AIR POLLUTION SPECIAL

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A DOWN TO EARTH SUPPLEMENT FOR THE YOUNG AND CURIOUS

Taking Your Breath Away

A brief report on the most annoying sources of air pollution fuming all across India

Cover Story

Airpocalypse

As air pollution becomes an alarming issue that can no longer be snoozed, let us take a deep breath and study about its major pollutants and sources across the country


Shambhavi Shukla and Anubhuti Sharma

Five years back itself, in 2019, air pollution was alone responsible for about 16.5 lakh deaths in India. This was disclosed by the *Global Burden of Disease* (GBD), published by some very credible organizations—the Lancet Planet Health and the Indian Council of Medical Research. Their stat is believable as 24 out of 50 most polluted cities in the world are already in India, which we know from nothing but the World Health Organization's data released in May 2023.

With every passing year since 2019, the air quality worsened such that, currently, it has become one of the biggest reasons for child mortality in India. To let you know, child mortality is the total number of children dying out of every 1,000 kids annually in the age group of 0–5 years. In simple words, air pollution is among the biggest health risks to babies in India. Just grab the latest *Down To Earth* which reports how the newborn are its most innocent victim. Delhi kids, anyway, experience a peculiar vacation annually apart from the traditional summer and winter break. Do you know what's it called? 'Pollution vacation'!!!

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Choking to Death

Air pollution is a slow, silent, and an inconspicuous poison. Initially, it triggers chronic coughing and, eye and nose irritation which makes breathing difficult. In the long term, it causes lung cancer, cardiovascular diseases, asthma, bronchial allergies, and other respiratory ailments.

Agents of Breathlessness

NO_X, SO_X, CO, O_3, PM2.5, and PM10 are the most problematic pollutants. From your Chemistry classes, you'd know that NO_X and SO_X are oxides of nitrogen and sulphur. About CO and O_3, try finding out yourself. And regarding 'PM,' begin by noting that it is the devil amongst these all.

'PM' stands for Particulate Matter. It refers to a mixture of teeny-tiny particles, usually made up of some solids and liquids, suspended in the air. For example, dust, dirt, soot, or smoke can be seen hanging as minute particles in the air. But most of the times, PM is invisible to us, measuring far smaller than even the diameter of our hair! Two important types of PM are PM10 and PM2.5.

PM10 is called so as its particles have a diameter of <= 10 micrometers. A micrometer, is essentially 1000^{th} part of a millimeter. In easy terms, PM10 is $1/7^{th}$ of the diameter of your hair! Similarly, PM2.5 has a diameter of <= 2.5 micrometers, which is much, much smaller. What's concerning is that PM10 can enter our lungs and PM2.5 can even get into our blood cells, thus messing up with our whole body. The International Agency for Research on Cancer identifies PM2.5 as one of the most lethal cancer-causing agents. In India, it exceeds the safety standards of air quality by a huge margin, usually followed by the levels of PM10, NO_2, O_3 and CO. The only pollutant that is within our standards is SO_2, however, it does give rise to more PM.

No Smoke without... a Source

The starting points of bad air are well-identified and the roaster is common to most Indian cities. Overall speaking, vehicular, industrial, waste-related, and household emissions are among the nastiest across the country. These sources release pollutants while burning fossil fuels or any other materials. In a city like Kolkata, the System of Air Quality and Weather Forecasting and Research estimated that such combustion sources are responsible for roughly 90 per cent of the bad air. Other non-combustible sources include dust generated from construction sites, road traffic, sea salt, etc.

Polluted air makes breaking news especially during winters. In the ongoing season, the Air Quality Index for Delhi has already scored 468 out of 500, with 500 being the severest,

Cover Story

A LITTLE BIT ABOUT SMOG

Smog is formed due to contaminants ejected by thermal power plants, brick kilns, hot mix plants, local factories, and also by vehicular, waste, and other exhaust. In case you are wondering: hot mix plants make asphalt mixture for laying and repairing roads. The chemicals present in the smog, like NO_x and volatile organic compounds, sometimes react under sunlight and form tropospheric ozone. That's how the existing trouble snowballs into more dangerous ones.

on the pollution scale. During winters, pollution happens because the smoke originating from various heating sources doesn't rise too high from the ground level as the air becomes denser and heavier in cold temperatures. Thus, the dispersion of pollutants is very slow in this season. This scenario is applicable, especially in North India.

