



Plastic Waste a Public Health Threat

For Prelims: [Microplastics](#), [Single-Use Plastics](#), [Virgin plastic](#), Endocrine-disrupting Chemicals

For Mains: Plastic Waste Management, Conservation Environmental Pollution & Degradation Government Policies & Interventions.

[Source: TH](#)

Why in News?

Studies have found alarming levels of [microplastics](#) and **endocrine-disrupting chemicals (EDCs)** in human tissues. **India, as the world's top plastic waste generator**, faces a growing public health crisis linked to fertility issues, cancers, and chronic diseases.























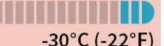

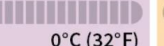
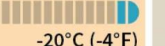







How are Microplastics and EDC in Plastics Affecting Human Health?

- **Microplastics:** Microplastics are plastic particles **smaller than 5 mm**, formed either intentionally (primary) or through the breakdown of larger plastics (secondary).
 - **Primary microplastics** include microbeads in **cosmetics and fibres from textiles**.
 - **Secondary microplastics** result from the degradation of plastic waste due to sunlight and ocean waves.
 - Microplastics are biologically active and have been found in **blood, lungs, heart, placenta, breast milk, ovarian follicular fluid, and semen**.
 - **Affect:**
 - **Men:** Linked to lower sperm count, motility, abnormal morphology, and hormonal imbalance.
 - **Women:** Associated with poor egg quality, menstrual issues, miscarriage risk, [Polycystic Ovary Syndrome \(PCOS\)](#), and endometriosis.
- **Endocrine-disrupting Chemicals:** EDCs are **natural or human-made chemicals** that may mimic, block, or interfere with the body's hormones, which are part of the endocrine system.
 - Plastics often carry EDCs like Bisphenol A (BPA) (in water bottles, food containers), phthalates such as DEHP and DBP (in cosmetics, toys, IV tubes), and PFAS (in food packaging, non-stick cookware).
 - **Affect:** These chemicals mimic or block hormones like estrogen and testosterone, disrupting reproductive health and metabolic functions.
 - Plastic additives like DEHP, BPA, and phthalates are classified as **probable carcinogens**.
 - EDCs also contribute to obesity, type 2 diabetes, thyroid disorders, and metabolic syndrome by mimicking cortisol and disrupting insulin response.

THE 7 TYPES OF PLASTICS

THEIR TOXICITY AND WHAT THEY ARE MOST COMMONLY USED FOR

TOXICITY CODE:  LOW  HIGH

Polymer Name	POLYETHYLENE TEREPHTHALATE	HIGH-DENSITY POLYETHYLENE	POLYVINYL CHLORIDE	LOW-DENSITY POLYETHYLENE	POLYPROPYLENE	POLYSTYRENE	All other plastics, including acrylic, fiberglass, nylon, polycarbonate, and polylactic acid (a bioplastic)
Resin Identification Code							
Abbreviation	PET or PETE	HDPE	PVC	LDPE	PP	PS	OTHER
Recyclable?	Commonly Recycled	Commonly Recycled	Sometimes Recycled	Sometimes Recycled	Occasionally Recycled	Commonly Recycled (but difficult to do)	Difficult to Recycle
Percentage Recycled Annually	 36%	 30-35%	 <1%	 6%	 3%	 34%	 Low
How Long to Decompose Under Perfect Conditions	5-10 Years	100 Years	Never	500-1,000 Years	20-30 Years	50 Years	Majority of these plastics: never Polylactic acid: 6 months
Maximum Temperature	 70°C (158°F)	 120°C (248°F)	 70°C (158°F)	 80°C (176°F)	 135°C (275°F)	 90°C (194°F)	Polycarbonate: 135°C (275°F) Polylactic acid: 150°C (302°F)
Brittleness Temperature	 -40°C (-40°F)	 -100°C (-148°F)	 -30°C (-22°F)	 -100°C (-148°F)	 0°C (32°F)	 -20°C (-4°F)	Polycarbonate: -135°C (-211°F) Polylactic acid: 60°C (140°F)
Toxicity Level							
Most Commonly Leached Toxin(s)	Antimony Oxide, Bromine, Diazomethane, Lead Oxide, Nickel Ethylene Oxide, and Benzene	Chromium Oxide, Benzoyl Peroxide, Hexane, and Cyclohexane	Benzene, Carbon Tetrachloride, 1,2-Dichloroethane, Phthalates, Ethylene Oxide, Lead Chromate, Methyl Acrylate, Methanol, Phthalic Anhydride, Tetrahydrofuran, and Tribasic Lead Sulfate, Mercury, Cadmium, Bisphenol A (BPA)	Benzene, Chromium Oxide, Cumene Hydroperoxide, And Tert-butyl Hydroperoxide	Methanol, 2,6-di-tert-Butyl-4-Methyl Phenol, and Nickel Dibutyl Dithiocarbamate	Styrene, Ethylbenzene, Benzene, Ethylene, Carbon Tetrachloride, Polyvinyl Alcohol, Antimony Oxide, and Tert-butyl Hydroperoxide, Benzoquinone	BPA, BPS, as well as all other toxins mentioned

What are the Concerns with Plastic Pollution in India?

