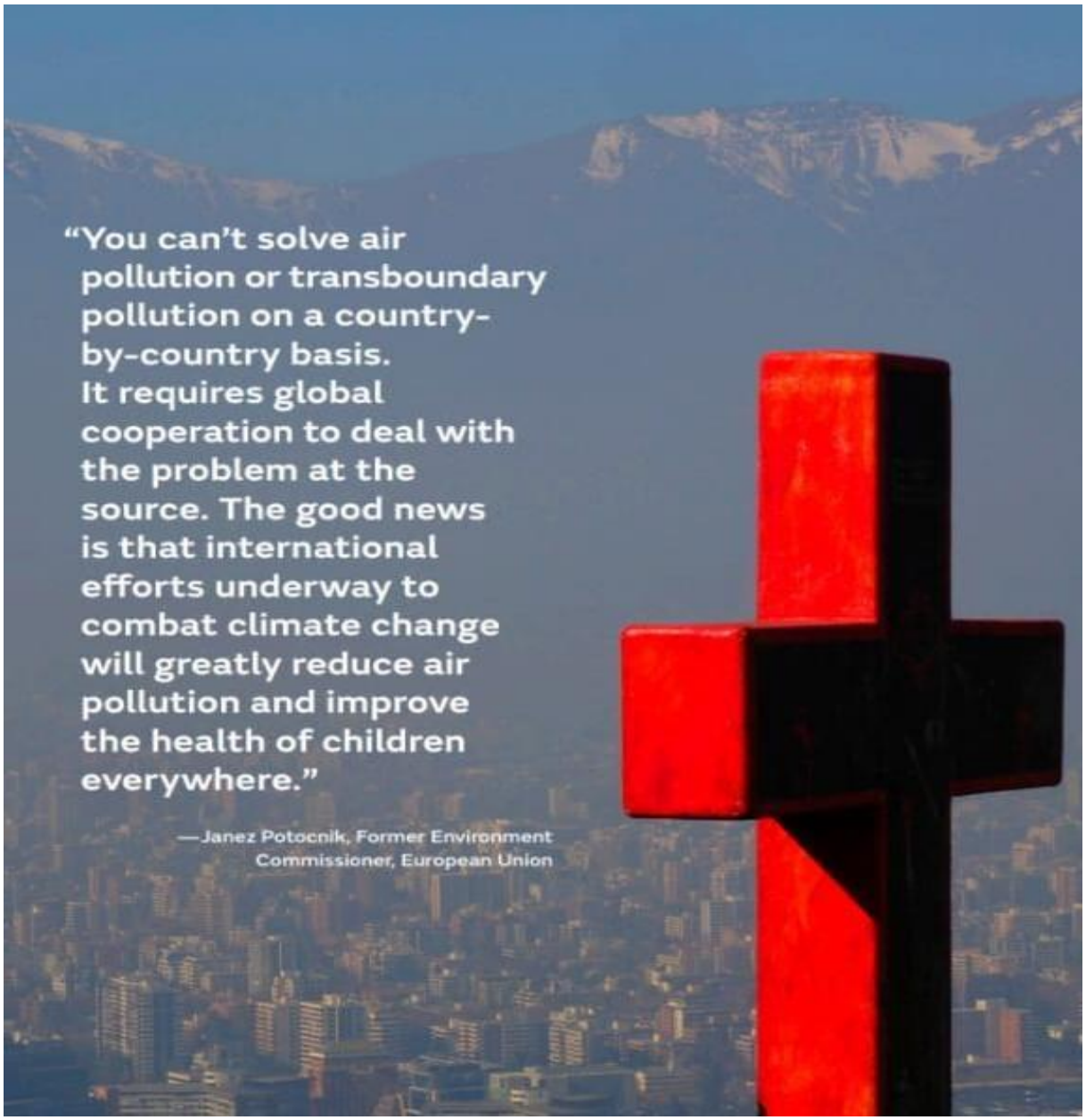
NEXT IAS

Air Pollution-A Crisis Without Borders



"When it comes to pollution, we are all connected. There is an invisible toxic thread that links workers being poisoned in low- and middle-income countries producing products and consumers exposed to poisons while consuming these products."

