Toxics Link
for a toxics-free world

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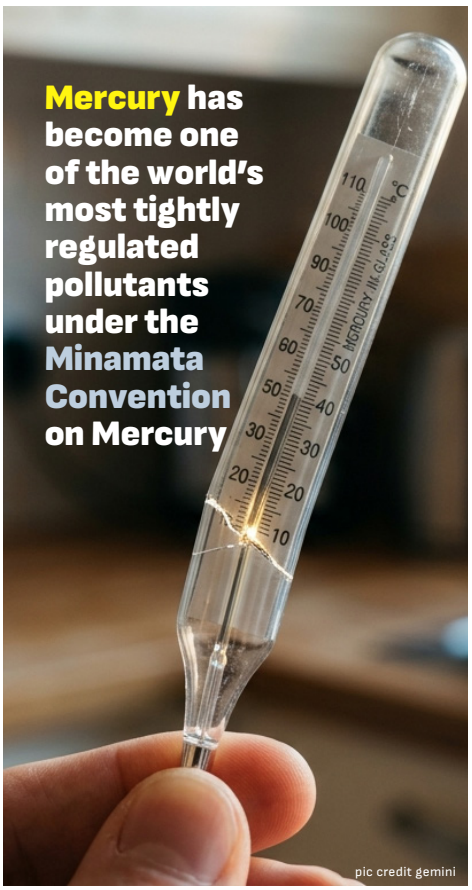


# Mercury, Minamata and the Politics of a Toxic Metal

By Garvita Srivastava

In April 2026, doctors in Pune reported a rare and alarming case: a nine-year-old girl slipped into a coma-like neurological condition after consuming an unregulated herbal powder prescribed for a facial skin condition. Laboratory analysis later revealed extraordinarily high mercury concentrations in the product – over 1,100 mg per 100 g. The child developed severe hypertension and Posterior Reversible Encephalopathy Syndrome (PRES), a rare neurotoxic condition linked to mercury exposure.

Just months earlier, Kerala's "Operation Saundarya" uncovered counterfeit cosmetic products containing mercury levels nearly 12,000 times above permissible limits. Authorities seized products worth several lakh rupees and registered cases against multiple establishments. These incidents are not isolated. They reveal a deeper global problem: mercury continues to persist in consumer products, informal markets, industrial systems, and medical waste streams despite decades of scientific evidence about its toxicity. Today, mercury has become one of the world's most tightly regulated pollutants under the Minamata Convention on Mercury – a legally binding international treaty designed to reduce anthropogenic mercury emissions and phase out mercury-added products.

## From Minamata Disease to Global Environmental Governance

Mercury poisoning gained international attention after the outbreak of Minamata disease in mid-20th century Japan. Industrial discharge from a chemical factory released inorganic mercury into Minamata Bay, where anaerobic microorganisms converted it into methylmercury which is a highly toxic organic form. The resulting ecological and human health crisis fundamentally transformed environmental toxicology. Methylmercury bioaccumulated in fish and biomagnified through marine food webs. Communities dependent on seafood developed devastating neurological symptoms including ataxia, sensory impairment, paralysis, fetal deformities, and death. Scientifically, Minamata demonstrated three critical processes that remain central to mercury risk assessment today:

- Microbial methylation of mercury in aquatic systems.
- Bioaccumulation within organisms.
- Biomagnification across trophic levels.

Unlike many pollutants, mercury is a global cycling contaminant. Atmospheric elemental mercury can persist for nearly a year, allowing long-range transboundary transport before deposition into terrestrial and aquatic ecosystems. Once deposited,

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IN THIS ISSUE

EDITORIAL

## SATISH SINHA

Associate Director, Toxics Link

It gives me immense pleasure to bring to you the latest edition of our widely circulated newsletter. With every issue, we have sought to inform, engage, and inspire our readers by highlighting some of the most pressing environmental and public health challenges in our core areas of work- chemicals and waste. This issue is no exception.

The articles in this issue of Dispatch explore some of the most pressing yet often invisible environmental threats of our time. These hazards remain hidden in plain sight, embedded in the products we use every day. They are found in the colourful garments we wear, the packaging that wraps our food, the chemicals used to brighten our clothes, mercury-containing medical devices and dental amalgams, and industrial effluents that silently contaminate our ecosystems.

I am glad to share here a recent and encouraging development from Maharashtra. In response to reports from medical practitioners of mercury poisoning linked to the use of certain brands of skin-lightening creams, the Maharashtra Food and Drug Administration has taken the significant step of banning the sale of specific beauty products found to contain dangerously high levels of mercury and lead. This is a welcome move to safeguard public health. Skin-lightening creams have long been under global scrutiny for the presence of hazardous substances, and the recent cases of mercury poisoning underscore the urgent need for stronger regulatory action. We believe this ban should not remain limited to Maharashtra but should be extended across the country.

Mercury is recognised as one of the most toxic metals known to humans. It is regulated globally under the Minamata Convention to which India is a signatory. India is now committed to completely phase out mercury from all products by 2030 with the exception of dental amalgam for which the phaseout deadline is 2034. We appreciate the measures initiated by the government and regulators to achieve these deadlines. However, there are opportunities to improve and streamline the efforts. For example, many dentists still use mercury amalgam as a restorative material even though safer and relatively cheaper alternatives are easily available in India. The dentistry students continue to face the dilemma of studying, learning and practising amalgam in the dental curriculum although amalgam is on its way out globally. Immediate attention of the regulators is needed to meet the deadline of 2034.

Mercury is not the only heavy metal posing serious health risks. Reports on lead contamination suggest that elevated blood lead level (BLL) in children in many parts of our country might be a contributing factor for learning disability and other related disorders. Global efforts in removing lead from petrol and paints have been largely successful. However, the continued use of lead in other products remains a significant source of widespread exposure. Children, being the most vulnerable, are disproportionately affected because lead accumulates in the body over time, increasing health risks as they grow. Reducing and minimising lead exposure and its long-term health impacts will require a very definitive roadmap and intervention. There are national regulation, guidelines and standards for the use of lead over its complete lifecycle. They are rendered less effective due to the implementation gaps. These gaps can be closed by the combined efforts of the government, industry, academia, and NGOs.

Today, we are faced with challenges forcing us to rethink the rationale driving our production, consumption, and waste disposal practices and models. Waste can no longer be treated as an end-of-pipe problem. It is a design problem, a production problem, a governance problem, and increasingly, a public health problem. The transition to a circular economy therefore demands much more than improved recycling. It involves adhering to the national goal of Just Transition while choosing between formal and informal waste management models and assessing the contextual viability of each and adopting sustainable practices such as repairing and refurbishing goods before throwing them in trash. For example, would a decentralized waste disposal model, built around government-supported micro-processing facilities and embedded within existing informal recycling clusters, offer a more practical and equitable solution?

sulfate-reducing bacteria convert it into methylmercury, which readily binds to proteins and crosses both the blood-brain and placental barriers. Its toxicodynamics are now well established:

• Elemental mercury vapor primarily affects the central nervous system,
• Inorganic mercury compounds damage kidneys,
• Methylmercury disrupts neuronal migration, synaptic signaling, and fetal neurodevelopment.

The World Health Organization classifies mercury among the top ten chemicals of major public health concern.

## Where is Mercury Still Used?

Mercury's persistence in industrial systems stems from its unique physicochemical properties – high density, electrical conductivity, and thermal responsiveness. Common mercury-containing products include:

• Thermometers and sphygmomanometers
• Compact Fluorescent Lamps (CFLs)
• Fluorescent tubes
• Button-cell batteries
• Electrical relays and switches
• Dental amalgam
• Chlor-alkali industrial processes
• Artisanal gold extraction
• Laboratory reagents
• Skin-lightening cosmetics

While many developed economies have sharply reduced mercury use, informal and poorly regulated markets

in developing countries continue to circulate mercury-containing cosmetics, medicines, and electronic waste. A lesser-known challenge is "legacy mercury." Even products manufactured decades ago continue releasing mercury through disposal, breakage, incineration, and informal recycling.

## India's Mercury Journey: Progress and Contradictions

India ratified the Minamata Convention in 2018, but India's engagement with mercury regulation began much earlier through hazardous waste rules, biomedical waste regulations, and increasing public health scrutiny. India's policy trajectory accelerated in the 2000s as healthcare institutions began transitioning away from mercury thermometers and blood pressure devices. Several policy instruments now indirectly regulate mercury and there have been measurable progress as well.

- Hazardous and Other Wastes Rules, 2016
- E-Waste Management Rules, 2012
- Biomedical Waste Management Rules, 1998
- Cosmetics Rules, 2020
- Standards under the Bureau of Indian Standards (BIS).

These policies have brought about visible progress in various aspects:
**Healthcare Sector Transition:** Many hospitals now use digital thermometers and aneroid BP monitors instead of mercury devices.
**Lighting Transition:** India's large-scale LED expansion substantially reduced reliance on mercury-containing CFLs.
**International Compliance:** India has aligned several domestic measures with Minamata obligations regarding trade, products, and waste.

Despite these regulations and policies, implementation gaps remain substantial. India is among the world's significant mercury emitters. Progress has been real but uneven, and civil society has been central to driving it.

## Where is India Struggling?

**Informal Recycling and Waste Systems:** A significant share of e-waste and hazardous waste is processed informally, exposing workers to mercury vapor during dismantling and recovery operations.

**Coal Combustion:** Coal-fired thermal power plants remain a major atmospheric mercury source. India's heavy dependence on coal complicates rapid emissions reduction.

**Unregulated Cosmetics and Traditional Medicines:** Recent seizures in Kerala and warnings regarding online skin-lightening products reveal serious enforcement weaknesses.
**Monitoring Limitations:** India still lacks a comprehensive nationwide mercury monitoring network for air, water, and biomonitoring surveillance.

