advocates, and policymakers, we must push for truthful representation, stricter laws, and unwavering environmental responsibility.

Dr Anjali S. Nair

From advertisements and packaging to corporate mission statements, "sustainable", "eco-friendly", and "ethical", are common terminologies which we come across almost everywhere these days. It is no coincidence. A recent report by Greenprint revealed that 78% of consumers consider a product's environmental impact before making a purchase. As climate concerns intensify, people are increasingly seeking brands that align with their environmental values.

However, this growing demand for sustainability has also opened the door to widespread "greenwashing"—a marketing tactic where companies appear more environmentally responsible than they truly are. In an era of urgent ecological challenges, distinguishing genuine commitment from clever branding has become more important than ever before.

What Is Greenwashing?

The term greenwashing was first coined by environmentalist Jay Westerveld in the 1980s. It refers to the practice of giving a false impression—or providing misleading information—about a company's environmental initiatives.

Researchers Delmas and Burbano define it as "poor environmental performance paired with positive communication", meaning companies market themselves as eco-conscious without making substantial operational changes. In today's marketplace, where "green" sells, the risk of encountering hollow environmental claims has never been higher.

The Many Faces of Greenwashing

Greenwashing appears at both the firm-level and product/service-level:

- **Firm-Level Greenwashing:** Companies brand themselves as environmentally responsible while also engaging in practices which are harmful to the environment.

  Example: General Electric's (GE) "Ecomagination" campaign promoted clean technologies while the company lobbied against stricter air pollution controls.

- **Product-Level Greenwashing**: Individual products are advertised as sustainable without backing it up with real environmental benefits.

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IN THIS ISSUE

MESSAGE

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Dear Readers

The call to protect the environment and drive sustainable development is echoing at multiple levels—local, national, and global. Stakeholders across sectors—academia, industry, NGOs, and communities—have been coming together to discuss and address the interconnected environmental challenges of our times. The world, through the United Nations Environment Programme (UNEP), is discussing a more sustainable framework for the use of chemicals with a clear roadmap for reducing and controlling the use of some of the hazardous chemicals in everyday products and processes and their resultant impacts on human health and ecology. We hope that some of these frameworks and processes are economically viable and easy to implement across all nations. The issue of plastic production and its management will again be discussed and hopefully finalised at the upcoming Inter-Governmental Negotiations in Geneva, as citizens across the world eagerly await the decisions of these negotiations, which are eventually intended to become legally binding on all nations.

The excessive use of plastics and the resultant increasing waste generation are recognised as a serious global crisis with deep and widespread impacts both on marine and land ecology. The ongoing research on microplastics further complicates the issue of plastics since this invisible material is now all-pervasive, posing very serious challenges in its mitigation. There is an attempt by the Ministry of Environment too towards the reduction of plastic waste generation through the adoption of circularity and use of recycled material in packaging products. The use of plastic waste as fuel is appearing to be on the rise since burn options are easy to adopt with little concern for the externalities of environmental costs.

Toxics Link has been participating in the global processes and contributing to ongoing global conversations and negotiations, while we have also been actively working towards reducing the use of mercury in products such as dental amalgam and skin lightening creams. Both these mercury-containing products are highly toxic with known impacts on human health, and hence, the need to completely end the use of these products. Dental colleges continue to teach and practice the use of amalgam as a restorative material, which needs immediate attention in view of long-term adverse impacts on the patients and the environment. We are actively working with all state dental associations to create awareness and sensitise consumers on this issue.

Through this edition of Dispatch, we are reaching out to you with insights on the critical issues that we are earnestly working on and global and national developments on some serious environmental concerns. We will be extremely happy to receive your feedback, suggestions and guidance. It will go a long way in making this periodical more informative and invigorating. Happy Reading!

Example: Certain LG refrigerators were promoted as Energy Star-certified but later found to be non-compliant.

Two broad types of greenwashing:

- **Claim Greenwashing**: Misleading or unsubstantiated environmental claims.
- **Executional Greenwashing**: Using nature-related imagery, language, or branding to falsely convey eco-consciousness.

Common Ways of Greenwashing

1. **Selective Disclosure**
   Selective disclosure happens when a company only talks about the good things it is doing for the environment and hides the bad ones. For example, a business might say it uses recycled materials but does not mention that its factory pollutes a nearby river. This gives people a false impression that the company is fully eco-friendly, even when it's not.
2. **Decoupling**
   Decoupling means that a company's actions are not aligned with the statements made by them. They might create advertisements or reports that sound very green, but in reality, they don't take real steps to protect the environment.
3. **False Legitimacy**
   Some companies try to gain public trust by looking green when they are not. They use clever marketing or fake labels

to make people think they are doing good things for the planet. This is called false legitimacy because the trust they get is based on misleading information.

4. **Vague and Undefined Terms**
   Many companies use feel-good words like "natural", "eco-safe", "green", or "environmentally friendly" without clearly explaining what those terms mean. These words are not regulated or standardised in most cases, which means they can be used freely—even if the product or service has little or no real environmental benefit. For example, a product might be labelled as "green" simply because it uses less packaging, even if its production involves causing heavy pollution. This kind of language can mislead consumers into thinking that they are making eco-conscious choices, when in fact, they may not be.

5. **Token Environmentalism**
   This refers to when a company initiates a small, highly visible green initiative to appear environmentally responsible, while continuing practices that cause significant environmental harm. An example might be a fast fashion brand launching a limited "sustainable" clothing line while the bulk of its production remains wasteful and polluting. These token efforts serve as a distraction—often called "greenwashing"—and are used more as marketing tactics than genuine steps toward sustainability.

6. **Irrelevant or Misleading Claims**
   Companies often spotlight a single environmentally positive feature of a product to create a green image, even if that feature is minor or unrelated to the product's overall impact. For instance, a plastic bottle might be labelled "BPA-free", which sounds positive, but doesn't address the pollution caused by single-use plastics or the toxicity of other chemicals still present in it. These types of claims divert attention from the bigger environmental picture and can mislead consumers into overestimating the product's eco-credentials.

7. **Hidden Trade-offs**
   Sometimes, a product may appear environmentally beneficial in one way, but causes harm in another area.—For example, a product made from biodegradable material may still be produced using highly polluting manufacturing processes, or transported over long distances, contributing to carbon emissions. These are the "hidden trade-offs" often not disclosed, leaving consumers with an incomplete understanding of the product's total environmental impact.

Plastic and the Greenwashing Illusion: A call for real sustainability

As industries face growing scrutiny over pollution and sustainability, plastic has emerged as a major battleground for greenwashing. With rising awareness around plastic pollution and climate change, sustainability has become a major selling point. Consumers increasingly seek products labelled as biodegradable, eco-friendly, or sustainable. Yet, not all that glitters is green. The plastic industry, in particular, has become a prime example of greenwashing—where misleading environmental claims mask real environmental harms.

Greenwashing in the Plastic Waste Industry

Greenwashing in the plastic sector manifests in various ways, from vague product labels to exaggerated recycling statistics. Buzzwords like "biodegradable", "compostable", and "eco-safe" are often used without proper certification, leading consumers to falsely believe that their plastic waste will harmlessly decompose. In reality, many so-called "biodegradable" plastics require specific industrial composting conditions largely unavailable in India's waste disposal systems.

The result is a widening gap between perception and reality, where industries exploit consumer goodwill while continuing to contribute to environmental degradation.

The Plastic Industry's Green Mask

Plastics, particularly single-use plastics, remain a dominant contributor to environmental pollution. Ironically, it has also become one of the most greenwashed commodities. Companies, especially in the Fast-Moving Consumer Goods (FMCG) sector, often make superficial changes or ambiguous claims about environmental responsibility while maintaining high levels of plastic production.

Source: https://energytracker.asia/types-of-greenwashing/

Notable Examples:

- Coca-Cola: In 2022, Coca-Cola replaced its green Sprite bottles with clear ones, citing improved recyclability. However, Break Free From Plastic's audits have consistently named Coca-Cola the world's top plastic polluter for five consecutive years. Changing bottle colour does little to address the massive volume of single-use plastic packaging the company produces.
- Procter & Gamble (P&G): P&G promoted Downy fabric softener's refill pouches as an eco-friendly innovation. In truth, these sachets are predominantly non-recyclable within India's waste infrastructure, adding to the burden of plastic pollution rather than alleviating it.
- European Union's Bottle Cap Regulation: Keeping caps attached to bottles aims to reduce litter. Yet, this modification doesn't tackle the core problem--overproduction and reliance on disposable plastics.

These examples highlight a pattern—small, cosmetic tweaks are often marketed as substantial environmental achievements while systemic issues remain unaddressed.

Common Greenwashing Tactics in the Plastic Sector

1. Vague Environmental Labels: Terms like "biodegradable," "eco-safe," and "compostable" are often used without standardised definitions or verified certifications. Many plastics labelled as biodegradable require high-temperature industrial composting, which is rarely available in most waste systems, especially in developing countries like India.
2. The Recycling Myth: Brands heavily market recyclability as a solution, but in practice, only about 60% of India's 3.5 million tonnes of annual plastic waste is recycled. Complex materials like multi-layered packaging are virtually impossible to recycle, making these claims highly misleading.
3. Recycled Plastic Narratives: Marketing products as made from "100% recycled plastic" create an illusion of sustainability but does little to reduce the demand for virgin plastics. Moreover, the recycling process itself has significant environmental costs.
4. Green Bioplastics: Bioplastics are often celebrated as a green alternative, but many require industrial facilities to properly decompose. Additionally, large-scale bioplastic production can compete with agriculture for land and resources, undermining food security and ecological balance.

How to Spot Greenwashing

To avoid falling prey to misleading green claims:

- Seek verified third-party certifications like BIS, Forest Stewardship Council (FSC), or ISO 14024.
- Check for full life cycle disclosures, not just end-of-life claims.
- Be sceptical of vague phrases like "100% green" or "eco-friendly" without evidence.
- Scrutinise sustainability reports to assess whether companies are implementing systemic changes.

The Role of Consumers and Regulators

The Role of Consumers

Tackling greenwashing requires active involvement from consumers. By choosing reusable, refillable, and genuinely compostable alternatives, consumers can drive real change. It is equally important that they demand transparency—asking brands to clearly disclose product ingredients, environmental impacts, and end-of-life management strategies. Through informed decisions and persistent advocacy, consumers can push companies towards genuine sustainability and help expose misleading claims.

The Role of Regulators

At the same time, regulators must step up to create a framework that discourages deceptive practices. They need to legally define terms like eco-friendly, biodegradable, and sustainable to prevent misuse. Mandatory third-party audits should be required to verify sustainability claims, while Extended Producer Responsibility (EPR) laws must be strengthened to ensure producers remain accountable for the entire lifecycle of their products. Additionally, strict advertising standards—with penalties for false or exaggerated environmental claims—are essential. These measures are crucial for fostering accountability, building consumer trust, and ensuring that sustainability efforts are genuine and impactful.

Don't Be Fooled by the Green Sheen

Greenwashing in the plastic industry is more than just misleading advertising; it is a major obstacle to genuine environmental progress. It misleads consumers, delays crucial policy reforms, shields polluters from accountability, and erodes public trust in authentic sustainability efforts.

In a world facing escalating environmental crises, the costs of inaction and misinformation are simply too high. Real sustainability demands systemic changes, transparency, and verifiable actions—not just catchy slogans or cosmetic tweaks. As consumers, advocates, and policymakers, we must push for truthful representation, stricter laws, and unwavering environmental responsibility. Only then we can move towards true ecological stewardship.