Richard Fuller, President, Pure Earth

Context:

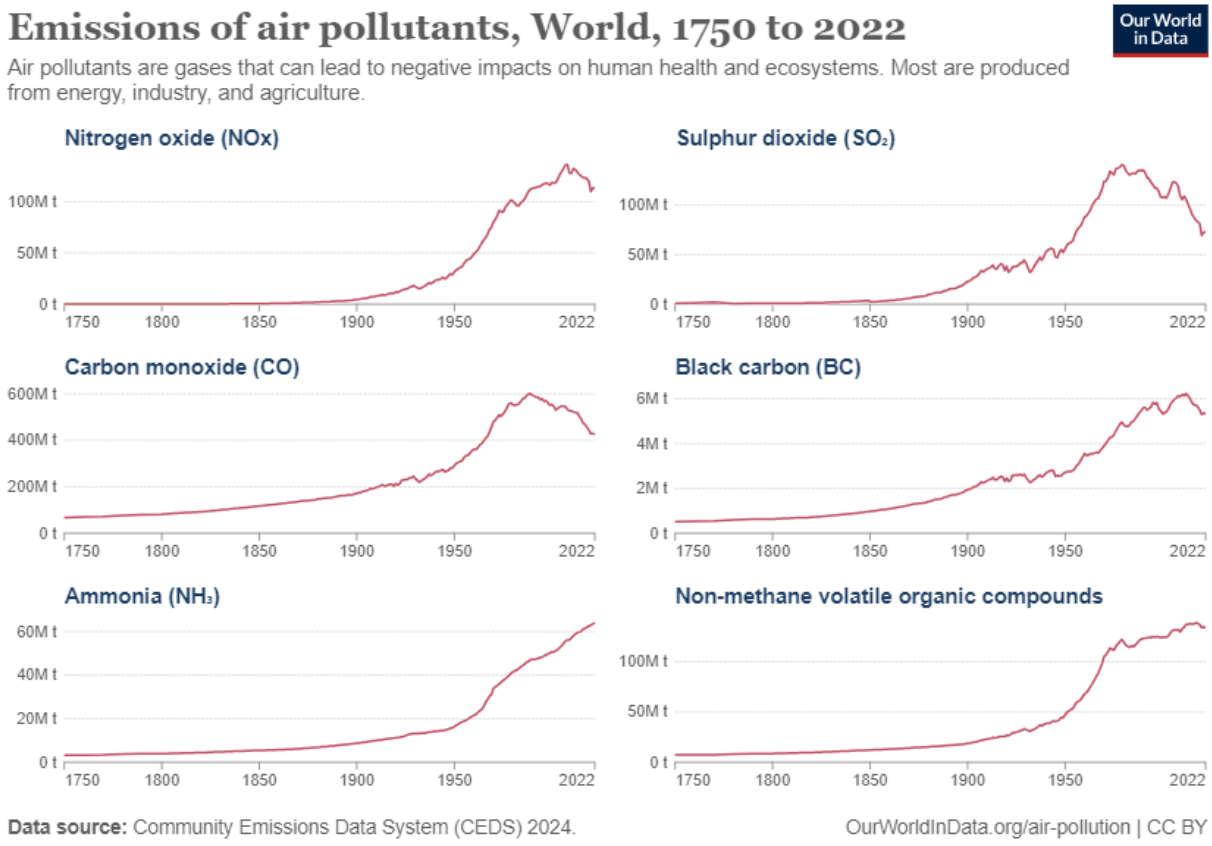
- A **dense layer of smog** enveloped **Delhi, Noida, Ghaziabad,** and other parts of the **National Capital Region (NCR)** on Wednesday (November 13) morning, causing a **significant drop in visibility.**
- According to **Swiss group IQAir's live ratings**, the **AQI in Delhi was 1133 (hazardous)**, with **PM2.5 as the main pollutant.**

1. What is Air Pollution?

- As per the definition by **WHO, Air pollution is contamination of the indoor or outdoor environment by any chemical, physical or biological agent** that modifies the natural characteristics of the atmosphere.
- **Household combustion devices, motor vehicles, industrial facilities** and forest fires are common **sources of air pollution.**

