

6. Inhalable Microplastics- Environment

30,000 live animals seized in global wildlife crime crackdown by Interpol . A pioneering study across four Indian cities reveals that residents inhale microplastics equivalent to a small plastic bottle over a lifetime, posing severe risks as these particles bypass lung defenses and transport harmful toxins. Despite constituting up to 5% of urban particulate pollution, these inhalable microplastics remain unmonitored by current air quality standards, leaving a significant public health danger unchecked.

Overview of Inhalable Microplastics (iMPs)

Definition- Inhalable microplastics are microscopic plastic particles sized less than 10 micrometers (microns).

Current Monitoring Status- These particles are not currently measured or controlled under standard air quality indices (such as AQI for PM2.5). This means their presence and danger are officially unmonitored, despite being active pollutants in the air.

Study Context- A first-of-its-kind study was conducted to examine these specific pollutants in four major Indian cities to understand the scale of the invisible threat.

Sources of Inhalable Microplastics

Microplastics enter the atmosphere through two main pathways- direct release (primary) or the breakdown of larger items (secondary).

Feature	Primary Sources (Direct Release)	Secondary Sources (Breakdown)
Description	Particles that enter the environment directly in their original micro-sized form.	Particles formed from the degradation, fragmentation, and weathering of larger plastic objects.
Key Contributors	Synthetic Textiles- Fibers shedding from polyester, nylon, and acrylic clothing. Tire Wear- Particles released from vehicle tires due to friction. Personal Care Products- Microbeads found in cosmetics and scrubs. Industrial Pellets- Raw plastic materials used in manufacturing.	Plastic Packaging- Degradation of bags, wrappers, and containers. Construction Materials- Breakdown of insulation, paints, and coatings. Waste Burning- Open incineration of plastic refuse. Footwear- Wear and tear from shoe soles.

Key Findings of the Study

The study monitored air quality at a human breathing height of 1.5 meters in busy market areas across Delhi, Mumbai, Kolkata, and Chennai.

Average Concentration- The air in these cities contains an average microplastic concentration of 8.8 µg/m³.

Daily Intake Estimates

Daily- An average city resident breathes in approximately 132 micrograms of microplastics every day.

Lifetime- Over a lifetime, an average urban resident could inhale nearly 2.9 grams of microplastics. This is roughly equivalent to the weight of a small plastic bottle.

Contribution to Air Pollution- Microplastics are a significant pollutant, constituting up to 5% of the total PM10 and PM2.5 particulate matter in Indian cities.

Inhalable Microplastics Are Dangerous

The health risks associated with iMPs are severe due to their physical size and their ability to transport harmful substances.

Deep Lung Penetration- Their tiny size (<10 µm) allows them to bypass the body's natural filtration systems, such as nose hairs and mucus. They penetrate deep into the lung tissue and lodge in the alveoli, interfering with respiratory function.

The "Trojan Horse" Effect- The particles act as vehicles for other dangerous pollutants.

Toxic Chemicals- Heavy metals like lead and cadmium, along with hormone-disrupting chemicals like phthalates and BPA, adhere to the surface of the plastics.

Pathogens- Harmful bacteria and fungi, including antibiotic-resistant strains, can attach to the particles and enter the lungs.

Systemic Health Risks

Chronic Inflammation- The body recognizes lodged plastic particles as foreign objects, triggering persistent inflammation which is a precursor to various diseases.

Entry into Bloodstream- The smallest particles ($<1\ \mu\text{m}$) can cross the lung barrier and enter the bloodstream. This allows them to reach vital organs, potentially affecting the heart, brain, and placenta.

Long-Term Persistence- Plastics are non-biodegradable and degrade extremely slowly, leading to accumulation in the body and continuous exposure over time.

Recommendations to Address Inhalable Microplastics

Official Recognition & Monitoring- Inhalable microplastics should be formally included in national air quality standards. Regular measurement protocols must be established to monitor them alongside PM_{2.5}.

Strengthen Plastic Regulation- Enforce strict bans on single-use plastics to reduce waste. Set manufacturing limits on high-shedding synthetic textiles to curb primary source pollution.

Improve Waste Management- Completely eliminate the open burning of plastic waste. Enhance waste segregation and recycling systems to prevent environmental degradation of plastics.

Public Awareness & Personal Choices

Clothing- Promote the choice of natural-fiber clothing (such as cotton, wool, and linen) over synthetics.

Home Care- Encourage the use of washing machine filters to trap fibers before they enter water systems and subsequently dry out to become airborne.

Reduction- Advocate for a general reduction in daily plastic usage.

Targeted Protection for Vulnerable Groups- Provide protective equipment, specifically N95 masks, to outdoor workers like traffic police and waste handlers who face the highest exposure. Issue exposure guidelines for high-risk zones.

Urban & Policy Action- Create vehicle-free zones in crowded markets to reduce tire-wear particles. Install high-efficiency air filtration systems in areas identified as high-risk.

Source- https://www.downtoearth.org.in/wildlife-biodiversity/30000-live-animals-seized-in-global-wildlife-crime-crackdown-by-interpol#google_vignette