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Pharmaceutical Pollution: How Modern Medicine Has Become an Environmental Curse

Without immediate and sustained action, the healing power of modern medicine may come at an irreversible cost to our ecosystems, biodiversity, and future public health

By Vidhi Mathur

Pharmaceuticals are central to modern medicine, playing a crucial role in preventing, treating, and managing diseases across human and animal populations. Their importance was never more evident than during the COVID-19 pandemic, which saw an unprecedented surge in the global demand for pharmaceutical products**.** The global pharmaceutical market was valued at over USD 1.6 trillion in 2023 and is projected to grow at a rate of 7.5% annually through 2032. This growth is matched by an estimated 3.8 trillion defined daily doses of medicines expected to be consumed globally by 2028, reflecting the scale and ubiquity of pharmaceutical use in contemporary society (IQVIA, 2024).

At the core of this industry are active pharmaceutical ingredients (APIs)—the bioactive compounds responsible for therapeutic effects. Over 4,000 such substances are currently in use in prescription medications, over-the-counter drugs, and veterinary pharmaceuticals (Massey et al., 2013). Produced globally at a rate exceeding 1,00,000 tons per year (Van Boeckel et al., 2014), these chemicals are essential for health, but present a growing concern when it comes to their unintended release into the environment.

Despite stringent regulations aimed at ensuring drug safety and efficacy for patients, the environmental impact of pharmaceuticals remains inadequately understood and largely unregulated on a global scale. With the growth of human and livestock populations—combined with increasing pharmaceutical consumption driven by ageing societies in industrialised nations—environmental contamination is parallelly rising. Active pharmaceutical ingredients (APIs) have been detected in various environmental compartments, including surface and groundwater, soils, sediments, manure, and even within the food chain. In Germany, 50% of APIs approved for human use are classified as bioaccumulative, persistent, and toxic (Ebert et al., 2014; Klatte et al., 2017). Over 600 APIs and their transformation products have been frequently found in surface waters and sewage effluents across 71 countries (Hamscher et al., 2002; Klatte et al., 2017; Ratsak et al., 2013; Weber et al., 2014). The major sources include untreated domestic wastewater, discharges from municipal treatment plants, pharmaceutical manufacturing effluents, and runoff from intensive farming and aquaculture practices.

What makes pharmaceutical pollution particularly concerning is that these compounds are designed to interact with biological systems at low doses. Even trace levels in the environment can disrupt ecosystems and harm wildlife. Studies have shown, for instance, that estrogenic (oestrogenic) compounds from oral contraceptives can feminise fish and amphibians, while antidepressants like fluoxetine alter fish behaviour, making them more vulnerable to predators (OECD, 2019). Antibiotic residues in water bodies are of grave concern, as they contribute to the acceleration of AMR—a growing global health crisis projected to surpass cancer as a leading cause of death by 2050 (WEF, 2025). In 2015, the International Conference on Chemicals Management (ICCM 4) nominated 'environmentally persistent pharmaceutical products' as an emerging policy issue in an effort to raise awareness among policymakers and fill knowledge gaps for sound evidence-based management worldwide.

What are the sources and pathways?

The key sources of pharmaceuticals and their metabolites in the environment are as follows **(see figure 1)**:

- **Pharmaceutical Manufacturing:** Industrial waste from pharmaceutical production is a major source of APIs in the environment. Effluents from such facilities can contain drug concentrations far exceeding safe thresholds. For instance, a wastewater treatment plant near Hyderabad, India, serving multiple drug manufacturers, recorded ciprofloxacin levels as high as 32 mg/L—much higher than therapeutic concentrations found in human blood (Larsson et al., 2007).
- **Households and Consumers:** A large volume of unused or expired medicines is improperly disposed of via toilets, sinks, or household

Figure 1: Major pathways of release of pharmaceuticals into the soil and water (OECD, 2019)

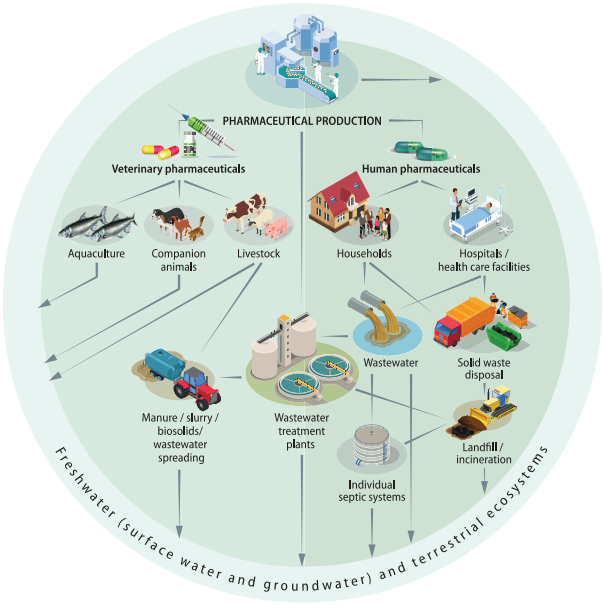
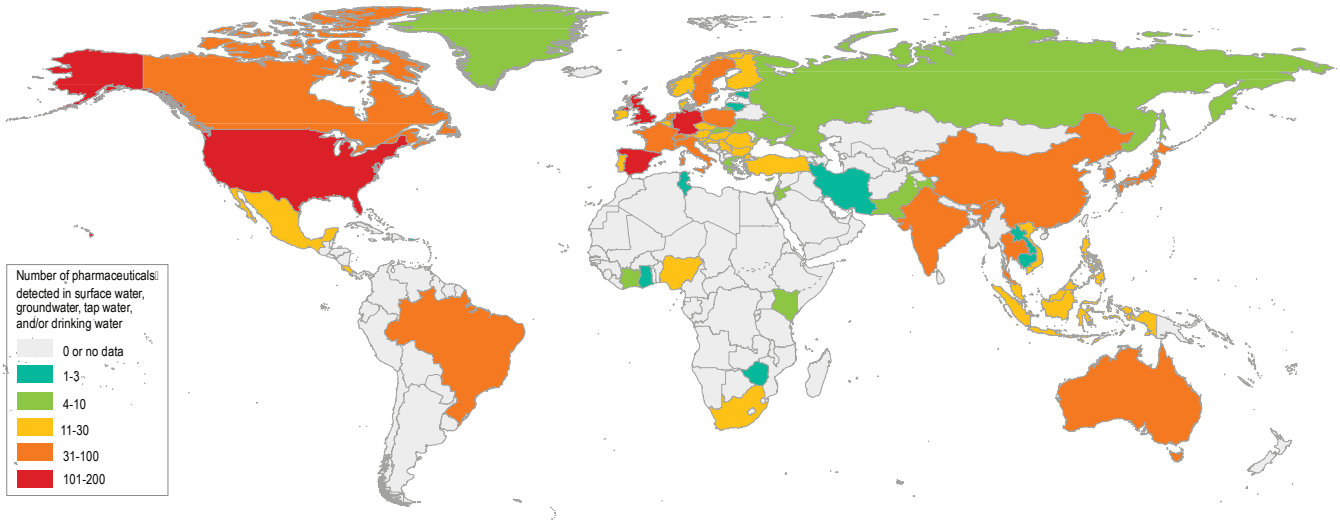


Figure 2: Number of pharmaceuticals detected in surface water, groundwater, tap water and/or drinking water (Global Chemicals Outlook II (GCO-II), UNEP, 2019).



garbage. These pathways introduce pharmaceuticals into municipal wastewater systems or landfills, where they can leach into groundwater and surface water. Studies estimate that up to one-third of all prescription drugs in the US go unused each year (Product Stewardship Council, 2018). Overprescription, self-medication, and misdiagnosis further increase the volume of pharmaceuticals entering the environment (Tong et al., 2011; Saad et al., 2017).

- **Hospitals and Healthcare Facilities:** Hospitals contribute to pharmaceutical pollution through wastewater and solid waste, particularly for drugs like anti-cancer agents, endocrine therapies, and contrast media. Although hospitals account for a smaller share of overall emissions compared to households, they dominate the release of certain specialised pharmaceuticals (BIO Intelligence Service, 2013; Daughton & Ruhoy, 2009).
- **Agriculture and Aquaculture:** Antibiotics are widely used in livestock for disease prevention and growth enhancement. An estimated 60-90% of these drugs are excreted and enter the environment through manure runoff or direct use as fertiliser. These practices contribute to AMR and contaminate nearby soil and water bodies, particularly in intensive farming systems (Larsson, 2014).

Municipal Wastewater Treatment Plants (WWTPs) usually receive pharmaceuticals from homes, hospitals, and care facilities, but conventional systems are not designed to filter out these emerging contaminants. As a result, APIs and their metabolites often pass through treatment processes and are released into the environment, sometimes in bioactive or transformed forms (Melvin & Leusch, 2016; Yang et al., 2017). As a result, a large number of pharmaceuticals are detected in surface water, ground water, tap water and drinking water (**see figure 2**). A 2022 global study found over 60% of rivers tested in 104 countries contained dangerous levels of pharmaceuticals like antidepressants, antibiotics, and painkillers. The highest cumulative API concentrations were observed in sub-Saharan Africa, South Asia, and South America. Most contaminated sites were in low- to middle-income countries that were associated with poor wastewater and waste management infrastructure and pharmaceutical manufacturing (Wilkinson et al., 2022).

Environment and Health Impact

The concentration and impact of pharmaceuticals in the environment are influenced by a complex interplay of factors. These include the type and amount of drug used, its toxicity, persistence, ability to degrade, and how easily it moves through ecosystems. Other critical variables are the source and timing of contamination, the design and efficiency of WWTPs, agricultural and veterinary practices, the vulnerability and exposure history of the receiving environment, and unpredictable natural conditions (OECD, 2019).

Some of the major environmental and health impacts are as follows:

1. **Ecosystem Disruption:** APIs released into the environment can interfere with wildlife behaviour, physiology, and reproduction. Diclofenac residues have led to the near-extinction of vulture populations in India, while antidepressants alter fish behaviour, and endocrine-disrupting chemicals have been shown to impair reproductive functions in aquatic species. The German Environment Agency estimates that 10% of pharmaceutical products may pose significant environmental risks (Bergmann et al., 2011).
2. **Antimicrobial Resistance (AMR):** Antibiotics in surface and groundwater promote the emergence and spread of drug-resistant bacteria. This accelerates the natural process of resistance, making existing medications ineffective. AMR is considered one of the most pressing global health threats, with projections suggesting it could cause 10 million deaths annually by 2050 if left unaddressed (WHO, 2023).
3. **Human Health Risks:** Chronic, low-level exposure to pharmaceutical residues—especially endocrine disruptors like synthetic hormones—has been linked to increased incidences of hormone-related cancers (e.g., breast and prostate), reproductive disorders, diabetes, and neurodevelopmental issues. These risks are particularly acute for vulnerable groups such as

pregnant women, infants, and those with existing health conditions. Contaminated food and water are key exposure pathways, highlighting the urgent need for improved waste management and pharmaceutical stewardship (OECD, 2019).

The Indian Context

India is one of the world's largest manufacturers of generic drugs, and has one of the fastest-growing healthcare and animal husbandry sectors in the world. Currently, the Indian pharmaceutical industry caters to over 50% of global demand for various vaccines, 40% of the generic demand in the US, and 25% of all medicines in the UK (Government of India et al, 2023). Policies such as Pharma Vision 2020 will only drive further expansion of the sector, with a predicted market size of $88 billion by 2030 (Mordor Intelligence, 2025).

This expansion is a cause for concern as the country faces challenges in effective downstream management, largely driven by limited capacity of waste treatment, lack of environmental standards and insufficient enforcement of existing rules. Multiple studies have detected a wide range of pharmaceuticals in surface and ground water. Alarming concentrations of antibiotics like ciprofloxacin (up to 32 mg/L) in wastewater levels exceeding therapeutic doses in humans have been detected in Hyderabad's Patancheru industrial zone (Larsson et al., 2007). Toxics Link's study has found high concentrations of Ofloxacin in Yamuna (Delhi), Gomti (Lucknow) and Cooum (Chennai) rivers, and Norfloxacin in Zuari river (Goa) (Toxics Link, 2021). IIT Madaras, in 2021, found high concentrations of different APIs, including Carbamazepine (205.62ng/L), Ciprofloxacin (25.23 ng/L), Diclofenac (28.51 ng/L), etc., in the Cauvery river (Renganathan et al., 2021).

