

6. Microplastics Pollution

A recent study found widespread microplastic contamination in fish along Goa's Mandovi estuary

Definition and Types

Definition – Microplastics are tiny plastic pieces or fibers smaller than 5 millimeters, with some being invisible to the naked eye.

Forms –

1. **Beads** – Used in cosmetics and personal care products.
2. **Fragments** – Broken pieces from larger plastic items.
3. **Pellets** – Raw industrial plastic materials.
4. **Film** – Plastic packaging and wrappers.
5. **Foam** – Expanded polystyrene from packaging and insulation.
6. **Fibers** – From synthetic textiles like polyester and nylon.

Sources of Microplastics

Primary Microplastics – Manufactured at micro-size, e.g., microbeads in cosmetics, industrial pellets.

Secondary Microplastics – Result from breakdown of larger plastic waste due to sunlight (UV radiation), mechanical abrasion, and chemical degradation.

Pathways into Environment –

1. Waterways via runoff, sewage, and untreated wastewater.
2. Soil through compost, sludge, and landfills.
3. Air through dust and atmospheric deposition.

Environmental Impacts

Aquatic Ecosystems – Ingested by small fish and aquatic organisms, moving up the food chain via bioaccumulation and trophic transfer. Disrupts feeding, growth, and reproduction in aquatic species.

Soil & Terrestrial Ecosystems – Alters soil properties and affects soil microorganisms. Potential contamination of crops through irrigation with microplastic-laden water.

Human Health Impacts

Consumption Risks – Microplastics enter humans mainly via seafood, drinking water, and salt.

Health Consequences –

Immune dysfunction – Chronic inflammation and impaired immune response.

Hormonal imbalances – Disruption of endocrine system affecting fertility.

Reproductive damage – Reduced sperm quality and menstrual irregularities.

Increased cancer risk – Potential genotoxic and carcinogenic effects.

Chronic diseases – Cardiovascular, metabolic, and neurological disorders may be exacerbated.

Efforts Made in India

Initiative	Description
Ban on Single-Use Plastics (July 2022)	Prohibits plastic cutlery, straws, packaging films, and other disposable plastic items.
Extended Producer Responsibility (EPR)	Mandates manufacturers to manage post-consumer plastic waste; includes collection, recycling, and disposal obligations.
Clean India Mission (Swachh Bharat Abhiyan)	Integrates plastic waste management into broader sanitation and waste management goals.
Research and Awareness	Government agencies and NGOs promoting research on microplastics in water, food, and marine ecosystems.

Challenges in Tackling Microplastic Pollution

Detection – Lack of standardized methods for identifying microplastics in food, water, and soil.

Awareness – Limited public understanding of microplastic risks and long-term health consequences.

Infrastructure – Insufficient facilities for waste segregation, recycling, and treatment.

Regulatory Gaps – Enforcement of bans and EPR norms remains uneven across states.

Way Forward

Scientific Research – Invest in studies on microplastic sources, pathways, and health impacts.

Biodegradable Alternatives – Promote bioplastics and reusable materials for packaging and daily use.

Improved Waste Management – Strengthen segregation, recycling, and plastic recovery systems at municipal and industrial levels.

Public Awareness Campaigns – Educate citizens about microplastic pollution and sustainable consumption practices.

Policy & National Strategy – Develop a coordinated national action plan, combining science, regulation, and community engagement to reduce microplastic burden.

Global Cooperation – Engage in international partnerships for technology transfer, research collaboration, and standardized monitoring of microplastics.

Conclusion

Microplastic pollution is a growing environmental and health threat in India, affecting water, marine life, and human health. With proactive policies, technological innovations, and community participation, India can lead global efforts in mitigating microplastic contamination.

Source – https://epaper.thehindu.com/ccidist-ws/th/th_international/issues/152121/OPS/GS3F0AO3L1+GPHF1FLAV.1.html