The challenge is therefore no longer merely policy creation, it is enforcement capacity, inter-agency coordination, and regulation of informal economies.

## Toxics Link: The Engine Behind Mercury–Use Transition

Toxics Link's mercury-related research and advocacy since the late 1990s have brought about a significant change in the use of mercury. It's regularly engaged in disseminating information to help strengthen the campaign against toxics pollution, provide cleaner alternatives and bring together groups and people affected by this problem. Their mercury work spans over two decades and multiple fronts:

**1. Research & Documentation:** Toxics Link's first mercury-related study, "Lurking Menace," published in 2004, depicted that a medium-sized hospital (300–350 bedded) with a dental wing generates approximately 3 kg of mercury annually. Follow-up reports in 2009 and 2011 estimated the full scale of the problem: eight metric tons of mercury are released in India each year due to improper handling and disposal of medical equipment alone – 69% from sphygmomanometers and 31% from thermometers.

**2. Healthcare Transformation:** Toxics Link conducted trainings on mercury toxicity awareness for doctors, administrators, nurses and other staff in healthcare facilities across 16 states in India. Delhi Government issued instructions for procurement of only non-mercury measuring instruments for hospitals. States of Punjab and Manipur also issued instructions for phasing out mercury-based healthcare instruments. CPCB issued guidelines for storage of surplus mercury-based measuring instruments.

**3. Dental Amalgam:** The estimated annual use of mercury in the dental sector in India stands around 65 tons, where 49 tons goes into cavities and 16.2 tons is mostly released into the environment as non-contact amalgam. Toxics Link's 2012 report, "Mercury in Our Mouth", brought this largely invisible issue to light. **4. Mercury-Added Cosmetics:** Toxics Link supported the global campaign on Mercury-added Skin-Lightening Creams conducted by the European Environmental Bureau in collaboration with the Zero Mercury Working Group, by joining in national government efforts to ban the manufacture, import, export and use of mercury-added cosmetics. Skin-lightening products were sampled from local markets as well as online marketing portals like Flipkart and Amazon India. Toxics Link was part of the broader ZMWG coalition, which at COP-6, secured the landmark decision to involve Interpol and the World Customs Organization in investigating the illegal production and trade of mercury-added skin lighteners.

**5. Policy Roadmap:** Their 2014 report "Mercury Free India – Right Choices" was an effort to suggest a possible roadmap for mercury reduction and its ultimate elimination in India, focusing on phasing out mercury in line with the Minamata Convention.

**6. Ongoing Market Research:** A 2021 Toxics Link study found that while India has made considerable progress in shifting to alternative products in sectors like healthcare and lamps, cost and quality of products remain major concerns given the country's socioeconomic diversity. Awareness of mercury health hazards remains low among consumers, traders, manufacturers and workers.

**7. The Transition:** Toxics Link's recent report published in May 2026, "Documenting Mercury-Free Model Healthcare Facilities in the Country", showcases how Indian hospitals have successfully transitioned away from mercury-based medical devices such as thermometers and sphygmomanometers. Through case studies of pioneering healthcare institutions, the report demonstrates that mercury-free alternatives are practical, reliable, and compatible with quality patient care. It highlights key enablers of this transition, including policy support, procurement reforms, staff training, and improved waste management systems. More importantly, the report marks a shift in India's mercury journey – from identifying risks and quantifying mercury use to documenting scalable

solutions that support the country's commitments under the Minamata Convention on Mercury.

## COP-6: A Turning Point

The Sixth Conference of the Parties (COP-6) convened over 1,000 in-person participants in Geneva and attracted nearly 4,000 online viewers from 3rd to 7th November 2025. Throughout the week, Parties adopted 22 decisions aimed at advancing the Convention's mission to safeguard human health and the environment from mercury pollution.

Under the leadership of COP-6 President Osvaldo Álvarez Pérez (Chile), delegates succeeded in adopting decisions on nearly all agenda items, with his emphasis on inclusive, small-group consultations helping bridge differences on several contentious issues including waste, cosmetics, trade, the procedure on extensions of exemptions, and Indigenous Peoples' engagement.

## Key Decisions from COP-6

**1. Historic Dental Amalgam Phase-Out:** The decision to phase out dental amalgam by 2034, and to add several phase-down measures for Parties to adopt in the meantime, received a standing ovation. What to do about dental amalgam has haunted the Convention from its inception, and its phase-out has been championed by the African Group since COP-4. Britain, alongside Iran and India, had opposed a phase-out by 2030, saying it was too soon. The final 2034 date was a compromise. A practitioner-based exemption was also included, allowing dental amalgam use "when its use is considered necessary based on the needs of the patient."

**2. Crackdown on Mercury-Added Cosmetics:** Delegates adopted a decision to address the continued presence of mercury-containing cosmetics in global trade despite a Convention-mandated phase-out. It calls for a report on enforcement challenges, work with Interpol, the World Customs Organization, and others on combating illicit trade, and help from WHO in developing a national public health strategy for reducing use of mercury-added cosmetics.

**3. India's Exemptions Granted:** Faced with requests from Bangladesh, India, and Thailand to extend their temporary exemptions from phase-out obligations for various categories of mercury-added products, the COP adopted two decisions – one addressed the three petitions, granting them. Notably, all other registered exemptions from the 2020 phase-out dates expired on 31st December 2025 and cannot be requested again.

**4. Mercury in Trade:** The trade in mercury compounds decision invites Parties and stakeholders to submit by 31st March 2026 available information on supply, use, and trade of mercury compounds, and share views on which compounds could be listed in a new Convention annex.

**5. Biodiversity Linkage:** The biodiversity decision requests Parties and relevant stakeholders to implement the Road Map for enhancing co-benefits from the Minamata Convention and the Kunming-Montreal Global Biodiversity Framework by 2030, and encourages Parties to integrate actions on reducing mercury pollution from artisanal and small-scale gold mining (ASGM) into national biodiversity strategies and action plans.

**6. Digital Strategy & AI:** The Secretariat plans to pilot the Minamata Exchange Platform as a key tool for inclusive information exchange during the 2026–2027 biennium. The US highlighted the importance of exploring the potential use of artificial intelligence in the implementation of the digital strategy.

## What the Future Actions Look Like

Globally, mercury use is likely to continue declining in consumer products and healthcare systems. However, three sectors remain major concerns:
A. Coal combustion
B. Artisanal gold mining
C. Informal waste recycling

However, for India, the next decade will be pivotal because it'll likely determine whether the country becomes a leader in mercury transition or remains constrained by enforcement deficits. The COP established an Effectiveness Evaluation Group to work toward the first effectiveness evaluation of the Convention, to be considered at COP-7 in 2027. The next International Conference on Mercury as a Global Pollutant (ICMGP) will be held in Hyderabad, India, from 4th to 10th October 2026. It will center around the theme – "Reaching Ten Years of Enforcement of the Minamata Convention: Achievements, Challenges and Road Map for the Future." It will be a significant opportunity for Indian civil society, scientists, and policymakers to take center stage in the global mercury conversation. However, future priorities for India include:

**1. Establishing National Mercury Monitoring Systems:** India lacks a comprehensive nationwide system to monitor mercury in ambient air, rivers and lakes, sediments, fish and seafood, human biomonitoring samples (hair, blood, urine), etc. Without baseline data, it is difficult to assess whether policy interventions are actually reducing exposure.

**2. Mercury in Marine and Freshwater Ecosystems:** India has extensive coastlines and inland fisheries, yet there is limited long-term monitoring of methylmercury in commercially important fish species. As concerns around food safety and blue economy initiatives grow, mercury surveillance in aquatic ecosystems will become increasingly important.

**3. Mercury Management:** Even if mercury use stops tomorrow, thousands of tonnes remain embedded in old

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medical equipment, industrial sites, fluorescent lamps, contaminated soils, landfills, etc. Managing this legacy will become a major challenge for municipalities and regulators.

**4. Mercury Linkages with Climate Change:** Since India has barely begun integrating mercury into its climate adaptation planning, rising temperatures, changing rainfall patterns, flooding events, etc. can influence mercury methylation rates and remobilize stored mercury.

**5. Strengthening Extended Producer Responsibility: C**urrent EPR frameworks focus largely on plastics and e-waste. But future regulations could require manufacturers and importers of mercury-containing products to finance collection systems, support safe disposal, and maintain take-back mechanisms. This would shift responsibility upstream rather than burdening municipalities.

**6. Formalising Informal Recycling Systems:** Informal sector plays a pivotal role here as it does in many other sectors. Informal e-waste dismantling, scrap markets, lamp recycling, etc. expose workers to a significant amount of mercury, therefore, future policies should cover worker protection, training, and integrate informal recyclers into formal waste systems.

**7. Dental Amalgam Transition Planning:** Following the COP-6 decision to phase out dental amalgam globally by 2034, India will need professional guidelines, curriculum updates in dental schools, affordable mercury-free restorative materials and support for public dental health programmes. These steps will likely turn into vital mercury policy discussions over the next decade.

**8. Standardisation and Certification of Alternatives:** A successful mercury transition requires not only banning hazardous products but also creating a regulatory ecosystem that validates and promotes safer substitutes. Elimination policies only succeed when alternatives are technically validated and institutionally accepted.