To address this, the Central Pollution Control Board categorised 'Pharmaceuticals' as 'Red Category' and 'Pharmaceutical formulation and for R&D purpose' as 'Orange Category' based on the Pollution Index. The Water (Prevention and Control of Pollution) Act, 1974 mandates industries to install an Effluent Treatment Plant (ETP). To accommodate clusters of small industries, MoEF&CC launched the centrally-sponsored Common Effluent Treatment Plant (CETPs) to make a cooperative movement of pollution control to treat the effluent. In 2020, MoEF&CC proposed standards for antibiotic residues in the treated effluents of the pharmaceutical industries. The proposed draft provided stringent limits for 121 antibiotics, but was retracted soon after.

Biomedical Waste Management Rules, 2016 (amended in 2018) mandated proper segregation, disposal, and tracking of pharmaceutical waste from healthcare facilities, with Extended Producer Responsibility (EPR) for manufacturers. However, provisions for the disposal of pharmaceuticals from households remain unaddressed. Some states, such as Madhya Pradesh, Kerala, etc., established state action plans on AMR containment (based on the National Action Plan) to address the issue by stipulating surveillance of antibiotic residue and contaminants in the environment, including wastes from farms, factories, veterinary and health care settings.

Path Forward

Pharmaceutical pollution in freshwater cannot be managed through a single policy tool or attributed to one source. It stems from multiple actors across the life cycle of pharmaceuticals—including manufacturers, healthcare providers, patients, veterinarians, farmers, and waste service providers. Effective mitigation requires a coordinated, cross-sectoral approach involving central and local governments, environmental and health agencies, the pharmaceutical industry, and both human and animal health sectors.

Several countries—such as France, Germany, the Netherlands, Sweden, and the UK—have already initiated multi-stakeholder dialogues to address this growing concern. While recent developments like the EU's 2024 mandate for environmental risk assessments of new drugs signal progress, global regulatory frameworks remain fragmented. Greater international cooperation and investment in circular economy models for pharmaceuticals are essential to reduce ecological and health risks and to build more resilient, preventive systems. However, most countries face the following challenges:

- Lack of standardised monitoring protocols.
- Insufficient incentives for eco-friendly drug design.
- Limited public awareness about proper medication disposal.

Based on the challenges, the following measures can be taken for effective management of pharmaceutical pollution:

- Improvements to Environmental Risk Assessment (ERA) and marketing authorisation of pharmaceuticals. This includes improving the availability and transparency of ERA data, and the inclusion of risk-benefit analysis with a possibility of regular review to add new information and data in actual use and effects, not just a presumed worst-case scenario.
- Green Pharmacy: Promote the development of biodegradable pharmaceuticals and redesign existing drugs to reduce the

environmental persistence of active pharmaceutical ingredients (APIs). The goal is to create compounds that are both therapeutically effective and environmentally benign—minimising accumulation and adverse ecological effects.

- Advanced Wastewater Treatment: There is no single technology capable of effectively removing all pharmaceutical residues from wastewater. Instead, a combination of treatment methods is typically employed to address the diverse chemical properties of these compounds (Undeman and McLachlan, 2011). Techniques such as ozonation and activated carbon adsorption are commonly used to target hydrophobic, biodegradable, and reactive substances (Van Wezel et al., 2017). For example, Switzerland has adopted large-scale implementation of ozonation and granulated activated carbon systems to enhance removal of pharmaceuticals from wastewater (OECD, 2019).

Pharmaceuticals have transformed global health, but their unchecked environmental release threatens to undermine the very systems they aim to protect. As our reliance on these life-saving compounds grow, so does our responsibility to manage their full life cycle responsibly. Tackling pharmaceutical pollution requires global collaboration, robust regulations, scientific innovation, and behavioural change—from production to prescription to disposal. Without immediate and sustained action, the healing power of modern medicine may come at an irreversible cost to our ecosystems, biodiversity, and future public health. The cure must not become the curse.

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EVENTS

AMR Consultation and Awareness Meet in Vijaywada

Toxics Link organised a meeting on "Pharmaceutical Pollution and AMR" in Vijayawada, Andhra Pradesh on March 12, 2025, where representatives from World Health Organization (WHO), Andhra Pradesh Department of Medical Education, Department of Health and Family Welfare, Department of Animal Husbandry, Department of Drug Control Administration, Andhra Pradesh Pollution Control Board, All India Institute of Medical Science (AIIMS), Government Siddhartha Medical College, Dr Pinnamaneni Siddhartha Institute of Medical Sciences and Research Foundation came together to discuss several key issues contributing to antimicrobial resistance (AMR).

The participants expressed concerns on widespread misuse and overuse of antibiotics in healthcare, agriculture and animal husbandry, inadequate infrastructure and lack of adherence to national standards for antibiotic susceptibility testing (AST), absence of effective surveillance systems, unauthorised sale and inappropriate use of antibiotics, and lack of proper waste management and community awareness on responsible use of antibiotics.

Consultation on Nonylphenol and its Ethoxylates

Toxics Link organised a consultation on Nonylphenol and its Ethoxylates in collaboration with the Gujarat Chamber of Commerce & Industry (GCCI), Confederation of Indian Textile Industry (CITI), Gujarat, GCPC, and Paryavaran Mitra in Ahmedabad, Gujarat on February 28, 2025 where industry leaders, policymakers and environmentalists discussed on sustainable practices within the textile and chemical industries.

Yogesh Parikh, Chairman, Chemical Taskforce, GCCI, Dr Bharat Jain, Member Secretary, Gujarat Cleaner Production Centre and Professor Dr. Sudipta Maitra from the Department of Zoology, Visva-Bharati, Santiniketan were among the dignitaries present at the conference.

Piyush Mohapatra, Senior Programme Coordinator, Toxics Link, made a presentation on the role of chemicals in textiles, while Dr Deepak Marathe, Senior Programme Officer, Toxics Link, shared key findings from Toxics Link's studies on Nonylphenol.

A panel discussion on chemical management and affordable alternatives was also organised. It was chaired by Mr. Satish Sinha, Associate Director, Toxics Link and included Dr Chandrima Chatterjee, Secretary General, Confederation of Indian Textile Industries, Dr Nitin Shah, Head of Chemical Technology Division, ATIRA, and representatives from the Gujarat Pollution Control Board (GPCB) in the panel.

Stakeholder Consultation on Chemicals in Textiles

Toxics Link organised a stakeholder consultation on "Chemicals in Textiles" at Surat, Gujarat on March 28, 2025. It was held in collaboration with Gujarat Pollution Control Board, The Southern Gujarat Chamber of Commerce and Industry (SGCCI), Confederation of Indian Textile Industry (CITI) and Paryavaran Mitra on concerns related to use of toxic chemicals in textiles and its environmental and health impacts. Global and national developments and the associated challenges faced by industries in shifting to safer alternatives were also discussed. The speakers and participants acknowledged the environmental and health concerns of toxic chemicals used in textiles and the need for joint and concerted efforts to phase out these chemicals from textiles.

Among the participants were Dr Jigna Oza, Surat Regional Head of Gujarat Pollution Control Board (GPCB); Mr Vijaykumar Kaniyalal Mevawala, President, SGCCI; Mr Jitendra P Vakharia, President, South Gujarat Textile Processors Association; Prof. Dr Sudipta Maitra of Vishva-Bharati University, Santiniketan; NIT Surat, South Gujarat University, representatives of textile and chemical industries, and Man-Made Textiles Research Association (MANTRA).

Advancing Mercury-Free Dentistry in India

National Consultation in New Delhi

A national conference on "Advancing Mercury-Free Dentistry in India" was organised by Toxics Link in New Delhi on March 17, 2025. Senior officials from Union Ministry of Health and Family Welfare (MoHFW), Indian Dental Association representatives, private dental practitioners, and faculty and students from prominent dental colleges unanimously agreed to make concerted efforts to phase out mercury amalgam from dentistry in India.

Dr L Swasticharan, Additional DDG & Director, MoHFW, emphasised on the need for more advocacy on the harms of mercury amalgam and research on cost-effective alternatives to dental amalgam while Charlie Brown, President, The World Alliance for Mercury-Free Dentistry, said India should now start working for phasing out and not just phasing down mercury use in dentistry and it should not take more than five years.

Dr Rajiv K. Chugh, Former National President Indian Dental Association, Prof. (Dr) Mahesh Verma, Vice Chancellor, Guru Gobind Singh Indraprastha University, Lt General (Retd) Vimal Arora, Former Director General, Dental Services and Colonel Commandant, Army Dental Corps were among the other dignitaries present.

Conference in Chandigarh

Toxics Link, in collaboration with Indian Dental Association, Chandigarh, brought together dentists from public and private sectors and dental students to discuss the transition away from mercury-based dental fillings. The event held on March 30, 2025 saw Satish Sinha, Associate Director, Toxics Link, along with Prof. S.P. Singh, President, IDA, and Head, OHSC PGIMER, leading the discussions on impacts of mercury amalgam on both patients and dental practitioners.

The dental practitioners agreed on the need to shift from mercury-based fillings to safer alternatives in dental education, awareness among dentists and the public about mercury toxicity and associated risks, and policy support to encourage the adoption of mercury-free alternatives.

Conference in Kolkata

Toxics Link, in collaboration with the Indian Dental Association, West Bengal, organised a conference in Kolkata on April 20, 2025. Focused on accelerating the phase out of mercury amalgam from dental practices in India, the event organised in Kolkata was attended by IDA's national and state leadership, including IDA national President Dr Subhra Nandy, IDA West Bengal State Branch President Dr R.D. Rekhade and State Branch Secretary Dr Raju Biswas. The discussions focused on the urgent need to revise dental curricula in alignment with global best practices, growing necessity to raise public awareness about mercury toxicity, and addressing the challenges in rural setups.

From Waste to Watts: Pros and Cons in India's Waste to Energy Push

While the waste-to-energy process offers a temporary solution to waste management challenges, overreliance on it risks encouraging overconsumption of plastics and toxic emissions

By Senerita Swamy

India's urban centres generate approximately 1,50,000 tonnes of municipal solid waste (MSW) daily, with projections indicating a rise to 2.2 billion tonnes globally by 2025. Waste, a major contributor to environmental degradation, poses a significant barrier to achieving sustainability goals and also impedes our climate change mitigation efforts. Circular economy offers a transformative approach to tackling this challenge by reimagining waste as a resource within a closed-loop system. Waste-to-Energy (WtE) technologies, which convert waste into electricity, biogas, or heat, are thus being increasingly promoted as a dual solution for waste management and renewable energy generation. However, the suitability of WtE in India's context remains contentious due to environmental, social, and technical challenges. This article explores recent developments in India's WtE sector, critiques its efficacy, and proposes sustainable pathways forward.

History

The first WtE plant, known as a "destructor", was built in Nottingham, UK, in 1874 by Manlove, Alliott & Co. It was designed by Albert Fryer. It marked the beginning of using MSW to generate energy, initially producing steam for local use. Early destructors burned waste to reduce volume, but were inefficient and caused significant pollution due to minimal emission controls. Modern WtE plants use advanced technologies to minimise the impact on environment. The first WtE plant in the US was built in 1885 on Governors Island, New York. Denmark followed with a plant in Frederiksberg, Copenhagen, in 1903, and the Czech Republic built one in Brno in 1905.

In India, the first WtE plant was established in Timarpur, Delhi, in 1987.

