1. What to know about indoor air quality and purification

Overview

The more privileged among us spend most of the day indoors — in homes, offices, gyms, and air-conditioned vehicles — where air quality can be controlled. Outdoor exposure is typically limited to commutes or errands, during which a properly fitted N95 mask is the only reliable way to reduce exposure to harmful pollutants.

But for the vast majority of Indians, outdoor air is unavoidable. Street vendors, delivery workers, labourers, and those living in unsealed homes face prolonged exposure to pollution. They lack the resources to create cleaner air bubbles for themselves, and thus bear a disproportionately higher burden of pollution.

Improving indoor air quality

Improving indoor air quality starts with managing exposure to PM2.5, the primary pollutant of concern which is linked to respiratory diseases, cardiovascular conditions, and neurological disorders.

In most of North India and cities across the country, PM2.5 levels exceed the World Health Organization's safe limits almost year-round, making indoor air quality management essential for those who can afford it.

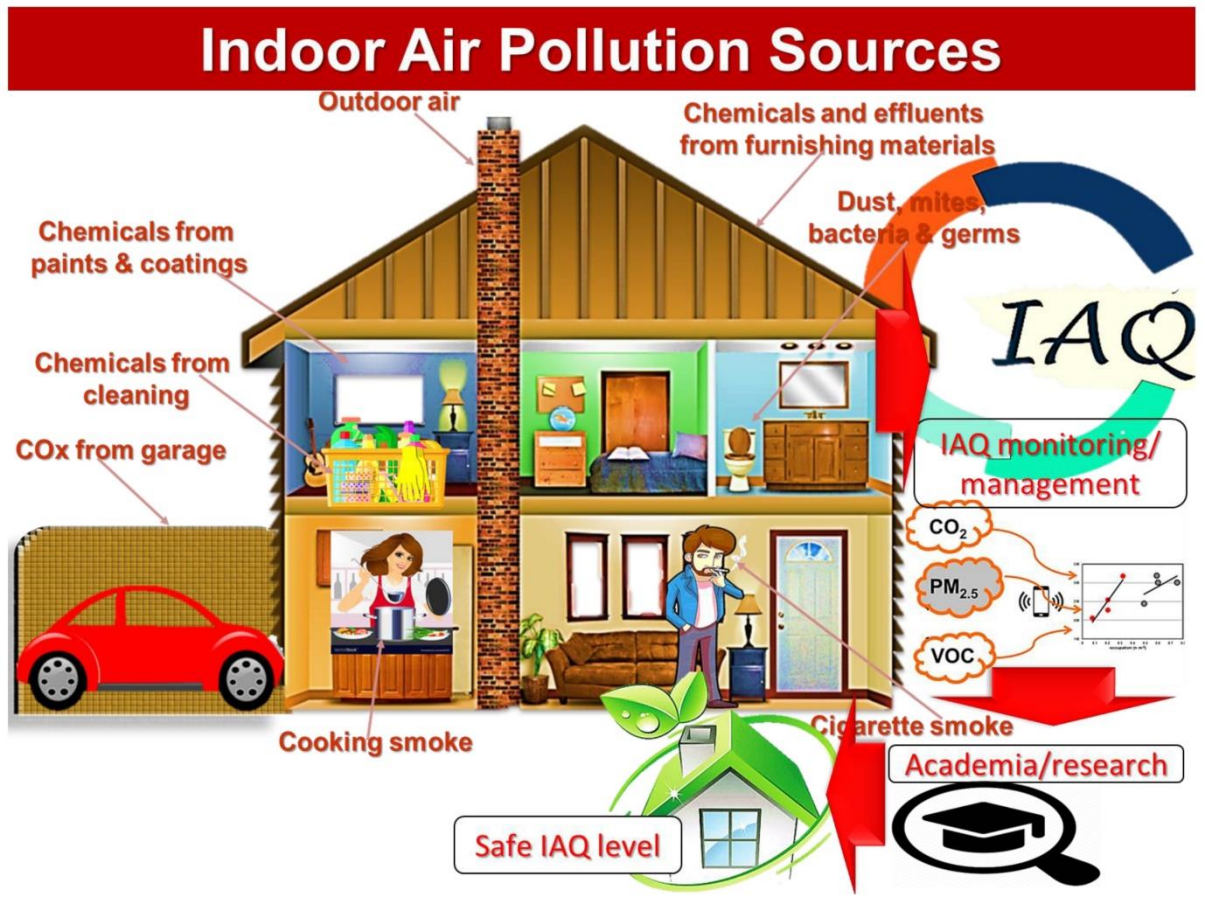
The first step is to limit the entry of outdoor pollutants. Keeping windows and doors closed prevents polluted air from seeping inside, while sealing gaps around windows, doors, and vents reduces air leaks.