**9. Mercury-Free Strategy:** At present, mercury is addressed through multiple fragmented regulations. A unified roadmap would provide clarity and accountability. It can include sector-wise targets, timelines, monitoring indicators, funding mechanisms, state-level implementation plans, etc.
These steps move the discussion beyond conventional mercury-control measures and positions India's future priorities within a broader environmental governance framework. Governments alone cannot solve mercury pollution; therefore, immediate meaningful actions require:

- Public procurement reforms for Mercury
- Stricter surveillance of counterfeit cosmetics
- Public awareness on safe disposal of mercury containing products
- Stronger producer responsibility systems
- Investment in substitutes or alternatives
- Scientific monitoring of vulnerable populations
- Formalisation of informal recycling sectors

Mercury doesn't wait. It seeps into soil, climbs through food chains, and lodges in the brains of children before policymakers finish their deliberations. Every year we delay is a year of silent, irreversible damage – damage that no future regulation can undo.
This is the uncomfortable truth at the heart of mercury governance: by the time contamination becomes undeniable, it is already too late. The bodies of fisherfolk in Minamata Bay bore that truth. Their trembling hands and failing sight were not a warning – they were the consequence of a warning ignored.
The Minamata Convention, then, is not merely a technical agreement about a toxic metal. It is a moral reckoning – a global admission that development pursued without precaution is not progress, it is a debt we hand to our children. It asks something harder than compliance. It asks governments, industries, and societies to act on evidence before catastrophe demands it, to choose the inconvenience of change over the permanence of harm.
We are at that inflection point right now. The science is unambiguous. The alternatives exist. The treaty framework is in place. What remains is the will to move – urgently, completely, and without waiting for the next tragedy to make the case. The window to act responsibly is open. It will not stay open forever.

***— The author is Senior Programme Officer, Waste and Sustainaibility, TL***

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EVENTS

# Mercury fillings will become history in less than a decade-COP-6

Toxics Link welcomes the landmark decision taken at Minamata COP-6 on in Geneva, to end the use of dental amalgam.
At the sixth meeting of the Conference of the Parties to the Minamata Convention on Mercury (COP-6), nations reached a consensus on 22 pacts taken to advance implementation, cooperation and protection of the human health and the environment from mercury pollution. Phasing out of mercury amalgam apart, coutries also agreed on stronger measures on mercury-added skin-lightening products and mercury supply, trade and waste. Mr Satish Sinha, Associate Director, Toxics Link represented Civil Society Organisations at COP6 and participated in the proceedings of the COP.

EVENTS

# Recent Workshops on Mercury-Free Dentistry

## Bangalore

Toxics Link organised a meeting with dental practitioners in Bengaluru on Mercury-Free Dentistry on November 9, 2025 in collaboration with Indian Dental Association (IDA) Karnataka and IDA Bangalore.

Priti Mahesh shed light on the hidden dangers of mercury exposure, especially its irreversible effects on pregnant women and children below the age of 15. She also highlighted the occupation exposure risks to the dental fraternity and emphasised on the need to revise the dental curriculum.

Dr Sushi Kadanakuppe, Associate Professor, V.S. Dental College and Hospital, Bengaluru gave examples of substitutes like composite resins, GICs, resin-modified GICs, bioactive materials, and ceramics—emphasising that we now have viable, safer options with comparable clinical outcomes.
With dentistry contributing nearly 3% of healthcare's carbon emissions, experts underscored the need for eco-conscious practices. Economic challenges in rural areas, where affordability limits adoption of alternatives, were discussed.

*http://toxicslink.org/publications/workshop-on-mercury-free-dentistry-in-bengaluru-karnataka/*

## Manipur

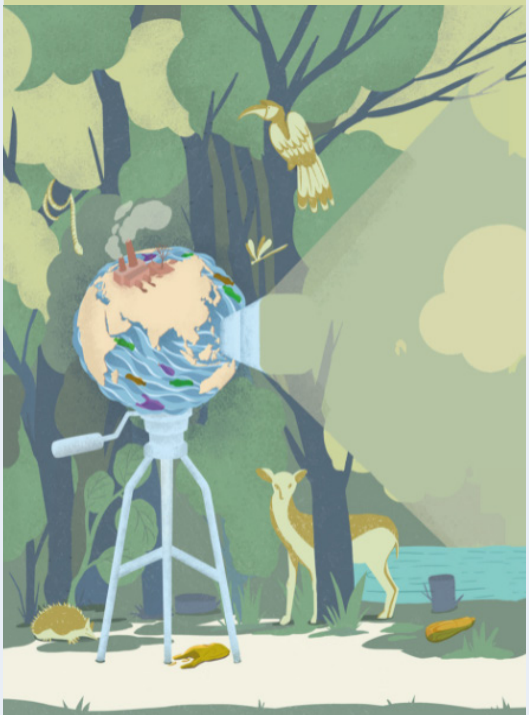
Toxics Link organised a meeting on Mercury-Free Dentistry in Imphal, Manipur on October 11, 2025, with support from the Indian Dental Association (IDA) Manipur. The session brought together dental professionals to discuss the phase-out of mercury-based amalgam and explore safe, sustainable alternatives.

*https://toxicslink.org/publications/workshop-on-mercury-free-dentistry-in-imphal-manipur.*

# Toxics Link is Organising 11th Environmental Film Festival "Quotes from the Earth"

The 11th edition of our two-day biennial environmental film festival "Quotes from the Earth" in partnership with India International Center (IIC), New Delhi, is around the corner.Ever since its inception in 2004, it has been instrumental in creating a unique platform for screening national and international films besides initiating dialogues on pressing environmental issues including climate change, biodiversity loss to pollution, waste, and environmental justice. The festival has successfully brought acclaimed filmmakers, environmental experts, policymakers, students, civil society organizations, and film enthusiasts together for panel discussions, interactions with filmmakers, and youth engagement. Over the years, it has become a much-anticipated event on Delhi's winter cultural calendar.

As we prepare for the 11th edition of the festival scheduled for December this year, we are pleased to invite our readers at India International Centre, New Delhi on December 3 and 4, 2026.



# Toxics Link Organising Partners of the 2nd Conclave Edition of the Asian Chemicals Forum (ACF) 2025


Mr. Satish Sinha, Associate Director, Toxics Link was a keynote speaker during the session "Targets and Indicators for Chemicals", moderated by Dr. Jitendra Sharma, Programme Management Officer, UNEP. The session also featured expert contributions from Ms. Xenia Trier, Associate Professor, University of Copenhagen and Mr. Ganesan Shumugam, ICC Chairman for the Treaties Expert Committee along with Mr Sinha. The session highlighted the need to develop meaningful indicators and achievable targets aligned with international frameworks such as the Strategic Approach to International Chemicals Management (SAICM).

Reflecting on the outcomes of ACF 2025, Mr. Sinha observed that the forum has effectively "set the foundation stones" for advancing chemicals governance, emphasising that this is a building process that will evolve through continued dialogue and collaboration. He noted that the practical steps discussed during the conclave must now be identified and taken forward into policy frameworks. While this transition will require time, further conversations, and sustained engagement, these discussions are expected to gradually form the building blocks of a larger, globally aligned framework for safer and more sustainable chemicals management.

Let's champion science-based solutions and collective action for cleaner environments and healthier communities!

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The 2nd Conclave of the Asian Chemicals Forum (ACF) 2025, held in Mumbai on October 8–9, served as a critical platform for advancing dialogue on chemical safety, regulatory compliance, and sustainable chemicals management in India and across Asia. Jointly organised by the Regulatory Representatives & Managers Association (RRMA) and the Helsinki Chemicals Forum (HCF), with Toxics Link and the Confederation of Indian Industry (CII) as organising partners, the conclave brought together over 300 representatives from government, industry, academia, and civil society. Discussions highlighted the urgent need to strengthen regulatory regimes and improve chemicals management protocols across key sectors such as chemicals and petrochemicals, pharmaceuticals, textiles, agriculture (including pesticides and fertilisers), plastics and polymers, consumer goods, and manufacturing sectors that are central to India's industrial growth and economic development.

The deliberations highlighted the strategic importance of aligning India's chemicals regulations and standards with global frameworks to enhance export competitiveness, improve market access, and position India as a credible player in the global chemicals value chain. With chemicals embedded across nearly all industrial sectors and closely linked to India's GDP growth and participation in global markets, participants emphasised the need for greater synergy between domestic regulatory systems and international requirements. Strengthened and harmonised regulations were viewed not only as essential for reducing risks to human health and the environment, but also as enablers of innovation, improved sectoral performance, and responsible industry practices.

# The PFAS Wrapsheet

**By Vidhi Mathur**

PFAS (Per- and Polyfluoroalkyl Substances) are a group of synthetic organic compounds that have been in use in consumer products around the world since the 1950s. They are characterized by their unique chemical structure, comprising either linear or cyclic fluorinated carbon chains –CnF2n– (n ≥ 3) or –CnF2nOCmF2m– (n and m ≥ 1). Their peculiar surfactant-like structure, with hydrophobic tails and hydrophilic heads, drives their extensive use in applications such as non-stick cookware (Teflon), firefighting foams, stain-resistant fabrics, and water-repellent textiles.[1] However, it's their exceptionally strong carbon-fluorine bonds that impart them with resistance to physical, chemical, and biological degradation, which has become a cause of concern for environmental and public health. Increasing studies have demonstrated PFAS-associated negative health impacts on fertility, foetal development and altered hormonal function.