Figure 1: Types of waste-to-energy plant

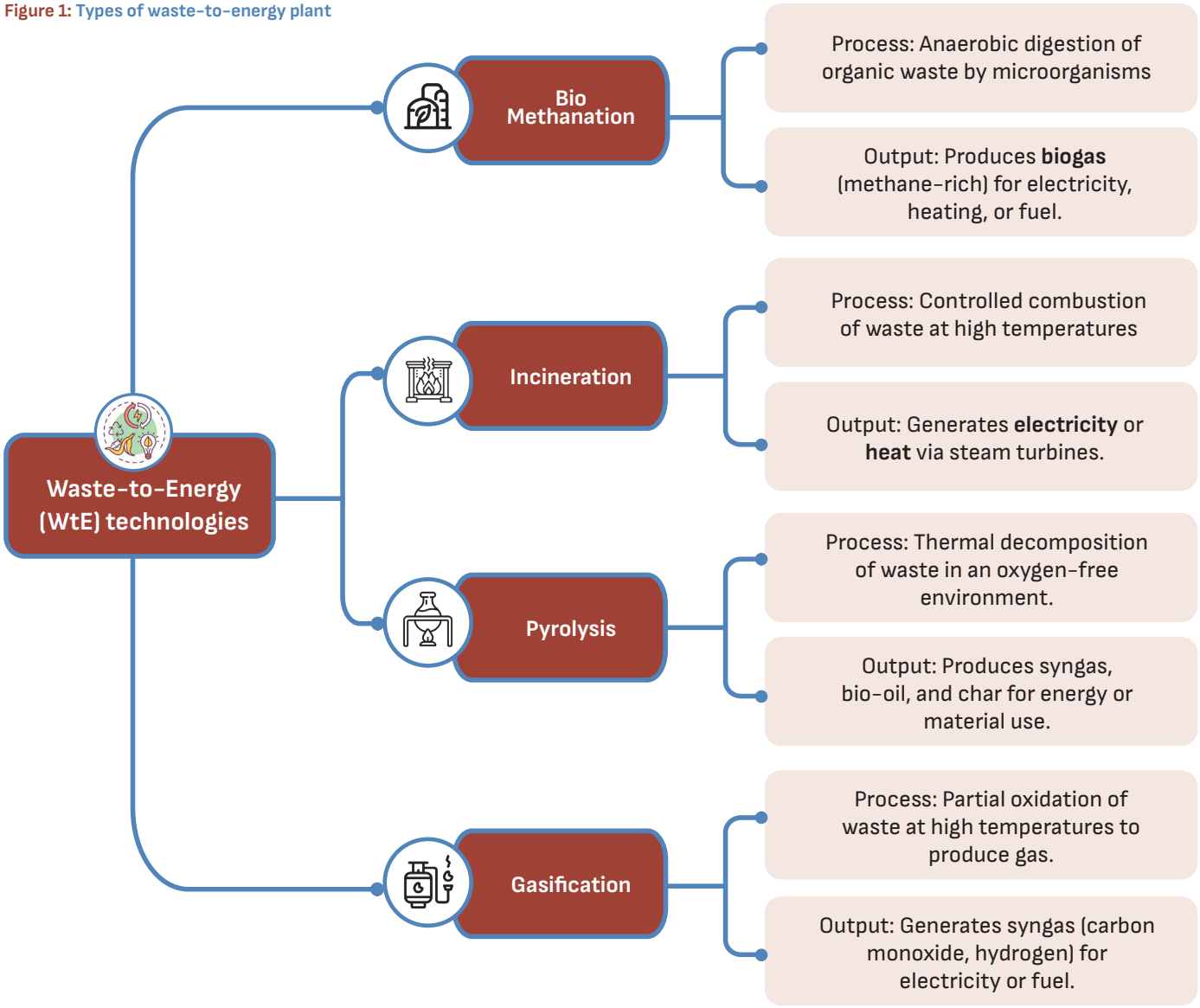
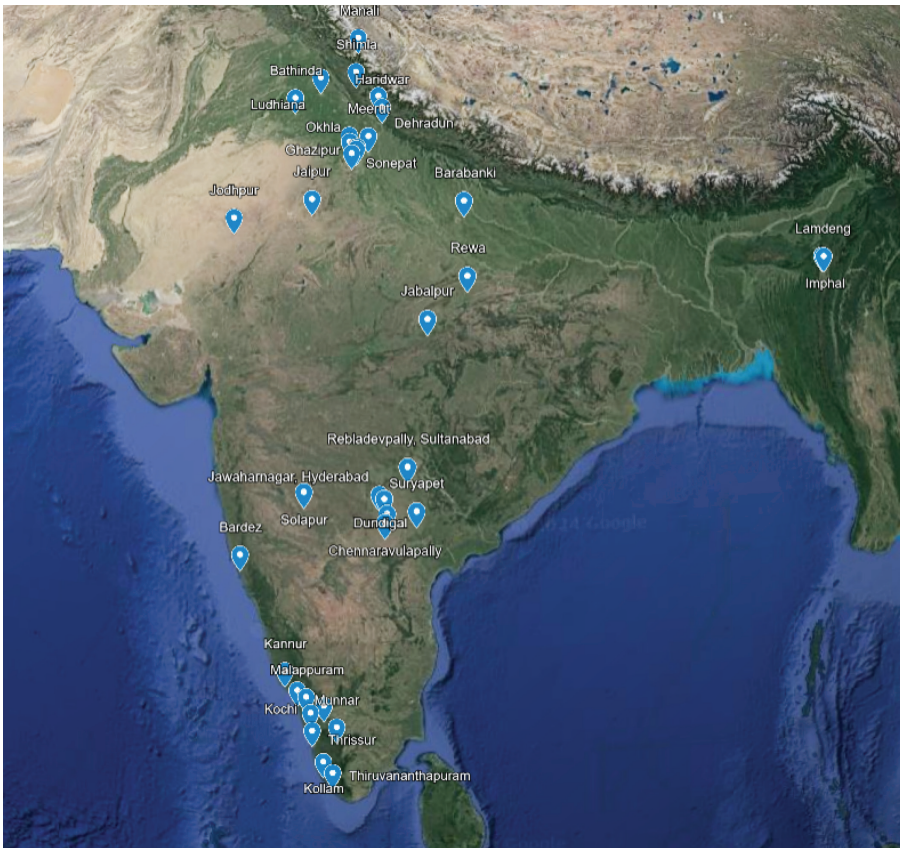


Figure 2: Waste-to-energy located in India



It failed within 21 days due to unsuitable waste characteristics, setting a precedent for the challenges that followed. By 2024, India had approximately 35 operational WtE (RTI) plants, supported by initiatives like the Swachh Bharat Mission. Many plants have closed or underperformed due to poor waste segregation, low calorific value of municipal solid waste, and high costs compared to alternative energy sources.

India's Waste-to-Energy Landscape

While the WtE process holds promise for addressing India's waste management and energy needs, its historical trajectory underscores the need for better waste management practices and technological adaptation to ensure sustainable progress. Incineration, despite being the most widely used, remains controversial due to emissions and health concerns associated with municipal solid waste (MSW) combustion. WtE projects, which address both waste management and renewable energy production, frequently utilise the Build-Operate-Transfer (BOT) model. However, Build-Own-Operate (BOO) is also used, especially for projects with long-term operational needs.

This process involves combusting waste in controlled furnaces to generate steam, which drives turbines to produce electricity for the national grid, thereby addressing the country's growing energy demands. To ensure environmental compliance, Indian regulations mandate the use of advanced emission control technologies, such as electrostatic precipitators and flue gas scrubbers, which effectively capture pollutants like dioxins and particulate matter.

According to the Central Pollution Control Board (CPCB) Annual Report 2022-23, there are 12 operational WtE plants in India spread across 10 states, with 299.94 MW capacity, and eight non-operational plants, likely incineration-based. The target was to have 100 WtE plants by 2024 (60 operational, 40 under construction), but the growth is slow due to local resistance over health risks, poor waste segregation, high costs, and other unknown factors causing delays in urban centres like Delhi and Mumbai.

Scaling of WtE in India

India is advancing its WtE initiatives to tackle its growing MSW crisis. There are a total of 413 proposed and constructed WtE plants mentioned in the guideline document on the usage of refuse-derived fuel published in 2018. This reflects India's ambition to integrate WtE as a sustainable solution for waste management and renewable energy production, despite challenges like public opposition and regulatory hurdles.

However, even as work is in progress, several challenges including low-calorific-value waste, high moisture content and poor segregation, which reduce efficiency and require additional fuel, raising costs, persist. Public opposition, as seen in Bandhwari's Aravali belt and in Deonar and Okhla due to environmental concerns over incineration-based plants, alongside regulatory gaps, threatens the feasibility of the plans.

Public resistance to WtE plant in Delhi

According to newspaper reports, residents living near the Okhla WtE plant have been repeatedly complaining of foul odours, increased air pollution, and associated health risks. Experiencing heightened respiratory problems and discomfort due to the plant's emissions, locals have held demonstrations, knocked on the judiciary's doors, and made public appeals for improved conditions. The pervasive odour and pollution have led to widespread discontent and a significant impact on the quality of life of residents.

Elderly individuals, as per reports, are largely confined indoors, relying on air purifiers to cope with the deteriorating air quality. In the legal suits filed, residents have argued that the plant's operations breach environmental and health regulations due to excessive emissions that deteriorate air quality and harm public health. In response, the Delhi High Court has mandated stricter pollution control measures and comprehensive health impact assessments. The Delhi Pollution Control Committee (DPCC) has also conducted inspections to ensure regulatory compliance, while the plant has been directed to upgrade its technology to manage emissions and odours better. Despite these efforts and ongoing community engagement, including public meetings to address grievances, tensions persist over the effectiveness of the measures and the balance between industrial development and environmental protection.

Figure 3: Proposed and Under-Construction Waste-to-Energy (WtE) Projects in Major Indian Cities

City/ Location	Plant Name/ Project	Status	Expected Completion	Daily Processing Capacity (TPD)	Power Output (MW)	Additional Notes
Mumbai	Deonar WtE	Under Construction	October 2025	600	8	Plans are for 3,000 TPD facility and Bio-CNG project to address 7,000 TPD city waste
Bengaluru	Bidadi WtE	Delayed	June 2025	600	11.5	Powers around 2,00,000 households
Kochi	Bharat Petroleum CBG	Under Construction	April 2025	150	-	Converts biodegradable waste to biogas; similar plants planned for Thiruvananthapuram and Kozhikode
Gurugram	Bandhwari WtE	Under Construction	Late 2025	1,800	25	-
Kozhikode	Kozhikode WtE	Planned	2025	-	6	-
Hyderabad	Hyderabad WtE (existing)	Operational	-	-	24	77 MW facility planned
Delhi (Narela-Bawana)	Bhawana WtE	Operational	Since 2017	2,000	24	Faces challenges with waste quality and emissions concerns
Delhi (Bhalswa)	Bhalswa WtE	Under Development	August 2025	3,000	-	Aims to reduce dumping at saturated Bhalswa landfill

Countries successfully implementing WtE

The Warsan WtE plant in Dubai is a leading example of green technology. The world's largest WtE facility, it processes two million metric tonnes of waste yearly—45% of Dubai's total—powering 1,35,000 homes with 200 megawatts of electricity. Operating at 34% efficiency, it reduces fossil fuel use, saving 1.5 billion tonnes of CO_2 emissions annually. With advanced filtration, pollutants like heavy metals are removed, while metals are recycled and ash repurposed for roads, leaving minimal residue. By diverting waste from methane-emitting landfills, Warsan supports sustainability, complementing the UAE's goal to boost recycling to 90% by 2050, showcasing WtE's role in a circular economy.

Sweden's WtE programme showcases green technology by transforming 4.4 million tonnes of household waste annually into energy, achieving a 99% recycling rate. Its 34 WtE plants convert waste like paper, plastics, and biomass into electricity for 7,80,000 homes and heat for 1.5 million households, while biogas from food waste powers buses and buildings. Importing 8,00,000 tonnes of waste, Sweden maximises resource recovery, aligning with circular economy principles. Advanced emission controls minimise pollutants, and WtE reduces fossil fuel use, complementing Sweden's 56% renewable energy mix and low CO_2 emissions. Efficient waste collection and policies like Extended Producer Responsibility (EPR) drive this sustainable, near-zero waste model. India's WtE sector struggles with inefficient waste segregation, low-calorific waste, and regulatory gaps, limiting its scalability and sustainability compared to Sweden's near-zero waste system.