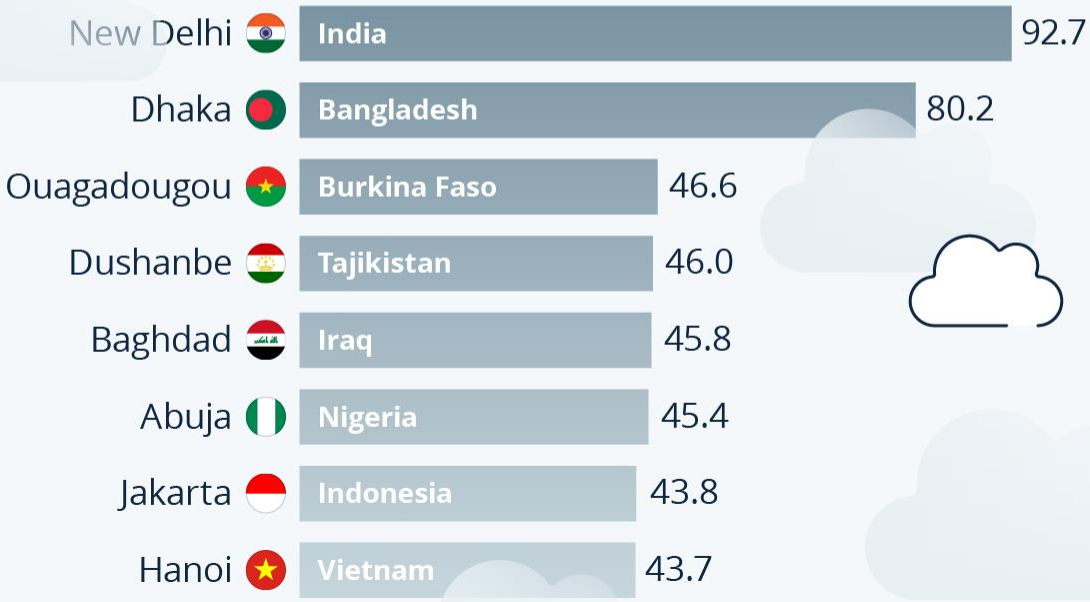
- **WHO data shows** that almost **all of the global population (99%)** breathe air that **exceeds WHO guideline limits and contains high levels of pollutants**, with **low- and middle-income countries suffering from the highest exposures.**
- **Air quality** is closely linked to the **earth's climate and ecosystems globally.**