The paper and pulp industry has been a regular consumer of PFAS in the production of disposable grease- and water-resistant food packaging and tableware items. The compounds are usually added to coatings of paper and cardboard packaging materials to create chemical barriers that repel grease and moisture from food. As a result, they are widely used in baking paper and cupcake cups, pizza boxes, bakery bags, fast-food and take-away containers, microwave popcorn bags, and compostable tableware
(See Figure 1).
According to the chemicals database (CompTox) maintained by the U.S. Environmental Protection Agency, there are more than 15,000 PFAS compounds; however, only 68 have been identified in various food contact materials by the Food Packaging Forum's database.[2,3] This was further confirmed by multiple studies conducted in the United States (2022) and the European Union (2020), where significant numbers of fast-food packaging materials contained PFASs.[4] Ironically, containers labelled "eco-friendly" or "plant-based" most commonly do contain PFAS.[5] A 2023 study on single-use food packaging and tableware from 17 countries found that the highest PFAS concentrations were consistently found in plant-based moulded fibre products (e.g. bowls, plates, and food boxes) advertised as biodegradable or compostable.[6]


Figure 1: PFAS in food packaging

## Health and Environmental Impact

PFAS are loosely bound to the lining of food packaging materials and can easily migrate into the food and the environment. The extent of migration depends on several factors, such as higher temperatures, longer contact time, lower pH and the use of emulsifiers in food.[7] A study conducted in Canada found that bowls stored in a dark, enclosed space for two years exhibited an 85% decrease in PFAS levels, indicating continuous release of PFAS from packaging material over time.[8] Consequently, PFAS-containing packaging can act as a source of PFAS emissions throughout its entire lifecycle, from production and use to disposal. Human exposure to PFAS from food packaging occurs primarily through the consumption of contaminated food and water (See Figure 2). Research has shown that individuals who consume more food prepared or served outside the home tend to have higher concentrations of PFAS in their blood. The same study also found elevated PFAS levels among frequent consumers of microwave popcorn, suggesting that PFAS are more likely to migrate from packaging into food when exposed to heat.[9] Although research specifically quantifying PFAS transfer from packaging to humans is still evolving, growing evidence indicates that food-contact materials can be an important pathway of exposure.
PFAS are highly persistent, bioaccumulative, and toxic chemicals. Following ingestion, they are readily absorbed through the intestine and enter the circulatory system, where they can accumulate in various tissues. Studies have shown that PFAS can disrupt intestinal barrier function and contribute to adverse health effects, while prolonged exposure has been associated with endocrine disruption, altered cholesterol metabolism, increased risk of obesity, immune dysfunction, and, in some cases, certain forms of cancer.[10]

Environmental exposure to PFAS can occur during both the production and disposal stages of food packaging (See Figure 2). Manufacturing facilities may release PFAS-containing effluents into surrounding water bodies, while discarded packaging can become a long-term source of environmental contamination. Studies conducted


Figure 2: PFAS exposure from food packaging in the environment

in Chennai have reported PFAS concentrations ranging from 3 to 93 ng/L in surface water[11] and from 0.1 to 136 ng/L in groundwater, reflecting the influence of industrial activities and inadequate wastewater treatment. In contrast, less industrialised regions such as Goa, Coimbatore, Patna, and Varanasi have reported comparatively lower levels of PFAS contamination in surface waters.[12]
Packaging waste represents another significant pathway of PFAS release into the environment. Even products marketed as compostable can become sources of contamination, as PFAS are gradually released during degradation. This poses particular challenges for composting facilities that receive PFAS-treated fibre-based food packaging.
One preliminary study found that PFAS concentrations were up to ten times higher in compost produced at facilities that accepted compostable fibre bowls than in facilities that did not.[13]

## Regulations

PFAS compounds such as Perfluorooctanesulfonic Acid (PFOS), Perfluorooctanoic Acid (PFOA), Perfluorohexanesulfonic Acid (PFHxS), and Perfluorocarboxylic Acids (PFCAs) have been listed under Annex A of the Stockholm Convention on Persistent Organic Pollutants for elimination, subject to certain exemptions. However, the ratification and implementation of these provisions are at different stages across the participating nations.
Specific regulations targeting PFAS in food packaging materials exist only in a few countries. For example, in the United States, the use of PFAS in food packaging materials was prohibited under the Federal Food, Drug, and Cosmetic Act (H.R. 9864), with the prohibition taking effect in January 2025. Similarly, the European Union's Packaging and Packaging Waste Regulation (Regulation (EU) 2025/40), which comes into effect in August 2026, restricts PFAS content in food packaging materials to 25 ppb. In Asia, the Philippines has also prohibited the intentional addition of PFAS in baby food packaging and certain childcare products.
In India, the Food Safety and Standards Authority of India (FSSAI) has released the draft Food Safety and Standards (Packaging) Amendment Regulations, 2025, which propose a complete ban on the use of PFAS in the manufacture of food contact materials. This amendment represents a significant step towards aligning India's food packaging regulations with emerging global efforts to reduce human exposure to PFAS.

## Conclusion

PFAS is a ubiquitous chemical. It is found in most environmental matrices and used in most consumer products, including food packaging materials. Evidence shows that these chemicals can migrate from packaging into food, contribute to long-term environmental contamination, and accumulate in living organisms. While several countries have begun restricting or eliminating PFAS from food-contact materials, their continued presence in packaging products highlights the need for stronger regulatory oversight, improved monitoring, and safer alternatives.
In India, the proposed ban on PFAS in food-contact materials by FSSAI is an important step towards reducing exposure; however, effective implementation will require strengthening laboratory capacity for PFAS detection, establishing monitoring and compliance mechanisms for food packaging manufacturers, developing clear standards for safer alternatives, and undertaking capacity-building programmes for regulators, industry stakeholders, and waste management operators. In addition, greater research on PFAS occurrence in food, packaging materials, environmental media, and waste streams, along with public awareness initiatives, will be essential to support informed policy decisions and encourage the transition towards safer and more sustainable packaging solutions.

***— The author is Senior Programme Officer, Chemicals and Health, TL***

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GUEST COLUMN

# Redefining Delhi's E-waste model through localised micro facilities

**By Digvijay Singh**

Digvijay is currently pursuing a Master of Science in Sustainaibility at The University of Edinburgh, Scotland, United Kingdom. As part of his research, he is studying the e-waste management and social vulnerability in Delhi, India. He is a strategy and sustanaibility professional and a certified as a Carbon Literate. His academic backgroud includes global strategy and sustainability and a Bachelor's degree in Business administration.

The National Capital Territory (NCR) of Delhi faces a profound environmental challenge at the intersection of urban consumption and electronic waste management. Generating roughly 2,30,000 metric tonnes of e-waste annually, approximately 10% of India's total volume,[1] the city currently relies on an informal recycling network that handles over 95% of this volume.[2] Centred in dense, long-standing recycling hubs such as Seelampur and Mustafabad, these informal workers possess unmatched collection logistics and manual sorting expertise. However, reliance on crude backyard techniques like open acid leaching and wire burning releases fine particulate matter, heavy metals, and persistent organic pollutants (POPs) directly into local neighbourhoods. Top-down solutions that attempt to relocate these activities to distant industrial eco-parks often fail because they disrupt hyper-local supply chains and threaten the immediate livelihoods of over 50,000 waste workers, as estimated by Toxics Link in its report on informal e-waste recycling in Delhi .

To achieve a realistic and inclusive transition, Delhi must shift from centralised isolation to a decentralised, cluster-integrated infrastructure. Rather than forcing informal recycling communities to move to remote zones, the capital can establish government-sanctioned, micro processing facilities directly within or adjacent to existing informal clusters. These localised hubs bring safe, modern technology such as small-scale mechanical cable strippers, air-scrubbed shredders, and contained hydrometallurgical recovery units to the worker's doorstep. By keeping processing infrastructure local, workers can continue sourcing materials through established networks without incurring added transport costs or operational friction, simultaneously cutting localised transit emissions compared to distant e-waste parks.

The process of recovering metals such as gold, copper, and palladium from electronic waste through localised hydrometallurgical units presents a significantly cleaner alternative to conventional mining practices. This method effectively reduces carbon emissions associated with the supply chain and prevents the contamination of local soil and water by toxic chemicals. Furthermore, implementing Zero Liquid Discharge (ZLD) closed-loop systems instead of acid bath drainage can avoid the accumulation of heavy metals in the Yamuna basin aquifer. This approach offers substantial benefits by decreasing both local toxicity and systemic carbon footprints, all without negatively impacting social welfare.

Providing accessible processing tools within familiar neighbourhoods can significantly ease the transition to formal adoption for informal workers. When compliance is viewed as a practical enhancement rather than an administrative obstacle, it becomes more achievable. By integrating formal recycling infrastructure directly into existing informal centres, Delhi can safeguard local livelihoods, optimise urban resource recovery, and establish a scalable sustainable economy that prioritises social equity.

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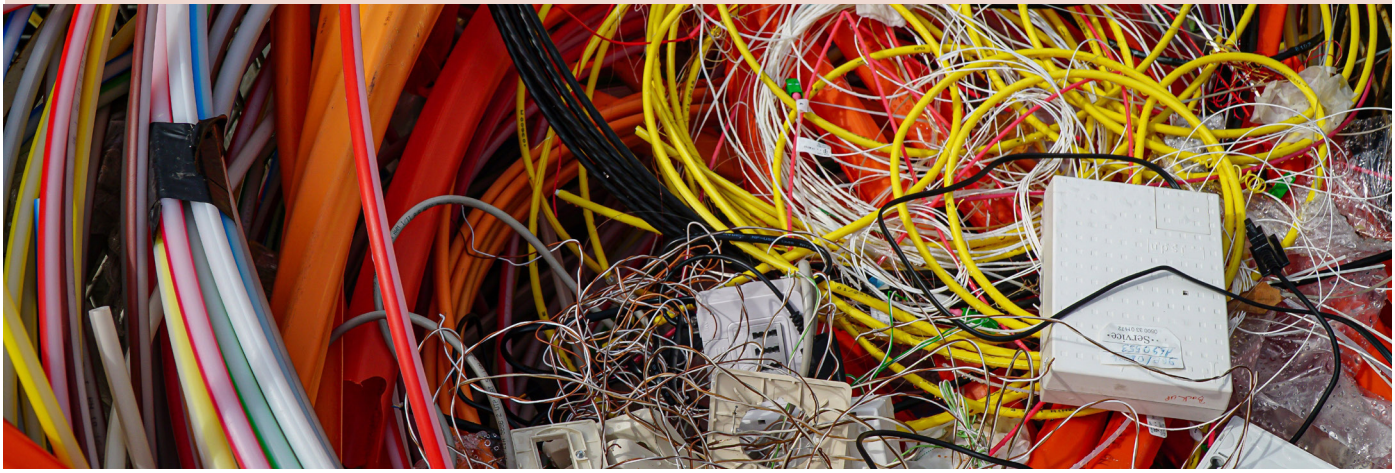