The problem with waste-to-energy

WtE is promoted as "clean energy" because it captures energy from waste, reducing landfill volume by around 87% and recovering metals for recycling. However, it has significant drawbacks which includes:

1. **High Greenhouse Gas Emissions**: Burning fossil fuel-based waste like plastics releases significant CO_2, undermining climate benefits. Although biomass waste emissions are carbon-neutral, variable waste composition reduces WtE's environmental edge.
2. **Harmful Pollutant Emissions**: WtE plants emit particulate matter, heavy metals, dioxins, and acid gases, linked to cancer, respiratory diseases, and neurological disorders. Inadequate filtration and poor smoke management, as seen at facilities like Timarpur-Okhla in Delhi, worsen air quality, sparking community resistance.
3. **Resource Destruction**: Poor waste sorting in mass-burn WtE destroys recyclable materials like plastics and wood, wasting resources that could support a circular economy.
4. **Undermines Waste Hierarchy**: By prioritising incineration, WtE de-emphasises waste prevention, reuse, and recycling, discouraging sustainable practices like composting and hindering long-term sustainability.
5. **Lower Energy Efficiency**: Waste-to-energy processes require approximately 111 grams of high-grade refuse-derived fuel (with a calorific value of around 4,000 kcal/kg) to produce 100 watt-hours, compared to around 55 grams of coal, which results in similar emission levels. Additionally, transporting this refuse-derived fuel requires nine trucks to match the energy output of

Why WtE is considered as green technology?

Reduces Landfill Dependency

WTE diverts up to 90% of waste from landfills, significantly cutting methane-a greenhouse gas 25 times more potent than CO2-produced by decomposing organic waste. This helps mitigate climate change, a core goal of green technology.

Generates Renewable Energy

WTE converts waste, a continuously available resource, into clean electricity, heat, or steam, reducing reliance on fossil fuels. This renewable energy production aligns with green technology's focus on sustainable energy sources

Lowers Greenhouse Gas Emissions

By replacing fossil fuel-based energy and minimising landfill methane, WTE reduces the overall carbon footprint of waste management and energy production, supporting global efforts to combat climate change.

Promotes Resource Recovery and Circular Economy

WTE recovers energy and materials (e.g., metals from ash) from waste, aligning with green technology's emphasis on resource efficiency and circular economy principles, where materials are reused to minimise waste.

Minimises Environmental Pollution

Advanced emission control systems in WTE plants ensure compliance with strict environmental standards, reducing air and water pollution compared to traditional landfills and older incinerators. This cleaner operation supports green technology's aim to protect ecosystems.

Supports Sustainable Urban Development

WTE addresses the challenges of growing waste volumes in urban areas, providing a scalable solution that reduces the need for land-intensive landfills and enhances waste management resilience, a hallmark of green technology's role in sustainable infrastructure.

one truck of coal, further reducing its viability.

6. **Toxic Residual Ash**: WtE generates hazardous ash, often mismanaged. A *New York Times* article (dated November 9, 2024) reported that ash from WtE was being dumped near playgrounds of Delhi without containment, risking environmental pollution and health hazards, especially for children.
7. **Unregulated Waste Trade**: Developed nations export waste to developing countries for WtE, often leading to improper disposal or incineration of hazardous materials, exacerbating environmental and health risks.
8. **High Costs**: Significant setup and maintenance costs, combined with lower energy yields compared to traditional sources, limit WtE's economic feasibility.
9. **Weak Regulation**: Lax emission standards, inadequate monitoring, and limited transparency, particularly in high-waste regions like India, intensify environmental and health impacts, with residents' complaints about pollution ongoing.
10. **Urban Health Risks**: Overreliance on WtE in cities like Delhi worsens air quality, potentially creating "gas chambers", and undermines circular economy goals by prioritising incineration over waste reduction.

Conclusion

To enhance efficiency and minimise the environmental impact of WtE plants in India, a strategic approach is essential. Conducting independent environmental and health impact assessments, engaging communities, maintaining transparency in data, communication and educational initiatives are essential to build trust and ensure sustainability. While the WtE process offers a temporary solution to India's waste management challenges, overreliance on it, risks encouraging plastic overconsumption and toxic emissions, which could escalate as WtE plants proliferate. Prioritising waste reduction, promoting sustainable alternatives like circular economy models, and incentivising eco-friendly materials are critical steps to safeguard the environment. By balancing WtE adoption with long-term strategies focused on waste prevention and green innovation, India can address immediate waste challenges while building a resilient and sustainable future.

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Highlights of the Basel, Rotterdam and Stockholm COPs 2025

Carbosulfan and fenthion were listed in Annex III of Rotterdam Conventions while UV-328, listed as a POP under SC in 2023, was reopened to allow for a specific exemption. Basel Convention discussed how to address textile waste.

By Piyush Mohapatra & Vidhi Mathur

The seventeenth meeting of the Conferences of the Parties (COP) to the Basel Convention (BC), the twelfth meeting of the COP to the Rotterdam Convention, and the twelfth meeting of the COP to the Stockholm Convention (SC) convened together from April 28 to May 9, 2025, in Geneva, Switzerland. This biennial event is held to find sustainable solutions in response to the invisible dangers to health, the environment and economic growth posed by hazardous wastes and chemicals. The theme of this year's COPs was "Make Visible the Invisible: sound management of chemicals and waste".

The 2025 BRS COPs brought together over 1,600 participants, including about 1,190 representatives from 191 countries, as well as ten representatives from states that are not party to any of the three Conventions. The delegates engaged in high-level discussions and adopted resolutions aimed at strengthening global measures to safeguard human health and the environment from hazardous chemicals and waste. These conversations are especially critical as global chemical manufacturing is increasing at a rate of about 3.5% per year, on track to double by 2030, and increasingly concentrated in the Global South. The human health effects alone are estimated to cost up to 1% of the gross domestic product of India, China, and Nigeria.

The Basel Convention's decisions included revisiting its Annex IV (disposal operations). Annex IV defines "waste" under the Convention and helps importing and exporting countries to track and regulate waste processing. The BC COP also adopted a strategic framework to help countries collectively work towards a set of objectives and monitor their progress. The secretariat also offered technical assistance to developing countries to accommodate their unique vulnerabilities and increase the effectiveness of the plastic waste amendments. In this COP, discussions commenced on nanomaterials-containing waste, with more information requested from the secretariat to address waste containing nanomaterials. Furthermore, parties began dialogues on how the BC would address textile waste, a stream of critical importance to countries like India.

The Rotterdam Convention agreed to list two substances in Annex III (subject to the prior informed consent (PIC) procedures) of the Convention: carbosulfan, a pesticide, and fenthion ultra-low volume formulations, a severely

hazardous pesticide formulation. Under this stipulation, the chemicals would be subject to PIC procedure. The exporting countries would need to inform the importing countries about their export, which would ensure that countries have the information they need to make informed decisions about whether to allow imports of these chemicals. The COP could not agree to list several other chemicals, including mercury, methyl bromide, chlorpyrifos and chrysotile asbestos, that are already governed by other international conventions due to objections from other parties. India too expressed its reservations on the listing of methyl bromide and chlorpyrifos, and chrysotile asbestos.

The COP also adopted a decision to enhance its effectiveness by implementing strategies to ensure the meaningful participation of all members of the Chemical Review Committee (CRC), which is responsible for recommending chemicals for listing.

The Stockholm Convention's COP agreed to list persistent organic pollutants chlorpyrifos, medium-chained chlorinated paraffins (MCCPs) and long-chain perfluorocarboxylic acids (LC-PFCAs) under Annex A for complete elimination. Deliberations on specific exemptions were made for each of the chemicals, such as control of locusts (for agricultural use only), control of ticks in cattle, and wood preservation against borers and termites in building for chlorpyrifos; construction materials like wires and cables (excluding uses in indoor living spaces) and specific exemption for adhesives and sealants for MCCPs; and semiconductors and replacement parts of vehicles for LC-PFCAs. Lastly, the COP decided to review MCCPs at SC's COP14 and specific exemptions for MCCPs at SC's COP15, and requested POPRC to prepare reports and recommendations on the matter.

In a first-ever case, the COP agreed to reopen UV-328, listed as a POP in 2023 under the SC, to allow for a specific exemption for use in water sealant tapes and as adhesives for the aircraft industry. There were strong objections from the NGOs and many stressed that this should not be set as a precedent. The exemptions are allowed till 2030 with a caveat for the parties to refrain from using the amendment procedure under Article 22 to add new specific exemptions or acceptable purposes in Annexes A and B after a chemical has been considered by Persistent Organic Pollutants Review Committee (POPRC) and the COP.

The next Triple COP will be held from April 19 to 30, 2027, in Panama City, Panama, to review the implementation of the three conventions and list new chemicals under the Rotterdam and Stockholm Conventions.

The authors are in the Chemicals & Health Team of Toxics Link

At Basel Convention, parties began dialogues on how textile waste would be addressed

Built Environment: Shaping Sustainable Climate Resilient Urban Futures

Choices made in urban planning, architectural design, and material use can either exacerbate environmental challenges or serve as a tool for mitigation

By Swati Vishan

"Built environment" is commonly defined as "human-made surroundings". Buildings, road infrastructure, special economic zones, and other similar structures are included in it. It significantly influences social well-being, economic activity, and environmental sustainability. According to Lawrence and Fudge (2023), it plays a significant role in shaping urban resilience and sustainability, as its design, construction, and maintenance determine energy consumption, resource efficiency, and long-term environmental impact.

However, this development also comes with challenges. With rapid growth of population and rampant urbanisation, unplanned developments are taking place resulting in environmental degradation and resource depletion, the major concerns around the globe.

The built environment globally accounts for approximately 40% of energy-related carbon dioxide (CO_2) emissions, with 28% from operational emissions—the energy used for heating, cooling, and powering buildings—and the remaining 12% from materials and construction processes (World Green Building Council, n.d.). In 2023, primary energy consumption in India increased by 7% to approximately 39 exajoules from the previous year (Statista, 2024). The 8% increase in fossil fuel consumption, which accounted for 89% of the nation's total energy consumption, is largely to be blamed for this surge (The Economic Times, 2024).

In this article, we will explore the intricate correlation between the built environment and climate change, examining how human-made surroundings impact the environment. We will also delve into how the concept of sustainability intersects with the built environment, highlighting the importance of integrating sustainable practices into planning, design, and construction. Furthermore, the article will outline key challenges associated with rapid urban development and discuss effective strategies and solutions to mitigate these issues, promoting a more resilient and environmentally-conscious future.

How Built Environment Impacts the Environment?

A well-planned built environment is critical in addressing climate change and advancing sustainability. Choices made in urban planning, architectural design, and material use can either exacerbate environmental challenges or serve as a tool for mitigation.

Impact on Climate Change

The construction and building industry significantly contribute to global warming. According to Goh & Chong (2023), this industry is responsible for 40% of total waste production, 12% of water use, and 30% of global greenhouse gas emissions. Considering these numbers, it's clear that embracing green construction, energy-efficient buildings, and low-carbon infrastructure is not just a choice but a necessary step for meaningful climate action.

Impact on Sustainability

Traditionally, economic growth has been measured through indicators such as gross domestic product (GDP) and gross value added (GVA) with a focus on financial output, often at the expense of social and environmental factors. This has led to resource depletion, loss of air and water quality, and dwindling biodiversity, all of which are ignored by conventional metrics.

Ecosystem services tend to be undervalued, stalling growth that addresses such neglect. Researchers and policymakers, however, have been promoting transition from a consumption-driven economy to one that prioritises

conservation. Jong-Jin Kim (2009) strongly advocates for the construction of policy frameworks that integrate ecological and social costs alongside traditional profit and revenue calculations.