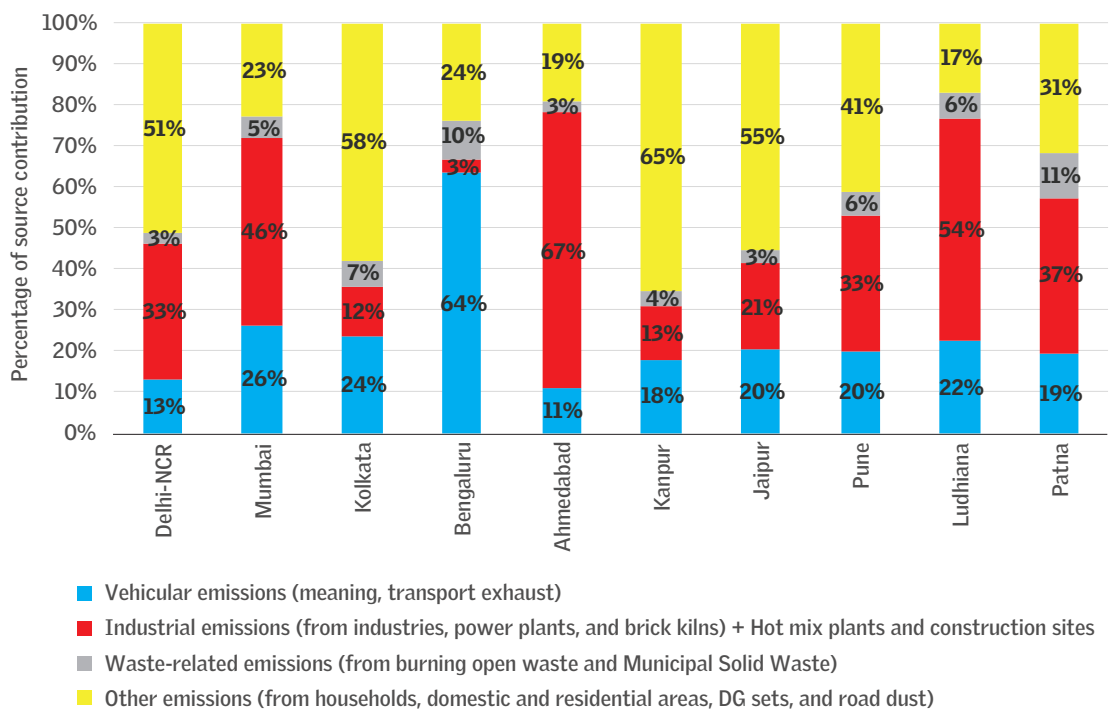
Vehicular emissions: Automobile exhaust is the villain of pure air. It mainly consists of CO, NO_X, PM2.5 and other toxins. These emissions are deadly because we are directly exposed to them on the roads so they come within our breathing zone. You must've already observed people feeling sick and nauseous from the black smoke that old rickety vehicles belch out.

In Mumbai, about 28 per cent of the NO_X is released solely by road transport. This figure is given by the National Environmental Engineering Research Institute and the Indian Institute of Technology, Bombay.

Industrial emissions: If you've ever visited Delhi, Kolkata, Ahmedabad, Ludhiana, Kanpur, or any other industrial hub in the early morning hours, you would've noticed a thick layer of haze on their skyline. It is clearly discernible as a white sheet of smog daunting the whole region.

Waste-related emissions: Lighting fire to any kind of waste outdoors releases a flux of obnoxious gases, be it a bonfire of dry leaves during winters or torching waste paper effigies. These activities emit a cocktail of NO_X, SO_2, CO, PM, and even carcinogenic toxins if the garbage contains plastic. Vapours released from open waste burning anywhere in a locality or landfill site subjects the

SOURCES OF POLLUTION



Source: Compliation of different city studies (published 2018 onwards) by the Centre for Science and Environment, New Delhi

nearby people to a high intensity exposure of intoxicants. Such burning of waste is rampant in several cities.

Other emissions: Domestic work within households—like burning fuel for cooking and heating, and running diesel generators for supplying power—dirty the air substantially. Open coal grills of restaurants and eateries waft thick smoke and, waste incinerators in hospitals and crematoria are other point sources of pollution.

Unpaved roads, construction and demolition areas, and numerous activities emit coarse PM. In a desert city like Jaipur, dust is prominent as on the one hand, there is constant road traffic and, on the other, there is hardly any greenery, or alternate source of moisture, to sediment it. Though this naturally-occurring dust is not a health risk by itself, it can hamper our respiration if it combines with automobile fumes and form PM2.5. This issue is already creating panic in Rajasthan as it has the highest share of pollution patients in our country—approx. 21 per cent reports the GBD.

In recent years, episodic event, like stubble burning, is another hazard hitting the headlines. In Punjab and Haryana, the cold weather coincides with the maturity of the agricultural cycle which requires the farmers to clear their fields for the next sowing season. Most of the farmers dispose the leftover stalks in their farms by burning them openly. And since the winds influencing the region drive smoke towards other parts of North India, this stubble burning has become a major menace. Thankfully, administrative measures are curbing these emissions.