EVENTS

# 25th World Sustainable Development Summit

**At the 25th World Sustainable Development Summit on 25 February, the India–Norway partnership took centre stage with a thematic session titled "From Source to Seas: Science-informed pathways for transforming plastic and chemical pollution governance." The session highlighted how rigorous scientific research and international cooperation are strengthening laws and policies to curb plastic pollution and protect our environment and health.**

**Experts shared findings from the India–Norway INOPOL project, which traces the movement of plastic waste and persistent organic pollutants from land into rivers and oceans, underscoring risks to human health, livelihoods, and ecosystems. Two key reports were released — a Plastic Waste Strategy for Tamil Nadu and an Action Plan for POPs management — offering evidence-based guidance to improve monitoring, enforcement, and pollution control.**

**Speakers emphasised the importance of data-driven policymaking, stronger regulatory frameworks, and sustained global cooperation to build effective legal pathways that address pollution from source to sea.**

**Let's champion science-based solutions and collective action for cleaner environments and healthier communities!**


# Chemicals Management: Persistent Organic Pollutants & Plastics

A stakeholder meeting on "Chemicals Management: Persistent Organic Pollutants and Plastics" was held on 24th February 2026, in Dehradun. Toxics Link in collaboration with The Uttarakhand Pollution Control Board organised the programme, with support from the India-Norway Cooperation Project for Plastic and Chemical Pollution Reduction in India (INOPOL) consortium and The Royal Norwegian Embassy, Norwegian Institute of Water Research (NIVA), Mu Gamma Consultants Pvt. Ltd., SRM Institute of Science and Technology and Central Institute of Petrochemicals Engineering & Technology (CIPET) alongwith support from Norwegian Embassy in New Delhi


The meeting brought together key institutions and experts, including the Uttarakhand Pollution Control Board, CSIR-National Environmental Engineering Research Institute, state government departments (e.g. Department of Health and Family Welfare), industry representatives, NGOs, researchers, and academia. The discussion focused on monitoring and managing persistent organic pollutants (POPs) and plastics (micro- and macroplastics) in the state.

Key deliberations covered regulatory measures, monitoring under NIP-2, emerging risks from PFAS and microplastics exposure, and the need to reinforce environmental and public health safeguards. The session also marked the release of Toxics Link's new report on POPs in Uttarakhand, which examines their sources, associated risks, and urgent actions required.

Together, we can push for safer chemicals, cleaner ecosystems, and healthier communities.

# Beyond Exposure: Gender Inequality and the Human Rights Dimensions of Toxic Chemicals

**By Tripti Arora**

## The Exposure we don't see

For a long time, the conversation on toxic chemicals has been framed through the language of exposure, pathways, doses, thresholds, and risks. It is a necessary language, backed by science and essential for regulation. But it is also an incomplete one. Because exposure, on its own, tells us very little about who is being exposed, why, and whose risks are considered acceptable.

The evidence itself is no longer uncertain. Research has linked many commonly used chemicals, including endocrine-disrupting chemicals such as phthalates, PFAS, bisphenols, pesticides, and heavy metals (lead, mercury), to infertility, hormonal disruption, reproductive disorders, cancers, immune dysfunction, developmental impacts, metabolic disease, and adverse pregnancy outcomes . What is particularly concerning is that many of these chemicals can interfere with hormonal systems even at very low levels of exposure, especially during critical stages of development such as pregnancy, infancy, and puberty .

There is now substantial evidence linking hazardous chemicals to serious health impacts. What remains insufficiently examined is how these risks are distributed, and why certain groups continue to carry a disproportionate share of them.

Women are often described as being "more vulnerable" to chemicals because of biological differences. Biology does play a role. Pregnancy, reproductive processes, and hormonal systems create distinct interactions with chemicals, and exposure during pregnancy can shape not only maternal health, but fetal development and long-term health outcomes across generations .

Yet biology alone does not explain the scale or pattern of harm.

## More Than Biology

Across societies, women are frequently positioned closer to exposure through the roles, responsibilities, products, and environments that shape everyday life. Household cleaning products, cosmetics, food packaging, plastics, pesticides, contaminated water, polluted air, and a wide range of consumer products create routine exposures that are often normalised and therefore overlooked.

Women are not biologically weaker. They are biologically different. Yet what is often described as women's heightened vulnerability is frequently the result of a combination of biological realities and social conditions.

Across much of the Global South, women remain concentrated in poorly paid and weakly regulated sectors such as informal waste work, agriculture, domestic labour, textile production, and small-scale manufacturing, where chemical exposure is frequent and protection is minimal . The same systems that limit women's access to resources and decision-making often place them closest to environmental harm.

This is why toxic exposure cannot be understood solely as a public health or environmental issue. It is also a question of gender justice.

## The Invisible Burden

One of the most revealing aspects of this crisis is how rarely women's health experiences are connected to environmental causes. Miscarriages become personal grief. Infertility becomes a private struggle. Hormonal disorders, autoimmune conditions, reproductive complications, and chronic fatigue are often treated as isolated medical conditions rather than as part of broader patterns of environmental exposure. Because once these experiences are viewed collectively, a disturbing pattern begins to emerge, one in which exposure is not random, but socially produced.

Even products associated with care, hygiene, and femininity are not exempt. Investigations into menstrual products sold in the Indian market have detected chemicals such as phthalates and volatile organic compounds, including in products marketed as safer or "organic" alternatives . Similarly, several skin-lightening creams sold globally have been found to contain mercury, a neurotoxin associated with serious health impacts . Products closely connected to women's bodies continue to be manufactured and sold with inadequate transparency about what they contain.

What makes this even more troubling is that women remain underrepresented in many of the spaces where decisions about chemicals, health, and regulation are made. Scientific institutions, policy forums, industry bodies, and political systems continue to reflect unequal power structures, and women's lived experiences are often treated as anecdotal rather than evidentiary.

Women are also often socialised to accept many of these risks as ordinary parts of everyday life, whether through products, caregiving responsibilities, workplace conditions, or beauty standards. This creates a layered form of invisibility: women's exposures are often missing from data, their experiences are insufficiently reflected in policy, and their voices remain underrepresented in the conversations that shape both.

## Beyond Exposure

When exposure is unequally distributed and those most affected have limited influence over the decisions that shape it, the issue extends beyond toxicology. It becomes a question of rights, participation, and accountability.

What does the right to information mean if people are not fully informed about the chemicals present in products they use every day? What does bodily autonomy mean when exposure becomes unavoidable, embedded into homes, workplaces, food systems, and even maternal environments? What does meaningful participation look like when those carrying the greatest burden of risk remain underrepresented in decision-

making processes?

The growing recognition of the right to a healthy environment within international human rights frameworks is important . But rights cannot remain abstract principles discussed in policy spaces while exposure continues uninterrupted in everyday life.

Perhaps the most dangerous aspect of toxic exposure is how ordinary it has become. These harms are often slow, chronic, and invisible. There are no singular moments of crisis, only the gradual accumulation of chemicals, illness, and inequality over time.

Because toxic exposure reflects the broader logic of unequal societies: some lives are protected more than others, some harms are considered acceptable, and some communities are expected to carry disproportionate burdens in silence.

Moving beyond exposure therefore requires more than better science, although science remains essential. It requires stronger regulation, greater transparency in products, and decision-making processes that meaningfully include those living closest to these risks. Most importantly, it requires recognising that environmental justice and gender justice cannot be separated.

The question is no longer whether toxic chemicals are harming women. The evidence is already substantial and growing.

The real question is why societies continue to normalise exposures that quietly shape women's health, bodies, labour, and lives. And why those carrying the greatest burden of harm remain furthest from the decisions that define acceptable risk.

*— The author is Gender and South Asia Regional Coordinator at IPEN*


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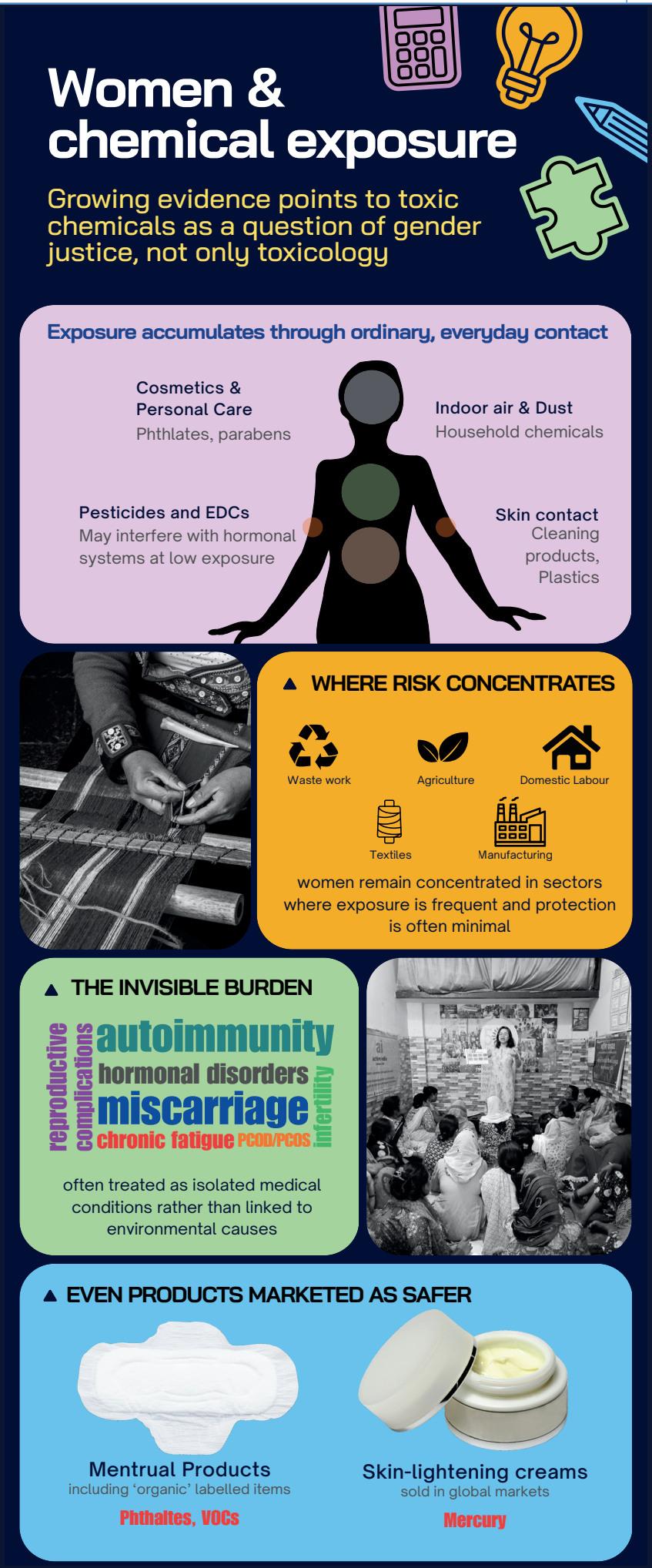