Using an air purifier, especially in spaces like bedrooms where significant time is spent, is key to reducing exposure. Limiting the volume of air the purifier needs to clean — by closing doors to other rooms — further enhances efficiency.

The need for enclosed spaces highlights the oxymoronic nature of "outdoor air purifiers" (smog towers), which cannot meaningfully reduce pollution due to the virtually infinite volume of outdoor air.

Even indoor purification has limitations for those living in unsealed homes, where outdoor pollutants infiltrate easily.

Indoor sources of pollution



While outdoor air pollution dominates discussions, indoor sources also significantly affect air quality.

Cooking, especially with solid fuels, releases fine particulate matter, carbon monoxide, and other harmful gases. Kitchens frequently have the highest levels of air pollution in a home — and even in households with modern stoves, poor ventilation can lead to a build-up of harmful pollutants.

The burden of this indoor air pollution is gendered — entrenched patriarchy ensures it is women who typically spend more time in the kitchen, and who are, therefore, disproportionately affected.

Burning incense or candles further worsens indoor air quality by releasing fine particles and volatile organic compounds.

Measuring air pollution

Many buildings, workplaces, and gyms claim to have air filtration systems, but these claims are often unverifiable without independent monitoring. Using low-cost air quality sensors to measure PM2.5 levels indoors can help assess whether additional filtration is needed.

For homes without centralized filtration systems, particularly in regions like North India where outdoor air is consistently poor, investing in an air purifier is almost always necessary.

Even when the air appears clear, relying on visibility or media reports as indicators of pollution can be misleading. Checking data from nearby air quality monitors provides a more accurate picture, and reinforces the need for indoor air quality management.

What to know about purifiers

An air purifier is essentially a fan paired with a HEPA (High Efficiency Particulate Air) filter, designed to trap fine particulate matter like PM2.5. Many modern purifiers come with sensors that automatically adjust fan speed based on air quality, improving efficiency. For those on a budget, a DIY purifier can be made using a HEPA filter and a fan.

HEPA filters are critical for trapping PM2.5, while activated carbon filters, though not essential for particulate matter alone, are useful for capturing gaseous pollutants.

A key metric is the Clean Air Delivery Rate (CADR), which indicates how quickly a purifier can filter air in a given space. Higher CADR ratings are particularly important for larger rooms.

It is essential to avoid purifiers that generate ozone, as they can do more harm than good. While stratospheric ozone protects us from UV radiation, ground-level "bad ozone" can worsen indoor air quality by producing additional pollutants through chemical reactions.

In cars, using the air conditioner in recirculation mode with windows closed helps minimize the intake of outdoor air, creating a safer environment inside the vehicle. However, this also highlights an ironic reality: AC cars emit pollutants while shielding their occupants from the very air they contribute to polluting.

Ethical issues in air purification

While air purifiers and similar measures can reduce health risks for those who can afford them, these solutions are inherently inequitable. This selective insulation can also diminish the urgency to push for systemic changes, which ultimately perpetuates the problem.

Measures to mitigate exposure are temporary and individualistic, addressing the symptoms rather than the root causes of air pollution. Worse, they risk exacerbating existing inequalities. The solution lies ultimately in improving outdoor air quality — a topic on which much ink, including by this author, has already been spilled.