Construction in the name of development often ignores the resource's inherent value and continues to exploit nature on a grand scale. We require an approach to integrate sustainability measures that encompass the true aspects of value into economic planning. Sustainable development is achievable by balancing economic growth with community and environmental wellbeing. And if we do not balance, the cost of an industrialised infrastructural environment will continually escalate while remaining a dominant influence on nature and life, rather than aiding humanity to support life sustainably.

Key Components of a Sustainable Built Environment

All phases of the built environment should integrate sustainability, but the stages of acquisition and design in particular have long-lasting impact on the environment. The decisions made in these stages, including choosing the materials, energy planning, and land use are impactful in the long run. A truly sustainable built environment needs to consider a wide array of interrelated system factors that affect the environment, economy, and society. The next few sections highlight particular aspects that define sustainability in the built environment:

Land Use and Planning

Indian cities are experiencing problems such as population congestion, reduction of green areas, *etc.* Optimal use of space in different regions would be helpful in reducing environmental destruction and managing rampant urban growth in India. Smart growth techniques involves integration of residential, commercial, and recreational areas to conserve land and help reduce long travel times (Newman & Kenworthy, 2015). Among the objectives of the National Urban Transport Policy (NUTP) is also to incorporate transportation at the urban planning stage rather than considering it as a consequential requirement (MoHUA, 2014).

Eco Design in Architecture

In India, sustainable architecture applies passive design methods which include using natural ventilation and daylighting to minimise the use of artificial energy (Vale & Vale, 2013). The Bureau of Energy Efficiency (BEE) guidelines under the Energy Conservation Building Code (ECBC) endorses energy-efficient buildings. Construction projects are cross-evaluated against green building practices using LEED and GRIHA certifications which award eco-sustainability milestones (Roderick et al., 2009). Toxics Link emphasises on the need for materials with no toxins, low emissions, and high recyclability to mitigate ecological impacts.

There are eco-designs guiding key elements and principles. These elements constitute rules towards ensuring a balance between design processes and environment friendliness of the resultant products. Some important elements of eco-design are mentioned below (Toxics Link, 2023):

- Dematerialisation
- Design for durability
- Design for eliminating toxicity
- Use of low impact materials
- Design for repair
- Design for upgradability
- Design for reuse
- Design for recyclability

Energy Efficiency and Renewable Energy Integration

Improved insulation, smart energy management system, and optimised ventilation systems are all necessary for boosting energy efficiency in Indian buildings. Indian authorities promote renewable power integration through schemes like the Solar Cities Programme and net metering for rooftop solar panels (MNRE, 2021). Initiatives like the Energy and Resources Institute's (TERI) model of green buildings promote self-sufficient energy structures that generate as much power as they consume in light of an increasing focus on net-zero buildings (Torcellini et al., 2006).

Sustainable Materials and Construction Practices

The carbon footprint of projects involving built environment is reduced when recycled and domestically sourced materials are used. Prefabricated building components, bamboo and fly ash bricks are just a few examples of environmentally-friendly building materials that have become increasingly popular in India (Kibert, 2016). There is the need to incorporate circular economy principles in material reuse and waste management as emphasised in previous Toxics Link reports.

Waste Management and Circular Economy

The construction sector in India generates a significant amount of waste. The industry needs to adopt the concepts of reuse and recycle. The C&D Waste Management Rules rolled out in 2016 steers waste handling towards safer disposal and resource recovery (MoEFCC, 2016). Waste-to-energy technology, for instance, turns biodegradable scraps into biogas and electricity (Morris, 1996). It's a handy alternative to dumping compostable waste in landfills, and in most cases, it helps bridge old methods with newer solutions.

Climate Resilience and Disaster Preparedness

Urban planning today is increasingly shaped by the need to build climate resilience, particularly in response to the growing frequency of extreme weather events such as heatwaves, floods, and cyclones. Infrastructure development now emphasises adaptive strategies—such as elevated housing in flood-prone areas and the use of heat-resistant materials—to reduce vulnerability (IPCC, 2014). Nature-based solutions, including urban forests, wetlands, and bioswales, are gaining prominence for their ability to mitigate urban heat island effects and enhance biodiversity (Gill et al., 2007). Additionally, the integration of smart city technologies—like IoT-based environmental monitoring—enables real-time disaster response and data-driven planning (Batty et al., 2012). While the implementation of these strategies may vary, they collectively reflect a shift towards more resilient and sustainable urban development.

Social and Economic Sustainability

A sustainable built environment must ensure social and economic inclusivity. Equitable access to public spaces, green areas, and pedestrian infrastructure fosters inclusive urban development (Talen, 2010) such as the Pradhan Mantri Awas Yojana (PMAY) that aims to provide affordable housing while integrating green building principles to ensure long-term sustainability (MoHUA, 2015).

Conclusion

The integration of sustainability principles into India's built environment is crucial for addressing the challenges of rapid urbanisation, resource depletion, and climate change. There is a pressing need for a shift towards sustainable planning, design, and construction. Reducing the environmental impact of built environment and promoting long-term social and economic well-being requires key components such as energy efficiency, eco-design, sustainable materials, and climate resilience. The recent developments in Hyderabad's Kancha Gachibowli area serve as a pertinent example of the complex interplay between urban development and environmental conservation.

In February 2025, the Telangana government announced plans to auction approximately 400 acres of forested land adjacent to the University of Hyderabad (UoH) for the development of IT parks. The Telangana High Court ordered a halt to the clearing operations and the Supreme Court subsequently stayed all activities on the land, citing concerns over environmental degradation and the need for proper assessment. This case underscores the challenges of balancing build infrastructure with environmental preservation (TOI, 2024, April 3).

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IN A TÊTE-À-TÊTE WITH CHARLES G. BROWN

An attorney, an author, and a civil rights worker, Charles G. Brown has worn many hats. But since 2001, nine years before he founded the World Alliance for Mercury-Free Dentistry, his only mission has been to protect human health and environment by making dentistry amalgam-free worldwide. In an interview with Toxics Link, Charlie tells us why it is time to phase out and not just phase down mercury amalgam use from dentistry.

Toxics Link: You are an attorney, and we know you as the founder of the World Alliance for Mercury Free Dentistry. Tell us more about yourself; how and when did you start advocating for mercury-free dentistry?

Charles Brown: Yes, I am an attorney. Back in the 1990s, when I was in a law firm, a few dentists came to us and told us that the dental fillings that the American Dental Association called "silver" was not silver. It was "mercury". We were shocked to learn that. They were scared that their license to practice would be withdrawn by the state dental licencing board at the behest of the American Dental Association because they were not using mercury amalgam fillings and also explaining why they were not using to their patients. We represented those dentists and argued for their freedom of speech enshrined in the First Amendment to the US Constitution. We won the case. That was the beginning. We then established the Consumers for Dental Choice, a non-government organisation.

In 2001, I decided to leave my law firm and start working towards mercury-free dentistry full time. It was all domestic till I learned through my colleague, Michael Bender of Mercury Policy Project, that a world treaty was being negotiated. It was our the then President Barack Obama, who had given a clarion call to the world to do a treaty on Mercury. I was advised to gather together different groups from across the globe and get them under one tent with one unified voice. So, in February 2010, the World Alliance for Mercury Free Dentistry was born. It was initially an idea, and as the treaty negotiations began later that year, a worldwide coalition was built brick by brick.

Amalgam use is a 150-year-old tradition in dentistry, and we are trying to undo the mistake of a horrible decision made in the middle of 19th century.

The World Alliance for Mercury-Free Dentistry is more of a huge global campaign against dental amalgam.

Yes, that's exactly what it is. We are working in about 60 countries. We have our Asian Centre for Environmental Health in Dhaka, Bangladesh, and we have partners all over the ASEAN region—Philippines, Vietnam, Indonesia, etc. Nepal was the first country to ban amalgam. Mongolia has ended amalgam use; Japan did so years ago after its horrid mercury poisoning experience. China has banned it for children, pregnant and breastfeeding women. We are seeing a lot of success across Asia, and we are very seriously working in Arab and European Union nations. In the Americas, we have campaigns from Brazil to Canada and Jamaica. We have worked in Colombia, Argentina, and Mexico. In the Pacific, we have a campaign successfully run from Fiji.

Mauritius, which is between India and Africa, had banned amalgam for children before the European Union did, more than 10 years ago. We have a very intense campaign across Africa. Tanzania and Gabon have already banned. Zambia and Tunisia have also banned amalgam for children. Many other countries are also quite close.

What similarities or differences have you found in responses from different continents /countries on amalgam. Are there symmetries in responses from block or group of countries?

When countries act on amalgam, there are generally three types of responses. There are:

- *Countries that are phasing out amalgam use:* The European Union, Japan, Moldova, Nepal, Norway, Philippines, Russia, St. Kitts and Nevis, Suriname, and Tanzania among others, have phased out amalgam use, announced plans for phasing out amalgam use, or use de minimis amounts of amalgam.
- *Countries that are ending amalgam use in children:* Mauritius and Vietnam have ended or are ending amalgam use in children specifically.
- *Countries that are ending amalgam use in programmes:* Bangladesh's armed forces, Indonesia's government health insurance, and Mongolia's ban on amalgam procurement are ending amalgam use in these government programmes. Private organisations are ending amalgam use too, like the Cameroon Baptist Convention hospital system's network of dental clinics–which provided oral care to approximately 47,000 in 2016–phased out amalgam use more than a decade ago.

Some countries start with one response and then go further. For example, the European Union ended amalgam use in children and then phased out all amalgam use.

Sometimes entire regions are united in their response to amalgam. For example, the entire European Union – all twenty-seven nations – have banned amalgam, as have nearby countries like Norway. And the whole African Region has jointly proposed to amend the Minamata Convention on Mercury to add a 2030 phase out date for amalgam.

Tell us about the ease of shifting and adapting to latest/ newer technology or material. Are there generational barriers?

Mercury-free filling materials were developed more than half a century ago, so all competent dentists practicing today – regardless of their generation – know how to use these alternatives. However, they might have learned to use mercury-free fillings from different sources, depending on their generation. For example, recent dental school graduates and all current dental

students are trained extensively on how to use mercury-free fillings. Dentists who graduated decades ago are more likely to have supplemented what they learned about mercury-free fillings in dental school with continuing education training or years of experience with using these alternatives.

Is there significant effort/research ongoing to improve the longevity of restorative materials. Any lead countries?

Research increasingly shows that mercury-free fillings can last as long as – or longer than – amalgam. With research and development to improve mercury-free fillings ongoing, future studies will show that the most current generation of mercury-free fillings have even greater longevity. But more and more research is recognising that the longevity of the filling is not as important as the longevity of the tooth itself. For that reason, it is also important to consider ways that mercury-free fillings can help increase the longevity of the tooth. Mercury-free fillings preserve tooth structure that must be removed to place an amalgam filling, mercury-free fillings can help prevent future caries, and mercury-free composite fillings can be easier to repair than amalgam.

Research is taking place in many countries, and we urge India to become a leader in the march towards mercury-free dentistry.

Tell us about your recent visit to India.

I went to Delhi this time to try to convince the Government of India to support the worldwide ban on amalgam use by 2030. I had some very good meetings with the government and the Union Ministry Health and Family Welfare seems supportive. But the Ministry of Environment is still undecisive as they find the cost of alternatives on the higher side. However, the major dental stakeholder, the India Dental Association (IDA), supports the end of amalgam and we are delighted. The middle class in India, just like the middle class in the United States, is not using amalgam, but we can't rest there. We have to stop use of amalgam among all—urban and rural, rich and poor.

It's been 12 years since the Minamata Convention. What, according to you, is preventing many countries from accelerating this phase down?

It's the dental lobby group. Some dentists choose to continue to use this dangerous product that's also toxic in the workplace. The American Dental Association owned patents on amalgam and also, like the World Dental Federation talks about cavity prevention but takes money from candy and beverage companies. The dental associations in the West are very different from the dental associations in the east. The American, Canadian, Australian, British, European are pro-mercury. They want to make quick and easy money and have forgotten they are health professionals first.