# In a tête à tête with Manjima Chatterjee

Manjima Chatterjee, Head of Sustainability Programmes, Shiv Nadar School, is an educator, arts practitioner, writer and curriculum leader with over two decades of experience across education, publishing, and the performing arts. She previously held leadership rolesas Vice Principal and Central Arts Curriculum Lead, where she developed pioneering, practice-based arts and sustainaibility curricula. Manjima is passionate about integrating climate justice, equity and the arts into meaningful educational practice.

**TL: Could you briefly describe your journey to becoming the Head of Sustainability Programmes at Shiv Nadar School, and what inspired your commitment to sustainability in education?**

**Manjima Chatterjee (Manjima):** My journey at the Shiv Nadar School began in 2012, and through these years I have worn multiple hats—from teaching Primary Years to heading the Arts Team at one campus, to being the Central Arts Curriculum Lead to Vice Principal-ship, and my current role as Head of Sustainability Programmes. My work in the Arts, particularly in creating experiential learning programmes such as 'Fun'kaar, student-led platforms like Kaafila, and leading a three campus project-based learning programme called SOUL (Spirit of Unlimited Learning) Fest taught me the power of experiential learning and student agency. These experiences have deeply informed my sustainability philosophy, as well as educational philosophy: sustainability is not a subject to be taught, but a value to be lived, and 'Education for Life'is to equip students for a healthy and fulfilling life, which is not lived in a vacuum. I am driven by the belief that schools must be tendered as communities with a focus on appreciation of all forms of life on this 'Goldilocks' planet, and also as "living laboratories" where we bridge indigenous wisdom with future-ready technology to nurture purposeful, ethically grounded citizens.

## Sustainability and Environmental Health

**Shiv Nadar School has integrated sustainability into its educational philosophy. How do you ensure that environmental sustainability is also viewed through the lens of human health, particularly children's health?**

**Manjima:** We ensure that sustainability is viewed through the lens of human health by prioritising a student-centric approach. Our policy treats physical and emotional well-being as non-negotiable. Whether it is indoor air quality, safe procurement of materials (like non-toxic stationery), or healthy food choices in our canteens, every decision is measured against its impact on our students' daily health and long-term well-being. With the desire to promote intentional healthy choices, we have introduced the Moolgyan Programme, which builds bridges between growing healthy food plants to developing a healthy approach to eating.

## Reducing Plastic Consumption

**Single-use plastics continue to be a major source of pollution. What measures has the school taken to reduce plastic consumption on campus, and how do you encourage students to adopt plastic-free habits beyond school?**

**Manjima:** We have implemented a strict Zero-Waste/ Single-Use Plastic Ban. This is supported by our Procurement recommendations, which prioritise compostable and plastic-free alternatives. Beyond the campus, we encourage students & school community, through regular classroom engagements as well as campaigns, to apply these plastic-free habits at home, turning them into advocates who influence their own families and broader communities.

## Waste Management and Circular Economy

**Waste segregation is often the first step, but creating a circular system requires much more. How does the school approach waste reduction, reuse, composting, and responsible recycling? Have students been involved in designing or managing these systems?**

**Manjima:** Waste segregation is a foundational practice, but we are moving toward a circular system. We utilise a three-stream waste system (Recyclable, Compostable, Landfill) across all campuses. Students are deeply involved in this process—not just as participants, but as designers and auditors. They lead seasonal environmental audits, manage composting sites, and document findings to track our resource footprint. Campuses particularly track food and paper waste by way of the Cafeteria and Paper Recycling Units (PRU). The PRU has been integrated into the regular learning programme for Foundation to Grade 6 so as to develop the habit of careful consumption as well as learn to find creative reuse options for used paper. Students additionally partner with external organisations to promote recycling and reuse of paper-based items such as notebooks and textbooks. All of this is integrated into their regular learning programme through projects and clubs. The schools have partnered with authorized waste disposal agencies that ensure proper waste segregation and environmentally compliant disposal. Additionally, the schools collaborate with external NGOs to recycle waste into sustainable products such as seating benches and plant pots, which are being used in the school campuses.

## Electronic Waste

**With increasing dependence on digital devices, e-waste is becoming a growing concern. Does the school have an e-waste management policy or awareness programme? How do you educate students about responsible disposal and the environmental impacts of electronic waste?**

**Manjima:** We recognise e-waste as a critical modern concern. Our approach emphasises responsible consumption and awareness. We educate students on

the lifecycle of digital devices and the environmental impact of disposal as a part of our Computer Science and STEAM programmes. We are actively working to integrate responsible e-waste disposal protocols into our operational policies. Authorised e-waste disposal partners have been identified and onboarded to ensure the safe, responsible, and environmentally compliant disposal of electronic waste. These partners also provide disposal certificates to ensure traceability and regulatory compliance.

### Chemicals in Everyday Products

**Children are exposed to chemicals through toys, stationery, school furniture, cleaning products, and food packaging. Is the school consciously working towards safer procurement practices or creating awareness about hazardous chemicals in everyday products?**

**Manjima:** We actively work to source safer, non-toxic alternatives for school supplies, furniture, and cleaning agents. Our procurement teams are required to prioritise environmental and social ethics, ensuring that the products brought into our learning spaces do not compromise the health of our students. The schools have procured eco-friendly, low-VOC green paints to promote a safer and healthier environment. Additionally, the procurement of natural wooden play stations has been initiated to support sustainable infrastructure and enhance outdoor learning spaces.

### Air Quality and Healthy Campuses

**Poor air quality has become a significant concern in many Indian cities. What measures has the school adopted to protect students from air pollution, and how is air quality integrated into environmental education?**

**Manjima:** We address air quality through a mix of infrastructure and education. This includes a strict no-idling policy for school buses and personal vehicles during drop-off and pick-up, and the design of green spaces to mitigate local pollution. All our campuses use sprinkler systems in sports ground & green areas to mitigate SPM in air. Air quality is integrated into our Science and Environmental Studies curricula, where students analyse real-time data to understand the impact of pollution on their city and their own surroundings. All classrooms and learning spaces are equipped with air purifiers to maintain healthy indoor air quality. Additionally, the schools have developed green spaces with indoor plants to enhance the learning environment and promote overall well-being.

*Planting of 'secret seeds' under the MoolGyan programme*

### Water Stewardship

**Water conservation is often discussed, but water quality is equally important. How does the school address issues of water safety, conservation, and responsible water use among students?**

Manjima: Water stewardship at our school goes beyond conservation; it's about quality and responsible use. We have integrated rainwater harvesting systems and flow-reducing fixtures across our campuses. More importantly, students treat these systems as 'living laboratories,' where they measure and review water performance. The schools conduct monthly water quality testing in accordance with IS 10500 standards to ensure safe drinking water. Water Treatment Plants (WTPs) are actively used for water purification, and the treated reject water is utilized for groundwater recharge through Rainwater Harvesting (RWH) systems. Sewage Treatment Plants (STPs) treat wastewater, which is then reused exclusively for horticulture and gardening purposes. Additionally, sensor- and press-operated water taps have been installed across the campuses to minimize water wastage and promote efficient water conservation.

### Climate Change and Waste

**Climate change and waste management are increasingly interconnected. How do you help students understand the relationship between consumption patterns, waste generation, greenhouse gas emissions, and climate action?**

**Manjima:** We use systems thinking to teach the interconnectedness of climate and consumption. Our curriculum guides students to connect the dots: how personal consumption choices directly correlate to waste generation, greenhouse gas emissions, and global climate action. It shifts their perspective from being passive consumers to active participants in a circular economy.

### Sustainable Consumption

**Young people are exposed to constant consumer messaging. How do you encourage students to become conscious consumers by questioning what they buy, use, and discard?**

**Manjima:** We encourage students to question the lifecycle of what they use. Through a PBL (Project-Based Learning) approach at various levels, students analyse the ethics of supply chains, the impact of fast-fashion, and the hidden costs of convenience. Through our partnership with FairTrade India, we promote ethical stewardship campaigns, whereby students learn to question not only the carbon footprint of every purchase, but also the ethical ramifications of purchasing in a globalised world, and also from specific companies that are known to disregard environmental and ethical laws. Parents at SNS have been major partners towards this end, as well.