Relevance: GS Prelims & Mains Paper III; Environment
Source: Indian Express

2. Argentina considering leaving the Paris Agreement: What does it mean?

Introduction

Argentina's far-right President Javier Milei is considering withdrawing his country from the Paris Agreement, which aims to curb global greenhouse gas (GHG) emissions, according to several Western media reports. The speculation surfaced after Milei's government asked its negotiators to leave the ongoing COP29 climate summit last week.

Argentina's review of the landmark climate treaty comes at a time when the world is preparing for President-elect Donald Trump to withdraw the United States from the deal for the second time.

What is the Paris Agreement?
The Paris Agreement is an international accord that was adopted by nearly every country in 2015 to address climate change and its adverse effects. Its primary goal is to substantially reduce GHG emissions in a bid to limit global warming in this century to "well below" 2 degrees Celsius above pre-industrial levels, while pursuing the means to curb warming to 1.5 degrees. The agreement mentions the safer limit of 1.5 degrees based on a fact-finding report which found that breaching the threshold could lead to "some regions and vulnerable ecosystems" facing high risks, over an extended, decades-long period.

The treaty also requires all Parties (countries which have joined the agreement) to state every five years what they are doing to tackle climate change — what is known as their nationally determined contribution (NDC). Each successive NDC is meant to reflect an increasingly higher degree of ambition compared to the previous version, according to the website of the United Nations Framework Convention on Climate Change (UNFCCC).

How does a country withdraw from the Paris Agreement?
Article 28 of the Paris Agreement lays out the procedure and timeline for a country's withdrawal from the treaty.

It says, "[a]t any time after three years from the date on which this Agreement has entered into force (this happened in 2016) for a Party, that Party may withdraw from this Agreement by giving written notification to the Depositary".

The Article also states, "[a]ny such withdrawal shall take effect upon expiry of one year from the date of receipt by the Depositary of the notification of withdrawal, or on such later date as may be specified in the notification of withdrawal."

If a member state wants to withdraw from the treaty, it has to submit the notification of a withdrawal to the Office of Legal Affairs of the UN, based at UN Headquarters in New York.

Once the withdrawal notification has been received, it only becomes effective after one year (or later if the member state so says in the notification). Until the withdrawal comes into force, the member state remains in the Paris Agreement and has to fully participate in all activities under it, according to the UNFCCC website.

Why is Argentina considering leaving the treaty?
Argentina's Foreign Minister Gerardo Werthein told The New York Times that although the country's government is yet to make a decision on whether it will leave the treaty, it is reconsidering its participation in a deal that "has a lot of elements" that it does not agree with. "We are re-evaluating our strategy on all matters related to climate change… And so far, we have not made any other decision beyond standing down until things are clearer," he said.

Notably, President Milei is a climate denier. In the past, he has called climate change a "socialist lie". Last year, President Milei had vowed to withdraw Argentina from the Paris Agreement but later backed out.

Werthein told The NYT that Argentina's government doesn't deny the existence of climate change and the discussion around the causes behind the warming was a "philosophical issue." "We have different views on the reasons," he said. "We consider it to be linked to natural cycles, and we agree on the need to take measures to mitigate it."

What impact will Argentina's withdrawal have?
Experts fear that Argentina's exit could trigger a domino effect, causing other countries to reconsider their own participation. This could undermine the Paris Agreement and the world's climate goals — countries have to slash their emissions by 42% by 2030 and 57% by 2035 to ensure that the planet does not breach the 1.5 degree Celsius threshold.

Argentina is South America's second-largest economy and the world's 24th-largest emitter of GHGs. It comprises significant fossil fuel resources and exports, with the second-largest reserves of shale gas (a type of natural gas) and the fourth-largest reserves of shale oil worldwide.

The withdrawal could also isolate Argentina. Argentina will become even less attractive as a trading partner for anyone who takes climate protection seriously, especially now that various countries, above all the EU, are introducing import duties for climate-damaging products.

However, some observers believe that President Milei will not be able to withdraw Argentina from the treaty easily due to domestic opposition. To implement the withdrawal, he will need the approval of the parliament which can prove to be a daunting task for him. Argentina

ratified the Paris Agreement in 2016 and all international treaties ratified by the country hold constitutional status.