We want to understand does a federal structure like that in the US and India becomes an impediment to policy action.

Federal systems do have that balance of power or tensions of power, that's correct. It's harder to win completely in a federal system with different power centres. In the United States, the federal government approves the products, but the states regulate the professions. Probably when we have one system like in Bangladesh, it's easier, but in a federal structure, you have a chance to find niche victories. For example, in India, you can have a win in Rajasthan or Kerala. It's the same in our country. But like the US Supreme Court, which had famously called states laboratories of democracy, a state can step up and say, we're going to get ahead of everybody else. In that sense, a federal system is a blessing, but in terms of trying to finish something, it's harder.

Amalgam fillings

In India, as we know, filling cavities with mercury amalgam is still being taught in dental colleges. Is it also being taught in the US?

Dental colleges need to show proficiency in dentistry, but not in amalgam. In the United States, we have regional testing centres, and they do vary in terms of their emphasis on amalgam. My early expectation was that the dental schools would lead the campaign to end amalgam. I was mistaken. Many professors like teaching it; that's the only thing they know how to teach. The dental schools did not lead then, but they are now catching up. Some of them have very much de-emphasised amalgam.

What would be your message to the dental practitioners in India?

Modern dentistry is mercury-free. You're poisoning yourself, your workers if you are using mercury amalgam. In the United States, dentists have the highest suicide rate in any profession because so many are using toxic mercury which drives you crazy. It's terrible to the environment, and in a crowded country like India, it will stay forever poisoning future generations.

What would be your message to the government?

Phase down has gone on for 20 years. I hope the Indian Government would accept that five more years is long enough to end amalgam by 2030. The dental students need to know it has no future, the public needs to know it's a risk, and the governments need to plan the end of amalgam. The Minamata Convention Treaty says to phase out amalgam by 2030, but it's voluntary. We want to make it a legal mandate to stop amalgam trade.

Are you also looking at another declaration making the amalgam phase out mandatory?

Yes, at present it's a mandate for children, and pregnant and breastfeeding women. We would like to shift it from being a goal to a mandate for all because some dentists aren't getting the message, some countries may not be getting the message, and some companies are still making it.

Are you talking to industries manufacturing mercury or persuading them to shift to some other alternative?

Oh, very much. We kept pushing two big US companies, but the turning point was when the US Food and Drug Administration said this is dangerous and don't give it to children and pregnant women. They stopped manufacturing amalgam. We are pushing other companies to get out. The Australian companies are at the top of the list, and

there are also individual companies in Turkey, Israel, US. We have tried to end it through consumers, by stopping usage by dentists and also by cutting off the supply. All of these are working.

Your commitment to phasing out mercury is apparent to all of us? How do you stay so motivated?

Well, I want to finish this. I have done different things in my life but this is something I feel like I can't leave it behind. Two dentists Andy Landerman and Hal Huggins, who wrote the book *It's All in Your Head: Diseases Caused by Silver-Mercury Fillings*, have influenced me. When Hal Huggins met me, he said, "How would you like to help a billion people?" I thought, my goodness, how could I do that? He said, well, if can we get mercury out of use in dentistry? That's my legacy, and I would better do it.

My work takes me all over the world, and I meet fantastic people who are so committed. I am so impressed with the NGO communities that I work with. Maybe, if I live long enough and have the time, I can write it all up.

STUDENTS CORNER

Making Cities Safe for Pedestrians and Cyclists

A footpath is not a luxury—it is the most democratic space in a city. It belongs to everyone: the child, the old man, the worker, the dreamer.

By Intekhab Kamal

In today's cities, the space for the common man is quietly shrinking. Roads are getting wider, cars are moving faster, and flyovers are popping up everywhere. But what about the footpath? What about the simple joy of cycling? Somewhere in our race for speed, we have forgotten: cities are meant for people—not just for vehicles.

In India, more than half of city dwellers walk or cycle to get around. But if you have ever tried walking in an Indian city, you know how tough it is. Cracked pavements, garbage piles, and rushing traffic turn a simple walk into a Herculean task. And when you finally find a footpath, chances are there would be no space for you to walk on. Many footpaths are taken over by street vendors, food stalls, parked bikes, and sometimes even garbage bins. A place meant for walking becomes yet another challenge to squeeze through. A government survey says only 20% of Indian roads have proper footpaths, and less than 5% have cycle tracks. That's a very small share for such a large number of people. And this isn't just inconvenient—it's dangerous.

Every year, around 25,000 pedestrians lose their lives on Indian roads. Cyclists too risk their lives daily, caught between speeding cars and trucks with no safe space of their own. A few weeks ago, I tried walking to a nearby park. I thought it would be peaceful. Instead, I ended up jumping over potholes, squeezing against walls to dodge traffic, stepping around vendor carts, and gasping for breath under the hot sun—with not a tree in sight. It hit me then: our cities have forgotten the people who move on their own two feet.

In India, walking and cycling often feel like acts of bravery. But it doesn't have to be this way. Look at Japan, in cities like Tokyo and Kyoto, narrow streets are made for walking. Children cycle to school, elderly people stroll to the park, and traffic moves around people and not the other way around. Japan also has one of the lowest pedestrian death rates in the world—thanks to good planning, strict rules, and a culture that respects shared space. European cities like Amsterdam and Copenhagen have shown the same spirit. With well-planned cycle lanes and pedestrian-friendly zones, they have built cleaner, greener, and happier cities. Even some Indian cities like Bengaluru, Pune, and Chandigarh are trying out "non-motorised transport" zones. But there's still a long way to go. This isn't just about comfort. It's about fairness, health, and the planet. When we walk or cycle, we cut down pollution, we save money, we stay healthy, and most importantly, we make cities fairer. A footpath is not a luxury—it is the most democratic space in a city. It belongs to everyone: the child, the old man, the worker, the dreamer.

As people who care about the future, we must ask: Why do the cleanest forms of travel get the least attention? Why should walking and cycling feel like a punishment? A smart city should not be one filled with cars—it should be one where no one is forced to drive. Our future cities must be walkable, breathable, and made for people. It's time we make space for the ones who truly move our cities—one step and one cycle at a time.

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STUDENTS CORNER

Noise Pollution: Combating The Silent Crisis

The question isn't whether we can afford to address noise pollution, it's whether we can afford not to

By Aditi Choudhary

The constant drone of traffic, incessant honking, blaring loudspeakers, construction jackhammers, and industrial machinery have become the unwelcome soundtrack of modern urban life. Beyond being a mere irritant, this invisible pollutant, noise, is slowly eroding public health and ecological harmony in ways we are only beginning to comprehend fully.

With the World Health Organization (WHO) now estimating that over 1.6 billion people worldwide face harmful noise levels daily, we can no longer afford to turn a deaf ear to this growing crisis. The impacts reach far deeper than momentary annoyance, affecting everything from our cardiovascular health to our children's cognitive development.

The Deafening Reality: Understanding Our Sonic Landscape

Within India's rapidly expanding urban centres, the situation has become particularly dire. A walk through any major city reveals noise levels that regularly exceed permissible limits by 20-30 decibels. Visit commercial hubs or industrial zones, and you might encounter readings above 100 decibels, roughly equivalent to standing next to a running motorcycle or power saw.

Even after 10 o'clock at night, when cities should settle into restful quiet, many urban areas continue to buzz with activity--late-night establishments playing loud music, vehicles with modified silencers, and ongoing construction work--disregarding time restrictions. The Supreme Court of India's landmark judgment on Noise Pollution (V) In re (2005) established that silence zones must observe silence between 10 pm and 6 am, with ambient noise levels not exceeding 40 decibels. Despite this ruling, a 2024 study by the National Environmental Engineering Research Institute (NEERI) found that over 78% of urban areas in India exceed this limit by 15-25 decibels during nighttime hours, directly contributing to what the Indian Council of Medical Research (ICMR) terms "noise-induced sleep disturbance syndrome".

The situation is equally troubling for communities situated beneath flight paths. According to a 2023 study published in the Journal of Aviation Medicine, residents near major Indian airports endure the repetitive roar of aircraft with sound levels frequently exceeding 85-95 decibels during take-offs and landings. The communities within a 10-kilometre radius of Delhi's Indira Gandhi International Airport experience up to 300 aircraft movements daily, with each creating noise events well above the 55-decibel threshold set by WHO.

Recent findings from the European Environment Agency have drawn alarming connections between prolonged exposure to noise levels above just 55 decibels (comparable to a busy office) and serious health conditions. Traffic noise has emerged as Europe's second most harmful environmental stressor, trailing only air pollution. The consequences—increasing cases of cardiovascular diseases, sleep disruptions, cognitive impairment in children, and rising rates of anxiety and depression—should serve as a wakeup call for communities worldwide.

Innovative Solutions from Around the Globe

The good news? Around the globe, innovative approaches to taming this chaotic soundscape are showing remarkable promise. In the Netherlands and Japan, driving along certain highways might feel unusually peaceful thanks to pioneering porous asphalt technology. These specialised road surfaces don't just reflect sound waves; they absorb them, reducing traffic noise by up to 7 decibels. The difference is immediately noticeable to both drivers and nearby residents.

Meanwhile, cities like Singapore and Barcelona have embraced nature's sound-dampening potential. Their comprehensive "green wall" programmes along highways and major roads aren't just visually appealing, they're acoustic shields. A study published in the Journal of Environmental Management confirmed what residents already sensed: these vegetated barriers can slash traffic noise by 8-10 decibels while simultaneously purifying the surrounding air.

The Noise Pollution (Regulation and Control) Rules, 2000, as amended in 2010, mandates the establishment of "silence zones" encompassing areas within 100 metres of hospitals, educational institutions, courts,

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and religious places. According to guidelines issued by the National Green Tribunal in Hardeep Singh vs SDMC & Ors. (2022) case, these zones require ambient noise levels to remain below 50 decibels during daytime and 40 decibels during night hours. The Supreme Court's ruling in Farhd K. Wadia vs Union of India (2009) further strengthened these provisions by authorising immediate seizure of loudspeakers and equipment violating noise standards in these critical zones. A 2023 assessment by the Central Pollution Control Board, however, revealed that only 37% of designated silence zones across major Indian cities effectively maintain required noise levels, highlighting significant enforcement challenges.

India's Path Forward

For India, these global examples offer valuable lessons that can be adapted to our unique context. While the Noise Pollution (Regulation and Control) Rules established standards in 2000, enforcement remains the primary challenge. Creating dedicated noise enforcement units within pollution control boards could finally bridge this implementation gap and give teeth to existing regulations.

India faces additional challenges from cultural and religious celebrations that often involve loud music and fireworks. In the landmark case of Balwant Singh vs Commissioner of Police (2014), the Supreme Court balanced constitutional rights to religious expression with citizens' right to health, ruling that the noise level at the boundary of public places where loudspeakers or public address systems are used should not exceed 10 dB above the ambient noise standards for the area or 75 dB, whichever is lower. The Maharashtra Pollution Control Board's analysis of festival seasons revealed that Ganesh Chaturthi and Diwali celebrations in Mumbai produce sustained noise levels of 100-110 decibels in residential areas, well above the 55-decibel safety threshold established by medical research.

The rampant culture of honking presents another unique Indian challenge. The Central Road Research Institute's 2023 traffic noise study quantified that unnecessary honking contributes to approximately 40% of urban traffic noise in Indian metropolitan areas. The National Transport Research Institute documented that major intersections in Delhi experience an average of 628 horn events per hour during peak traffic, creating sustained noise levels of 87-95 decibels. Section 190(2) of the Motor Vehicles Act, 1988, and Rule 119 of the Central Motor Vehicles Rules, 1989, explicitly prohibit needless honking and mandate horns not exceeding 83 decibels. Yet the National Crime Records Bureau reports that enforcement remains among the lowest for any traffic violation. The "Horn Not OK Please" campaign implemented in Mumbai, which combines awareness with automated fine systems at key intersections, demonstrated significant reduction in honking incidents according to the Maharashtra Transport Department's evaluation report.