### Student-led Environmental Action

**Several initiatives at Shiv Nadar School are student-led. Could you share an example of a project that has had measurable environmental or community impact and what made it successful?**

**Manjima:** There are several community-led projects and campaigns that run at the campuses across the year. One truly student-led initiative that I would like to talk about is Kaafila. It is a student-led arts festival which is conceptualised, organised and executed completely by students at SNS Noida. When we put together the first edition in 2019, it was conceptualised as a zero waste, sustainable event, with clear

alignments with SDGs 4, 10 and 12. We were committed to promoting the work of marginalised communities and promoting access to all schools and learners through arts in education. We ensured that we minimised use of printables and disposables, and completely refused one-time-use plastic. We invited all participants to carry their own water bottles and replenished water at all our venues with glass bottles. Our event map and entry bands were printed on seed paper recycled from paper waste generated at school.

When we initially proposed these measures, there was a certain amount of concern and scepticism from different quarters. Students worried that their peers in other schools would not take being asked to carry water bottles well, food trucks were unsure about using non-plastic serving material, and the administration was not sure whether printables could or should be cut down in quite this way. However, the students stuck to their guns and managed to pull off most of these measures to an expected degree of success. It not only gave stakeholders at the school insight into creating zero waste alternatives, but also made our visitors from other schools and companies aware of ways in which wasteful expenditure could be mitigated. We received a lot of accolades from the community as well as from the media for putting these measures in place.

### Building Behaviour Change

**Changing behaviour is often more difficult than introducing infrastructure. What approaches have been most effective in encouraging students, teachers, and parents to adopt environmentally responsible practices?**

**Manjima:** Infrastructure changes are easy; behaviour change requires a shift in mindset. We have a planned trajectory of learning embedded into the curriculum from Early to Primary Years, and then from Middle to Senior Years, which focuses on building the capacity for awe and wonder to appreciation and analysis, leading up to problem solving, through developing skills of patient observation and inference. We take students and parents on nature walks and participate in citizen science projects, as well as engaging with the Wellbeing and Arts teams to develop spaces and sensibilities that promote active engagement with nature, responsible self-care, and a community of learners who care about their world and their own learning.

For measurement, we utilise a dual data approach. We track quantitative metrics (like reduction in paper use) alongside qualitative assessments (like student surveys on nature and climate awareness). By correlating the two, we show students that their personal choices—like double-sided printing—have a measurable, positive impact, which reinforces the habit.

### Partnerships for Environmental Education

**Schools cannot address sustainability challenges in isolation. How important are collaborations with NGOs, researchers, government agencies, and local communities in strengthening your sustainability programme?**

**Manjima:** Sustainability is a collective effort. We actively collaborate with local NGOs, other learning organisations, and Shiv Nadar Foundation entities to bridge formal schooling with informal learning.

*Re-Store initiative - a thrift store through which we sell pre-loved and upcycled things, including our recycled paper, which is used to create art pieces as well as notebooks and bags*

We are lucky to have partners from the SNF and The Habitats Trust who support our learning by providing resources as well as wisdom. We actively engage with organisations such as WWF to support us with our learning. We also develop partnerships with other schools—local as well as national and international—and international networks to promote our learning as well as our message.

These partnerships provide students with a wider platform to test their ideas and contribute to real-world community initiatives, which is vital for meeting our mission of global citizenship.

### Preparing Future Environmental Leaders

**Beyond creating awareness, how do you equip students with the skills needed to address emerging environmental challenges such as plastic pollution, hazardous waste, chemical safety, biodiversity loss, and climate change?**

**Manjima:** We equip students by moving beyond theory to action competence. Our curriculum uses interdisciplinary integration (STEAM, Humanities, Biology, Math) to analyse complex challenges. Students build Action Research capacity—learning to gather data, prototype solutions, and present them publicly. They learn to solve problems in real life by solving simulated as well as real problems through a scaffolded process. By enabling them to observe the world with patience and care, understanding how planetary systems interact with each other, and supporting them with identifying problems and working out solutions with a long-term view, we are preparing them to be systemic designers of a sustainable future.

### Advice for schools

**Many schools want to strengthen their sustainability programmes but are unsure where to begin. Based on your experience, what practical steps would you recommend for schools that want to create healthier and more sustainable campuses?**

**Manjima:** In order to undertake sustainability as an approach and a process, it is important that schools understand that it must be embedded as a mindset and in all processes, and not

viewed separately as a stand-alone event or learning strand.

**Start with a Sustainability Committee—**you need administration, faculty, parents, and students at the table from day one. Be real–be willing to engage with real change. Superficial strokes will not achieve your purpose.

**Conduct a baseline audit;** you cannot improve what you do not measure. Set milestones for yourself and keep measuring your progress with dipsticks.

**Designate your campus infrastructure as a Living Lab** and invite students to engage with it and propose solutions, such as how to grow nutritious food for yourself, or cool down a classroom without using an AC. When the school building itself teaches the lesson, sustainability becomes part of the daily culture rather than an added burden.

### Looking Ahead

**What are the next priorities for Shiv Nadar School's sustainability programme, particularly in areas such as circular economy, waste reduction, environmental health, and responsible consumption?**

**Manjima:** We are in the process of embedding nature enriched learning into our Early, Primary and Middle Years curriculum, and have launched a MoolGyan learning programme to promote a healthy relationship with plants and food. We will be supporting and promoting these programmes over the course of this year. Alongside, our Middle and Senior cohorts continue to promote FairTrade values and ethics through their campaigns and promotional activities.

Our next priorities are scaling our SOP development and aligning with our Sustainability policy to ensure every sustainability commitment is repeatable and accountable. We are also deepening our focus on Environmental Health audits and integrating Mission LiFE principles more deeply into our faculty professional development to ensure our teachers are the primary champions of this change.

**Any relevant details of your sustainability and environment programs that you want to share with our readers.**

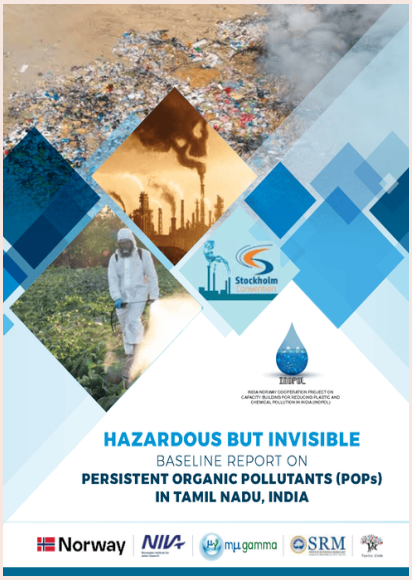
**Manjima:** We believe that a truly essential aspect of our work is building awareness and a culture of care within the community. To this end, we have conducted 'BioBlitz' — citizen science explorations in our neighbourhoods — with Primary Years students and their parents, and 'Echoes of the Wild' — a scavenger hunt for life forms that coexist with us within the campus space — with Middle Years students. On the basis of the latter, we are in the process of developing campus biodiversity maps which emphasise the importance of acknowledging the coexistence of multiple other species of flora and fauna even within the city space.

We took students to watch special shows of Nocturnes, an award winning documentary on Moths, and introduced them to BioRobotics and Insect Studies at Shiv Nadar University. We also took them to the fantastic Themed Botanic Garden there, which they thoroughly enjoyed. Much of this was organised under Project Ukama — which means the whole world is interdependent in the Shona language (from South Africa). We have also partnered with organisations like Katkatha Puppet Arts Trust to create giant puppets of insects, which were then taken out on a parade, and put up posters of the Seven Principles of Ocean Literacy around our campuses to develop a better understanding of our oceans and how they impact our lives.

Taken in alignment with the MoolGyan and Nature Curriculum as well as FairTrade supported work, the idea is to promote and nurture the idea of interdependence and accountability for our actions across all stakeholders.

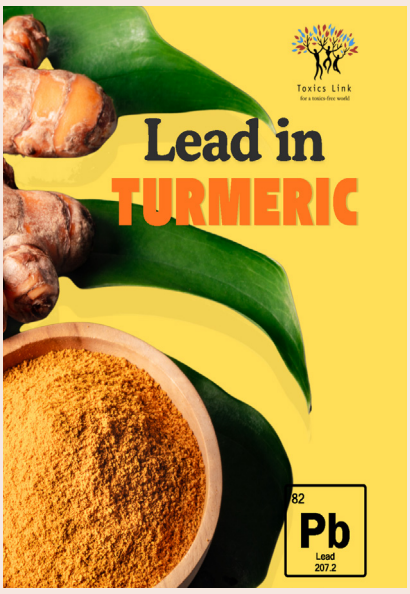
*Giant puppet parade under Project Ukama*

PUBLICATIONS




## Hazardous But Invisible Baseline Report On Persistent Organic Pollutants (PoPs) in Tamil Nadu

A joint effort by the Norwegian Institute for Water Research (NIVA); Mu Gamma Consultants Pvt Ltd and Toxics Link, this Baseline Report of Persistent Organic Pollutants (POPs) provides an overview of the pollution status, management aspects, as well as public health and socio-economic considerations of POPs pollution in Tamil Nadu, India.




## Lead in Turmeric

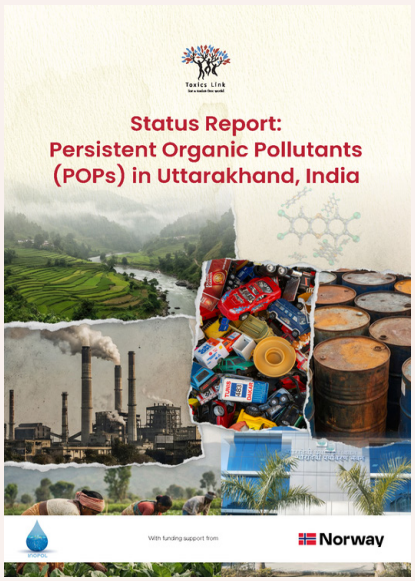
The study analysed 13 raw turmeric samples collected directly from farms across six Indian states. All samples contained lead levels well within the FSSAI permissible limit, suggesting that the high lead levels reported in commercially available turmeric powder are more likely to arise during post-harvest processing, handling, or adulteration rather than cultivation.

