



Indoor Air Quality

[Source: TH](#)

Why in News?

[Indoor air pollution](#) is a growing concern in India, especially in urban areas where people spend 70–90% of their time indoors. Yet, discussions around **Indoor Air Quality (IAQ)** remain limited, with most policy focus still on outdoor pollution.

Air Pollutants



Air Pollutants

Sulphur Dioxide (SO_2)



It comes from the consumption of fossil fuels (oil, coal and natural gas). Reacts with water to form acid rain.

Impact: Causes respiratory problems.

Ozone (O_3)



Secondary pollutant formed from other pollutants (NO_x and VOC) under the action of the sun.

Impact: Irritation of the eye and respiratory mucous membranes, asthma attacks.

Nitrogen Dioxide (NO_2)



Emissions from road transport, industry and energy production sectors. Contributes to Ozone and PM formation.

Impact: Chronic lung disease.

Carbon Monoxide (CO)



It is a product of the incomplete combustion of carbon-containing compounds.

Impact: Fatigue, confusion, and dizziness due to inadequate oxygen delivery to the brain.

Ammonia (NH_3)



Produced by the metabolism of amino acids and other compounds which contain nitrogen.

Impact: Immediate burning of the eyes, nose, throat and respiratory tract and can result in blindness, lung damage.

Lead (Pb)



Released as a waste product from extraction of metals such as silver, platinum, and iron from their respective ores.

Impact: Anemia, weakness, and kidney and brain damage.

Particulate Matter (PM)



PM10: Inhalable particles, with diameters that are generally 10 micrometers and smaller.

PM2.5: Fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller.

Source: Emitted from construction sites, unpaved roads, fields, fires.

Impact: Irregular heartbeat, aggravated asthma, decreased lung function.

Note: These major air pollutants are included in the Air quality index for which short-term National Ambient Air Quality Standards are prescribed.

What is Indoor Air Quality?

- **Definition:** IAQ refers to the quality of **air inside and around buildings**, impacting the health and comfort of occupants.
- **Common Indoor Air Pollutants:**
 - **Carbon Monoxide (CO):** A toxic **odorless gas** produced from incomplete combustion.
 - **Formaldehyde:** Found in wood products, glues, paints, and furnishings; a known **carcinogen**.
 - **Asbestos:** Found in older construction materials **used for making fireproof or incombustible building components**; exposure can lead to serious lung diseases.
 - **Radon:** A radioactive gas that **seeps from the ground into buildings**.
 - **Lead:** Found in old paints, plumbing, and ceramics.
 - **Mould:** A **microorganism and type of fungus** that thrives in damp places, and humid environments.
 - **Pesticides:** Used **indoors for pest control**, contributing to chemical exposure.
 - **Smoke:** From cigarettes or cookstoves, carrying harmful toxins.
 - **Allergens:** Dust mites, pet dander, and pollen trapped in carpets and furniture.
- **Reasons for Deteriorating IAQ:** Outdoor pollutants like **Particulate Matter (PM2.5)** enter poorly sealed or ventilated buildings through gaps in poorly insulated structures.
 - Indoor activities such as cooking, smoking, use of incense sticks, and chemical cleaning.
 - **Overcrowded housing** in Indian cities increases pollutant levels due to **limited space for dispersion**.
 - The **lack of public awareness and regulatory oversight on IAQ** standards allows harmful practices and materials to persist unchecked.
- **Impact:** India recorded the **highest average annual indoor PM2.5 levels** (55.18 $\mu\text{g}/\text{m}^3$), as revealed in Dyson's Global study, followed by China, Turkey, UAE, and South Korea.
 - Globally, **household air pollution causes 3.2 million premature deaths annually (WHO)**, as pollutants from solid fuels and kerosene damage the lungs, impair immunity, and reduce blood oxygen levels.
 - Poor ventilation can lead to carbon dioxide build-up, resulting in **"sick building syndrome."**
 - Indoor air pollution is linked to **noncommunicable diseases** such as stroke, heart disease, Chronic obstructive pulmonary disease (COPD) and lung cancer. Women and children bear the heaviest health burden.

What are the Solutions to Indoor Air Pollution?

- **Air Purifiers:** Use air purifiers equipped with High Efficiency Particulate Air filters to trap particulate matter like PM2.5 and other harmful pollutants.
- **Use of Indoor Plants:** Certain indoor plants, like **spider plants and peace lilies**, can help purify the air by **absorbing pollutants like formaldehyde and benzene**.
- **Use Clean Fuels and Technologies:** Switch to cleaner alternatives like solar, electricity, biogas, liquefied petroleum gas (LPG), natural gas, or alcohol fuels for cooking and heating.
- **Low-VOC Materials:** Reducing the use of **volatile organic compounds (VOCs)** in building materials like paints, varnishes, and furnishings can significantly improve indoor air quality.
- **Health-Focused Building Practices:** Establish health-focused building construction guidelines in collaboration with the **Indian Green Building Council (IGBC)**, aligning with **Eco-Niwas Samhita (ENS)**, to ensure suitability for healthy living.

Prelims

Q. In the context of proposals to the use of hydrogen enriched CNG (H-CNG) as fuel for buses in public transport, consider the following statements: (2019)

1. The main advantage of the use of H-CNG is the elimination of carbon monoxide emissions.
2. H-CNG as fuel reduces carbon dioxide and hydrocarbon emissions.
3. Hydrogen up to one-fifth by volume can be blended with CNG as fuel for buses.
4. H-CNG makes the fuel less expensive than CNG. Which of the statements given above is/are correct?

- (a) 1 only
(b) 2 and 3 only
(c) 4 only
(d) 1, 2, 3 and 4

Ans: (b)

Q. Consider the following: (2019)

1. Carbon monoxide
2. Methane
3. Ozone
4. Sulphur dioxide

Which of the above are released into the atmosphere due to the burning of crop/biomass residue?

- (a) 1 and 2 only
(b) 2, 3 and 4 only
(c) 1 and 4 only
(d) 1, 2, 3 and 4

Ans: (d)