Relevance: GS Prelims; Environment
Source: Indian Express

3. US embassy in Kyiv shut over attack fears: Unpacking Biden's move to let Ukraine use ATACMS inside Russia

United States Embassy in Kyiv shut down

The US embassy in Kyiv was closed recently over concerns of a "potential significant air attack", the Department of State Consular Affairs said in a statement.

"Out of an abundance of caution, the embassy will be closed, and embassy employees are being instructed to shelter in place… The US Embassy recommends US citizens be prepared to immediately shelter in the event an air alert is announced," the statement on the website of Kyiv embassy said.

A day earlier, Ukraine had struck Russia with American ATACMS missiles, which Joe Biden finally allowed Kyiv to do in the fag end of his tenure.

What exactly did Biden allow Ukraine to do?

Weeks before he leaves the White House, Biden has provided authorisation to Kyiv to use the Army Tactical Missile System, also known as ATACMS, inside Russia. The Biden administration had secretly sent these missiles to Ukraine earlier this year, under the stipulation that Ukraine would not use it inside Russia.

In September, Russian President Vladimir Putin had

warned that Moscow would view the use of these long-range missiles on Russian territory as the "direct participation" of NATO countries in the war.

The recent US authorisation appears limited to allowing Ukraine to defend its forces inside Russia's Kursk region.

Experts believe that the US decision is linked to North Korean soldiers entering the war in support of Russia.

Why Kursk?
Kursk region important in the war between Russia and Ukraine, where Kyiv's surprise offensive over the Russian territory had caught Moscow off-guard. Russia is trying to regain Kursk, this time with the help of North Korean soldiers.

Kursk is crucial because it creates a buffer zone between Ukraine and Russia, and both Kyiv and Moscow want military control over it.

Ukraine on Tuesday struck Russia's Bryansk region, which is close to Kursk and is helping Russia's war efforts there.

What threats do long-range missiles pose?
According to the Arms Control Association, a US-based organisation that promotes awareness on arms control policies, "ballistic missiles are powered by rockets initially but then they follow an unpowered, free-falling trajectory toward their targets. They are classified by the maximum distance that they can travel, which is a function of how powerful the missile's engines (rockets) are and the weight of the missile's payload. To add more distance to a missile's range, rockets are stacked on top of each other in a configuration referred to as staging."

Presently, 31 countries in the world possess ballistic missiles. However, only nine of these countries, including India, Pakistan, the US, China and North Korea, are known or suspected of possessing nuclear weapons with ranges that can exceed 1,000 km.

The missiles that the US has authorised Ukraine to use is a surface-to-surface ballistic missile capable of hitting targets at up to 300km (186 miles). This range means that Ukraine may now be able to hit targets inside Russia, including Russian-annexed Crimea.

Also, the missiles are fuelled by solid rocket propellant and follow a ballistic path into the atmosphere before coming back down at a high speed and high angle, making them difficult to intercept, the BBC report says.

What will the ATACMS mean for the war?
Since the start of the war between Russia and Ukraine, NATO states have largely withheld the supply of heavy artillery and advanced weapons to Kyiv, fearing escalation.

Now, experts believe that the US policy shift on ATACMS can open doors to other allies making similar concessions to Ukraine.

For instance, with Germany scheduled to hold snap elections in February, Chancellor Olaf Scholz has been under pressure from political opponents to drop his resistance to sending German-made cruise missiles to Ukraine.

The UK and France have supplied the Storm Shadow/SCALP missiles to Ukraine, but Kyiv is so far only allowed to use them inside Ukraine's internationally recognised borders.

The Storm Shadow, also known as SCALP EG, is an "air-launched long range, conventionally armed, deep strike weapon, designed to meet the demanding requirements of pre-planned attacks against high value fixed or stationary targets" and can "be operated in extreme conditions, the weapon offers operators a highly flexible, deep-strike capability based around a sophisticated mission planning system," according to MBDA, a European multinational corporation that manufactures missiles.

On November 18, The Guardian reported that the UK may allow the use of Storm Shadow inside Russia.

Experts believe that no single weapon can win the war for Ukraine, but can buy more time for Kyiv.

Relevance: GS Prelims; International Issues
Source: Indian Express