PUBLICATIONS


## Documenting Mercury-Free Model Healthcare Facilities in the Country

### Full Report & Summary Report

This report documents India's transition from mercury-based to mercury-free healthcare instruments across selected states. It highlights challenges, best practices, and lessons from Delhi, Goa, Bihar, and West Bengal to support safer healthcare systems.

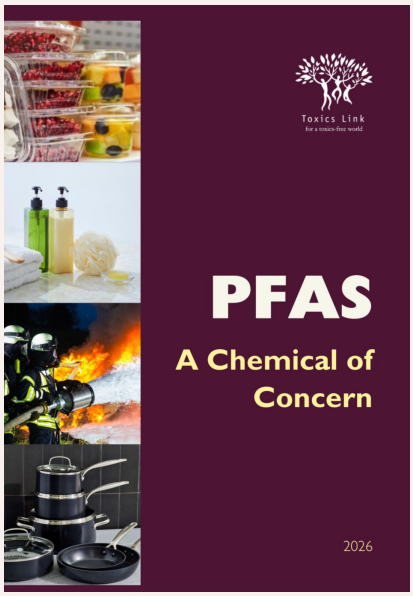



## Status Report: Persistent Organic Pollutants (POPs) in Uttarakhand, India

Persistent Organic Pollutants (POPs) are hazardous chemicals that threaten human health and the environment. This report reviews their status in Uttarakhand, identifies sources, risks, and policy gaps, and supports the national and state efforts by promoting awareness safer environmental practices.

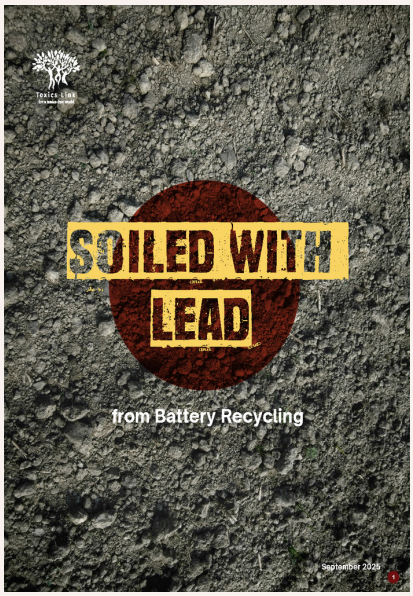

## Revisiting Single Use Plastic Ban

Toxics Link assessed the on-ground effectiveness of the single-use plastics (SUPs) 2022 ban, across street vendors, markets, small eateries, retail outlets, religious sites, and transport hubs. The study found that 84% of 560 surveyed locations across Delhi, Mumbai, Guwahati, and Bhubaneswar continue to use or sell banned plastic items.




## PFAS: A Chemical of Concern

This report examines per- and polyfluoroalkyl substances (PFAS), widely used persistent chemicals found in various industrial and consumer products. It highlights their environmental persistence, potential health risks, global regulatory developments, and emerging concerns in India.




## Soiled with Lead: from Battery Recycling

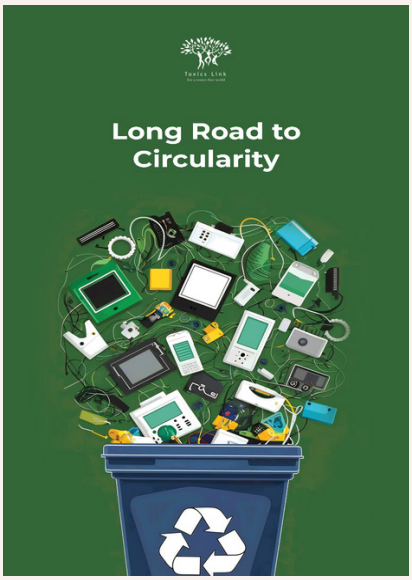
This report assesses lead contamination in soil around authorised (formal) and unauthorised (informal) recycling units across Delhi NCR, Haryana, Rajasthan, and Uttar Pradesh, revealing high levels of lead in soil and raising serious concerns for public health and environmental safety.


## Safe Disposal?

This report by Toxics Link examines the environmental and health impacts of small-scale sanitary napkin incinerators by analysing ash and flue gas. The findings reveal hazardous substances, including phthalates, dioxins, furans, and heavy metals, raising concerns about emissions from low-temperature systems used in India.

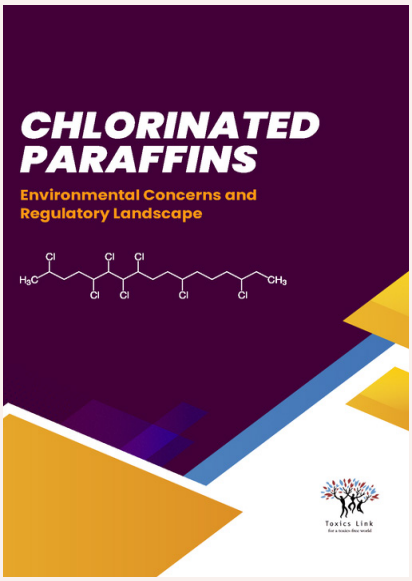

## Lead and Its Compound in India

This report compiles India's regulatory framework on lead across products and environmental media, highlighting key standards, gaps, and enforcement challenges; serves as a reference for policymakers and stakeholders to strengthen coordination, improve compliance, support informed actions to reduce lead exposure.




## Long Road to Circularity

This report reviews current e-waste regulations and identifies key challenges affecting their effectiveness. It highlights persistent gaps such as low consumer awareness, weak financial traceability of e-waste flows, and limited monitoring capacity.

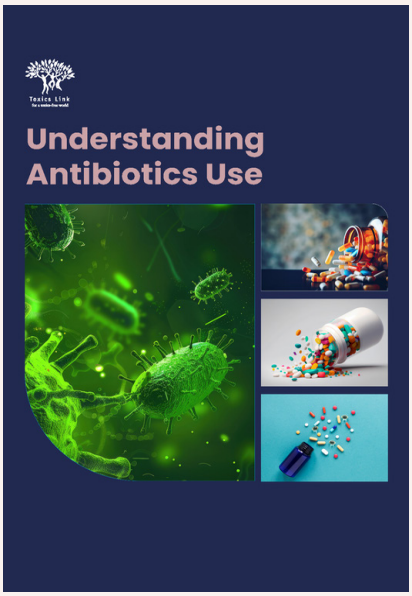



## Chlorinated Paraffins

Chlorinated paraffins (CPs) are toxic synthetic additives used in plastics, textiles, lubricants, and more, posing health risks. This report highlights their environmental and toxicological impacts, reviews global regulations, and urges India to adopt strict controls while guiding stakeholders on risk management.

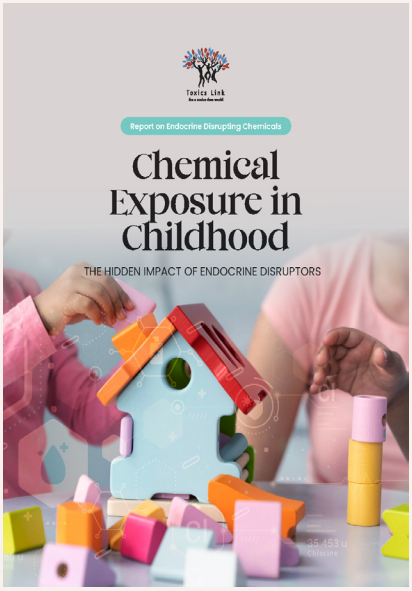

## Stitch in Time: Evaluating Consumer Behaviour & Electronics Repair Accessibility

This report examines the repair landscape across Delhi, Hyderabad, Kolkata, Nagpur, and Ranchi. By analysing IT and appliances through economic and behavioural lenses, it identifies factors driving consumer choices and underscores the repair sector as a vital pillar for India's circular economy.




## Understanding Antibiotics Use

Antimicrobial resistance poses a growing threat to public health in India, driving a rise in drug-resistant infections. The study highlights the critical gaps in awareness, regulation, and practices among consumers, pharmacists, and clinicians, underscoring the urgent need for stronger antimicrobial stewardship programmes across stakeholders.




## Chemical Exposure in Childhood: The Hidden Impact of Endocrine Disruptors

Endocrine disrupting chemicals (EDCs) are commonly available around us posing health risks. This report provides an overview of EDCs, highlighting their presence in various children's products. It also proposes policy and consumer-oriented recommendations to reduce exposure and mitigate risks.


## About Toxics Dispatch

Toxics Dispatch was started in 1998 with the primary objective of creating awareness about environmental pollution related to the management of waste and hazardous chemicals and their impact on the environment and public health.

Toxics Dispatch was born out of the need to reach out to various stakeholders, including government officials, judiciary, youth, and the general public, to sensitise them about the extent of toxic pollutants and their damaging effects on the environment.

Since its inception, Toxics Dispatch has highlighted pressing issues of hazardous, biomedical, municipal solid waste, e-waste, international waste trade, and the emerging issues of pesticides and Persistent Organic Pollutants (POPs). The newsletter aims to disseminate information to help strengthen the campaigns against toxic pollution, provide cleaner alternatives, and bring together groups and people affected by this menace.

Toxics Dispatch comes out thrice a year and is available online and in print. You can subscribe by writing to us at info@toxicslink.org.

**All issues of Toxics Dispatch can be viewed at**

https://toxicslink.org/dispatch

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for a toxics-free world

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Toxics Link (The Just Environment Charitable Trust)

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