- **Massive and Mismanaged Plastic Waste Generation:** India contributes **9.3 million tonnes** of plastic pollution annually (burning 5.8 mt and releasing 3.5 mt into the environment) making it the **world's largest polluter**, surpassing Nigeria, Indonesia, and China, according to a 2024 Nature study.
- **Environmental and Health Hazards: Open burning**, a common disposal method, emits toxic pollutants that **degrade air quality** and **harm respiratory health**.
 - **Plastic debris clogs rivers and drains**, worsening urban flooding and threatening aquatic biodiversity.
 - Single-use plastics persist for centuries, polluting land and oceans and harming marine life. Cities like Mumbai see high microplastic exposure, while phthalate levels in drinking water exceed safe limits in Delhi, Jabalpur, and Chennai.
 - Children in polluted areas face increased risks of **early puberty, learning issues, and obesity due to EDCs**.
- **Economic and Agricultural Impact:** India could lose **USD 133 billion** in plastic packaging value by 2030 if waste continues to go uncollected.
 - **Microplastics in soil** from plastic use in agriculture and poor wastewater treatment are degrading soil fertility and threatening food safety.

- The **e-commerce boom** has escalated plastic packaging waste, most of which is non-recyclable.
- **Weak Infrastructure and Regulatory Oversight:** Insufficient sanitary landfills, poor segregation at source, and a lack of **advanced recycling technology** hinder effective waste processing.
 - **Informal sector recyclers**, though critical, operate unregulated, leading to gaps in plastic tracking and environmental safety.
 - The enforcement of policies such as the **Plastic Waste Management (Amendment) Rules, 2024** and **Extended Producer Responsibility (EPR)** remains inconsistent and inadequate.
 - Rise in **Single-Use Plastics (SUPs)**, which account for 43% of total plastic waste. Despite regulatory bans, enforcement remains poor due to the low cost and easy availability of such plastics.
- **Data and Policy Gaps:** Official collection rates (95%) are overstated; real rates are closer to 81%, hampering effective planning.
- **Global North-South Divide:** Despite lower per capita plastic use (0.12 kg/day), India's poor disposal systems result in more environmental leakage compared to high-income countries with better infrastructure.

India's Initiatives Related to Plastic Waste Management

- [Swachh Bharat Mission](#)
- [India Plastics Pact](#)
- [Project REPLAN](#)
- [Un-Plastic Collective](#)
- [GoLitter Partnerships Project](#)



How Can India Combat the Growing Threat of Plastics?

- **Microplastic Filtration Systems:** Invest in advanced water treatment technologies to **filter microplastics** to reduce plastic contamination in the environment and the food chain.
 - The **National Plastic Waste Reporting Portal** will help track and monitor waste more

effectively.

- **Behavioural Change and Public Awareness:** Launch national campaigns under [Swachh Bharat Mission 2.0](#) and [Mission LiFE](#) to educate citizens about plastic hazards and encourage plastic-free lifestyles.
 - Integrate environmental education in school curricula and promote **reduce-reuse-recycle** values from an early age.
 - Encourage use of **eco-friendly alternatives** (glass, cloth, jute, biodegradable polymers).
- **Biomonitoring and Public Health Surveillance:** Establish national **biomonitoring programs** to assess the levels of EDCs in blood, urine, and breast milk, and fund longitudinal studies to **track health outcomes such as fertility issues, metabolic diseases, and cancer**.
 - Regular surveillance of plastic pollution and its effects on public health should be implemented to inform policymaking.
- **Fiscal Measures and Economic Incentives:** Increase eco-taxes or cess on [virgin plastic](#) production and packaging to limit production.
 - Provide subsidies and tax benefits for industries investing in eco-friendly packaging and plastic alternatives.
- **Stronger Regulation and Enforcement:** India must move beyond **end-of-pipe waste solutions** by revising the Plastic Waste Management Rules to address **low-dose chemical toxicity** (such as EDCs), microplastic contamination, and the heightened vulnerability of children and pregnant women.
 - Under the PWM Rules 2024, **Producers, Importers, and Brand Owners (PIBOs)** are legally obligated to collect and responsibly process the plastic packaging they introduce, including compostable and biodegradable plastics.
 - While an online submission and tracking system has been introduced to ensure compliance, its effectiveness depends on robust implementation and strict monitoring.
 - Harmful plastic additives should be classified as toxic under the **Environment Protection Act, 1986**.
Additionally, the **EPR mechanism** must be strengthened through material-specific targets, third-party audits, and traceability via **plastic credits** to ensure accountability and circularity.
- **Collaborate on Global Plastic Initiatives:** India should align with global initiatives like the [UN Clean Seas Campaign](#) to share knowledge and best practices for reducing plastic waste globally.

Drishti Mains Question:

India is now the world's top plastic polluter. Examine the socio-economic and health impacts of plastics. Suggest reforms to tackle this crisis.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims

Q.1 In India, 'extend producer responsibility' was introduced as an important feature in which of the following? (2019)

- (a) The Bio-medical Waste (Management and Handling) Rules, 1998
- (b) The Recycled Plastic (Manufacturing and Usage) Rules, 1999
- (c) The e-Waste (Management and Handling) Rules, 2011
- (d) The Food Safety and Standard Regulations, 2011

Ans: (c)

Q.2 How is the National Green Tribunal (NGT) different from the Central Pollution Control Board (CPCB)? (2018)

1. The NGT has been established by an Act whereas the CPCB has been created by an executive order of the Government.
2. The NGT provides environmental justice and helps reduce the burden of litigation in the higher courts whereas the CPCB promotes cleanliness of streams and wells, and aims to improve the quality of air in the country.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Ans: (b)

Q. Why is there a great concern about the 'microbeads' that are released into the environment? (2019)

- (a) They are considered harmful to marine ecosystems.
- (b) They are considered to cause skin cancer in children.
- (c) They are small enough to be absorbed by crop plants in irrigated fields.
- (d) They are often found to be used as food adulterants.

Ans: (a)

Mains

Q: What are the impediments in disposing the huge quantities of discarded solid waste which are continuously being generated? How do we remove safely the toxic wastes that have been accumulating in our a habitable environment? **(2018)**