Natural factors exacerbating pollution include dust storms, forest fires, and sea salts. These vary geographically and seasonally, and are highly impactful. Mumbai and Chennai are coastal cities which makes their air much lighter in comparison to Delhi's. The high amounts of sea salt present in these cities sticks to the available dust particles and clarifies their air. A prominent coastline also helps in easily dispersing the impurities, unlike in Delhi which is landlocked. However, one remains affected as long as they are within the breathing zone of pollution.

Losing Steam

Not only does air pollution result into an enormous public health damage, it also incurs a staggering financial loss to our country, estimated up to 2.6 lakhs crores says the GBD. Thus, as it dooms our future, let us urgently prevent this airpocalypse.

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Readers-Writers

Incredible Mother Nature

An admiration and concern for nature and all its virtues.

Rev Fr Dr PS Varghese

The author is the Principal of MGM College, Dimapur, Nagaland.

Though the resonance
of the woods is wild,
There is stunning silence
in every jungle.
Yet the beauty of nature emanates.

Every flowing river,
Makes a soft bubbling sound,
Pacifying body and mind alike;
Giving immense pleasure.
Connecting,
the mighty mountains and
the mighty oceans alike.

Cold breeze
furnish goosebumps to every cell;
Incredibly refreshing the body,
mind, and soul.

Silence is filled in every prayer.
Nothing more to ask, seek, or knock,
No more utterings;
But to experience in every heart.

Mother Nature is incredible.
Less care and attention;
Only exploitation everywhere;
Yet she takes care of all.

Every rain cools the earth;
Thunder, lightning, wet spells,
Each to experience in awe.

Every thunder
Reminds of big-bang.
The flash of lightning,
About the sword of an angel.

When the land is thirsty,
It preserves every raindrop
in its womb,
And reserves it for
the germinating seeds.

Limitations prevail while conveying,
about the incredible nature.
Feel it with a pure heart!
Feel nature in its essence.
Experience is the greatest guru.

Reimagine. The beauty is invaluable.
Recreate. And partake in creation.
Restore. For future generations.

Sahaj Jaggi

Pollution and Privilege

Environmental injustice in Delhi

Delhi's air pollution arrives with a paradox—as the smog reduces visibility, what becomes clear is the gap between the rich and the poor

Being a student living in Delhi, we have three breaks during our school session—the summer break, the winter break, and the holidays due to the rising pollution level that we Delhiites call our pollution break. As students, we see these holidays as something fun, as a timepass. Even after so many years of these breaks, we fail to realise the gravity of the situation. The main cause for this is our privilege and the rising political ignorance.

With air filters installed in our homes and private cars parked alongside, we talk about buying a petrol car for the next year as the ban on diesel cars is reimposed (How ironic!). We will never fully comprehend the impact of this air pollution because though we, the middle and upper class, cause this pollution, the less privileged residents bear the costs of our actions.

Studies reveal that the levels of suspended particulates is generally higher in Delhi's poorer neighbourhoods. Compounded by the fact that the poor spend more time outdoors because of physical labour while the rich can choose to stay indoors means that the poor are more exposed to pollution that too without masks for protection.

Another aspect to note is the stark contrast in the surroundings of these people—the upper and middle class live in greenery with trees all around in contrast to the slums with little or no plants. This directly affects their daily intake of pollutants. A case study conducted by the *New York Times* of two children from different income backgrounds in Delhi found that the poor child was exposed to five times the pollutants the wealthy child was.

Now, what can we as the youth of today do? Well, here's what these children in the US did: in August 2023, 16 youth successfully fought a case against the US state of Montana for violating their right to a 'clean and healthful environment.' A 5-year-old child along with 15 other olders ones slowly, with the help of a few firms built their case, appeared in court as witnesses and despite the discouragement, won.

This is one of the first times in the US history in which a court has held 'that the government violated the constitutional rights of children through... actions that promote fossil fuels,' said Olson, chief legal counsel, Our Children's Trust. This was a huge win led by youth for the climate as well as for democracy.

These children are an inspiration for all of us. They reflect how one can use their privilege for the good of the society. If not for fighting a case against the state of Delhi, we can, at the very least, be environment-friendly individuals. A child on the street should not be the victim of our environmentally detrimental actions.

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yeh Dil maange NO more

Even as the world faces its most serious existential crisis – climate change – we are embroiled in needless armed conflicts, be it in Ukraine or in Gaza. Of course, wars also function as another trigger for the changing climate. Quite apart from the enormous costs in lost lives and property – money which could have been far better utilised perhaps in fighting climate change – these internecine, fuel-guzzling, dust-spewing conflicts end up adding hugely to global emissions. When will the world's leaders sit up and say enough is enough?

Ritika Bohra/GT