As our cities continue to rapidly expand, we have a fleeting opportunity to avoid the acoustic mistakes made elsewhere. Incorporating sound considerations into master plans for new developments while retrofitting existing areas with noise reduction solutions could prevent countless future problems. The Smart Cities Mission provides an ideal platform for integrating comprehensive noise management strategies.

India also possesses unique advantages in addressing this challenge. Our architectural heritage includes numerous noise mitigating designs, from traditional courtyard homes to stepped wells, which naturally create tranquil spaces amid chaotic surroundings. By reviving and adapting these principles for modern construction, we could develop culturally appropriate solutions that honour our past while protecting our future.

Similarly, indigenous materials like bamboo offer possibilities for developing cost-effective acoustic panels and barriers suited to Indian budgets and environmental conditions. Rather than relying solely on imported technologies, investing in local research and innovation could yield solutions that address our specific noise challenges while creating new economic opportunities.

The path towards quieter, healthier environments isn't a single highway but rather a network of approaches combining thoughtful urban planning, robust regulatory frameworks, technological innovation, and active community participation. While the challenges are substantial, the examples highlighted above demonstrate that meaningful noise reduction is achievable with coordinated effort and political will.

The benefits extend far beyond environmental protection. Quieter communities experience improved public health outcomes, enhanced quality of life, and even economic advantages through increased productivity and reduced healthcare costs. As we face the growing cacophony of modern life, the question isn't whether we can afford to address noise pollution, it's whether we can afford not to. The evidence is clear, the solutions are emerging, and the time for action is now, before the damage to our collective health and ecosystems becomes irreversible.

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Basel Ban (Amendment): Implications For India

By Piyush Mohapatra & Tripti Arora

In the 1970s-80s, laws regulating hazardous waste gained momentum in developed countries, resulting in a large number of industries seeking cheaper sites for disposal. This led to an increase in export of hazardous waste to developing countries, who were promised substantial revenues for accepting wastes and often under the guise of recycling to circumvent import rules or domestic regulations.

Considering these challenges and to protect the environment and human health, the global community, under the auspices of the United Nations Environmental Programme (adopted the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal in 1989 which came into the force in 1992. It The aim objective objective was to establish checks and balances on waste exports among the sovereign nations. The convention did not ban transboundary movement of waste, instead, it introduced the "prior informed consent" procedure. It meant, if both the importing and exporting countries agreed, the waste could be traded.

The objective of the Basel Convention is to protect human health and the environment from the adverse effects of wastes, in particular taking into account the vulnerabilities of developing countries. The treaty obligations include: 1) reducing and minimising waste at source; 2) managing wastes within the country in which they are generated; 3) reducing transboundary movement of wastes to a minimum; 4) managing wastes in an environmentally sound manner; and 5) strictly controlling waste trade via a notification and consent mechanism known as "prior informed consent". The treaty currently has 187 Parties.

However, with time, as export of hazardous waste, both legally and illegally, continued from developed to developing countries, questions were raised on the legal implications of the Basel Convention. The convention had several provisions that allowed exporters to find ways to continue shipping hazardous waste It resulted in a huge environmental burden on the developing countries with instances of illegal dumping of hazardous waste in many developing countries since the passing of the Basel Convention[1]. Even after many years, flagrant violations of the convention continued to persist at the hands of developed countries, putting the communities and ecosystems of importing countries under threat.

Adoption of Basel Ban Amendment

These loopholes in the Basel Convention were consistently raised by civil society groups and stakeholders at the

Conference of the Parties (COPs). As a response, the Basel Ban Amendment was adopted in 1995. The amendment aimed to strengthen the convention and prohibited export of all hazardous waste for disposal or recycling from Organisation for Economic Cooperation and Development (OECD) countries, the European Union (EU), and Liechtenstein and the countries that ratified the ban amendment (Annex VII) (as defined by the convention) to non-OECD (non-Annex VII) countries. Though the Basel Ban Amendment was adopted in 1995, it didn't get enough support of the parties to enter into force. Efforts were made by some developed countries to delay or weaken the amendment. Finally, the amendment was passed in the Tenth Conference of the Parties in 2009, with ¾ of the parties present and voting. However, it was 10 years later in 2019, with the inclusion of St. Kitts and Nevis and Croatia, that it gained the requisite number to enter into force[2]. This resulted in a new beginning.

While the Ban Amendment is legally binding only for countries that ratify it, all Basel Parties must still respect the import prohibitions of other Parties. For example, an Annex VII country—regardless of its ratification status—cannot export hazardous waste to a non-Annex VII country that has ratified the Ban, as that country's ratification is considered a national import prohibition (Article 4(1)(b)). Likewise, non-Annex VII Parties that have not ratified the Ban Amendment cannot import hazardous wastes from those Annex VII Parties that have. Since the Ban Amendment has now become a part of the Convention, therefore, any violation of the amendment is treated like any other violation of illegal traffic under the Convention.

However, if neither the exporting nor the importing country has ratified the Ban, the Amendment doesn't apply, leaving a grey zone that continues to be exploited. For example, Germany, an EU country that ratified the Basel Ban in 2002, cannot legally export hazardous waste to India, and any flagrant violation of this

1 https://www.investigatewest.org/news/rich-countries-are-illegally-exporting-plastic-trash-to-poor-countries-data-suggests-17691823

2 https://ipen.org/sites/default/files/documents/ban-basel-fact-sheet-v2_3-india-en.pdf

would be subject to the non-compliance mechanism of the convention and international condemnation. However, the United States of America, one of the few OECD nations that have not ratified the Basel ban, can easily export hazardous waste to India without any legal implications (latest estimates of plastic exports are given below).

The Indian Scenario

India was one of the first countries of the global south in the early 1990s to call for a ban on exports to developing countries. India notified the Hazardous Wastes (Management and Handling) Rules, 1989, before the Basel Convention came into force in 1992, and became a party to the Basel Convention the same year. Subsequently, to properly align the national law with the convention, India made amendments to the Hazardous Wastes Rules in 2000 and 2003. A revised version of the rules, titled Hazardous Waste (Management, Handling and Transboundary Movement) Rules, was promulgated in 2008. Over the years, the issue of the transboundary movement of hazardous waste has remained an important one for the country. The rules were revised again in 2016. They are now called "The Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016". Among the traded wastes, electronic waste (e-waste) remains a concern for the country, and thus, the E-Waste (Management) Rules, 2016, came into being to manage the voluminous quantity of e-waste generated in the country.

India has robust waste regulations in place, especially to control the import of hazardous waste but is yet to declare a ban on the import of hazardous wastes; and, the Basel Ban Amendment, which is critical in the context of global waste trade, has not been ratified. It is pertinent to mention here that China, Indonesia, and Malaysia, the major waste importing countries of Asia and South Asian countries like Maldives and Sri Lanka, have also ratified the Basel Ban Amendment.

India is one of the fastest growing economies of the world and is open to accelerate the industrialisation pace, that can potentially lead to generation of much more hazardous waste. It may be mentioned here that the country on its own generated 6.2 million metric tonnes of hazardous waste in 2024, and is grappling with managing it in an environmentally sound manner. Hence, there is an obvious concern that non-ratification of the Basel Ban Amendment is making India much more vulnerable to hazardous waste import, wherein traders will look at the country as the hazardous waste export destination from non-ratifying countries like the US, Japan etc.

Basel Ban Amendment and Employment

In India, waste recycling is a source of employment and livelihood for many people, with a large number of formal and informal workers engaged in the waste recycling sector. But ratification of the Basel Ban Amendment will have a negligible impact on employment. On the other hand, it will encourage adoption of safer recycling practices and also protect the health of the workers. The Basel Ban Amendment only restricts import of hazardous wastes, including wastes of Persistent Organic Pollutants (POPs), electronics, obsolete ships, flammable liquids and toxic heavy metals, which are considered to be toxic for the environment and human health.

Waste trade is most often a violation of a true circular economy. It exploits the externalisation of costs in a very linear manner--making others pay the bill for harm and pollution best prevented at source. Considering all environmental, public health and socio-economic costs, ratification of the Basel Ban Amendment would benefit India by internalising those costs by making those responsible bear the cost of their actions.

Observation

India's waste challenges are quite evident, as the informal waste recycling sector continues to play a dominant role in waste management. Further, the impact of hazardous waste recycling on the environment and health has not yet been documented adequately. Therefore, considering India's ground situation, it is prudent to understand the challenges and social cost of hazardous waste recycling and and the need to ratify the Basel Ban Amendment to safeguard India's environment.

PUBLICATIONS

Lead in Solvent–Based Paints

This compliance monitoring report presents new data on the total lead content in solvent-based paints available in Indian markets for home use. It also provides background information on why lead paint is a source of serious public health concern, especially for children; reviews the national policy frameworks that are in place to ban or restrict the manufacture, import, export, sale, and use of lead in paints; and strongly underlines the need to strengthen compliance monitoring and enforcement of regulations on lead content in paints in our country.

Toxic Threads: Assessing Nonylphenol Contamination in Indian Textiles & the Environment

This study assesses the presence of Nonylphenol (NP) in textile products available in the Indian market, investigates NP contamination in river water, sediment and effluent samples from near major textile hubs of India, and evaluates the potential environmental and human health risks due to NP and its Nonylphenol Ethoxylates (NPEs) exposure. High NP levels detected in consumer textile products, especially innerwear and children's clothing, raise concerns about prolonged human exposure. The findings indicate that industrial discharge is a primary source of NP pollution in major rivers, posing risks to aquatic ecosystems and human health.

CLIMATE CHANGE SERIES

Public Lecture on "India in the Global Climate Agenda: Baku & Beyond"

Toxics Link, in collaboration with the India International Centre (IIC), began a public lecture series on climate change at the IIC main building in New Delhi on March 19, 2025. The first in the series was a discussion on "India in the Global Climate Agenda: Baku and Beyond". It saw academicians, civil society, media, students and environmentalists deliberate, debate, and envisage the future of climate action.

The panel included Mr Amitabh Sinha, Deputy Editor of *The Indian Express*; Mr Srinivas Krishnaswamy, Founder Trustee and CEO of Vasudha Foundation; and Dr Manish Kr Shrivastava, Associate Director of Earth Science and Climate Change at The Energy and Resources Institute (TERI).

The discussion was moderated by Mr Satish Sinha, Associate Director, Toxics Link. Amitabh Sinha highlighted India's current climate action status, while Srinivas Krishnaswamy emphasised equity and finance needs in global negotiations. Dr. Manish Shrivastava stressed the role of innovation and scientific research in shaping India's future climate commitments. The session concluded with an engaging Q&A with students, researchers, and experts.

With this lecture, we begin a series of conversations on climate change, aiming to discuss all aspects of this global problem: the impact, cause, and solutions.

Read the report: https://toxicslink.org/publications/public-lectures/public-lecture-on-india-in-the-global-climate-agenda-baku-and-beyond

ABOUT **TOXICS LINK**

Toxics Link is an Indian environmental research and advocacy organisation set up in 1996. The non-profit is engaged in disseminating information to help strengthen the campaign against toxic pollution, provide cleaner alternatives, and bring together groups and people affected by this problem.

More at: www.toxicslink.org

ABOUT **TOXICS DISPATCH**

Toxics Dispatch was started with the objective of creating awareness about pollution related to the management of waste and hazardous chemicals and their impact on the environment and public health.

The periodical highlights pressing issues of hazardous domestic, biomedical, municipal and e-waste, international waste trade, endocrine disrupting chemicals, Anti-Microbial Resistance, pesticides and Persistent Organic Pollutants, Bisphenol and other toxic chemicals like lead and mercury to help strengthen the campaign for safer alternatives.

Toxics Link
for a toxics-free world

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