2. What is the status of air pollution globally?

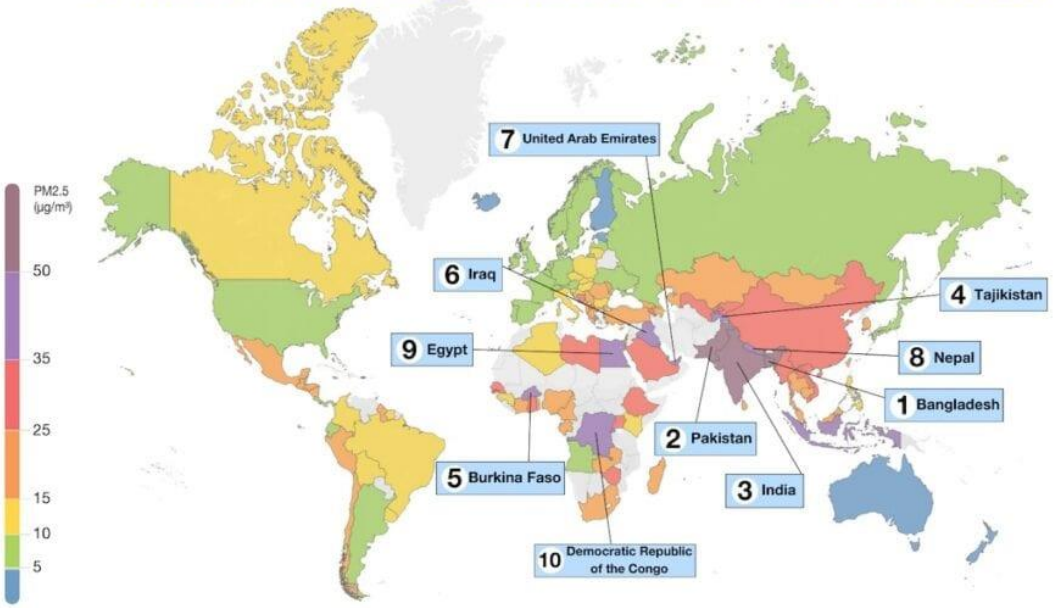


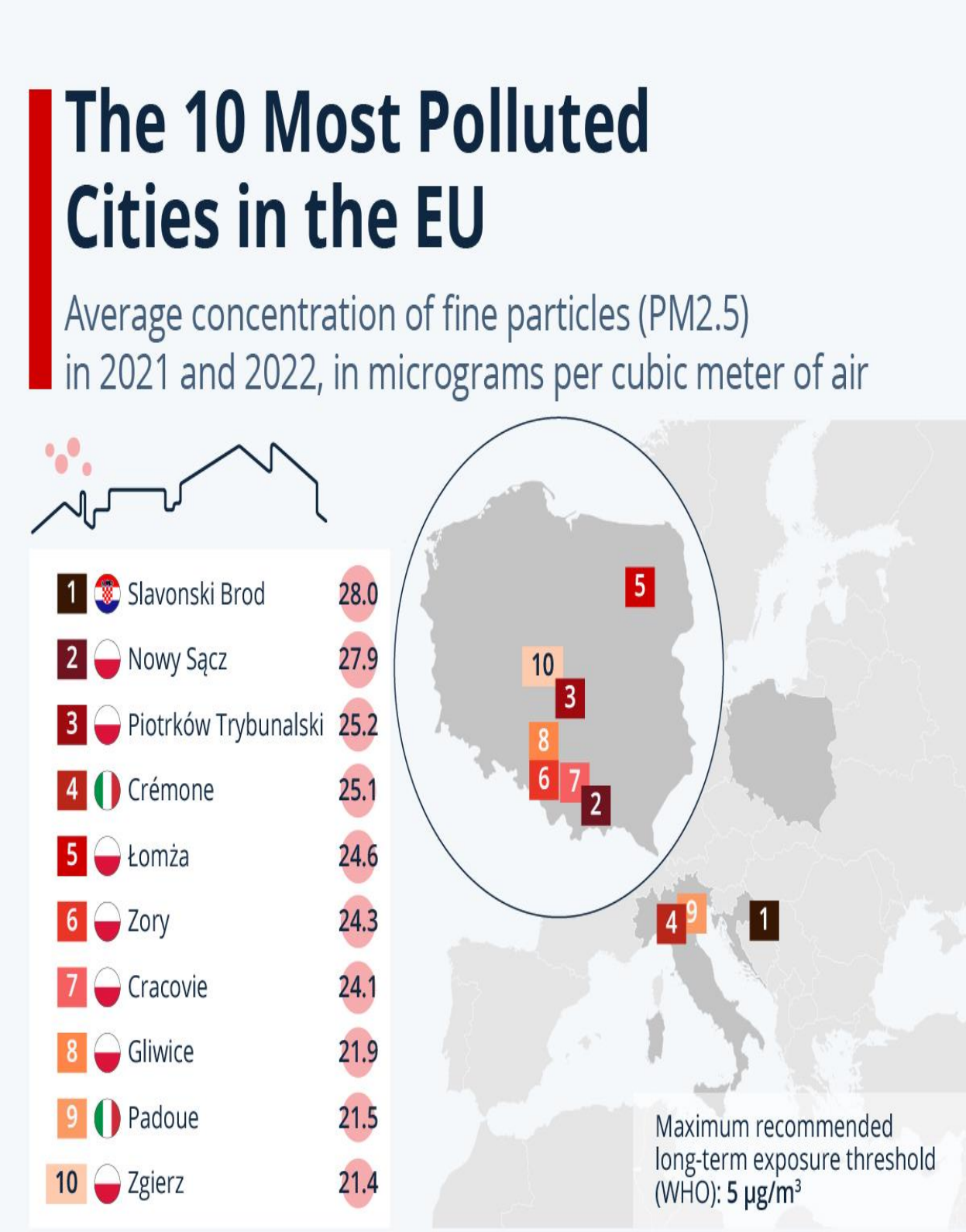
The World's Most Polluted Capital Cities

National capitals with the highest average annual PM2.5 concentration in 2023 (in micrograms/m³ of air)



10 Most Polluted Countries in the World in 2023

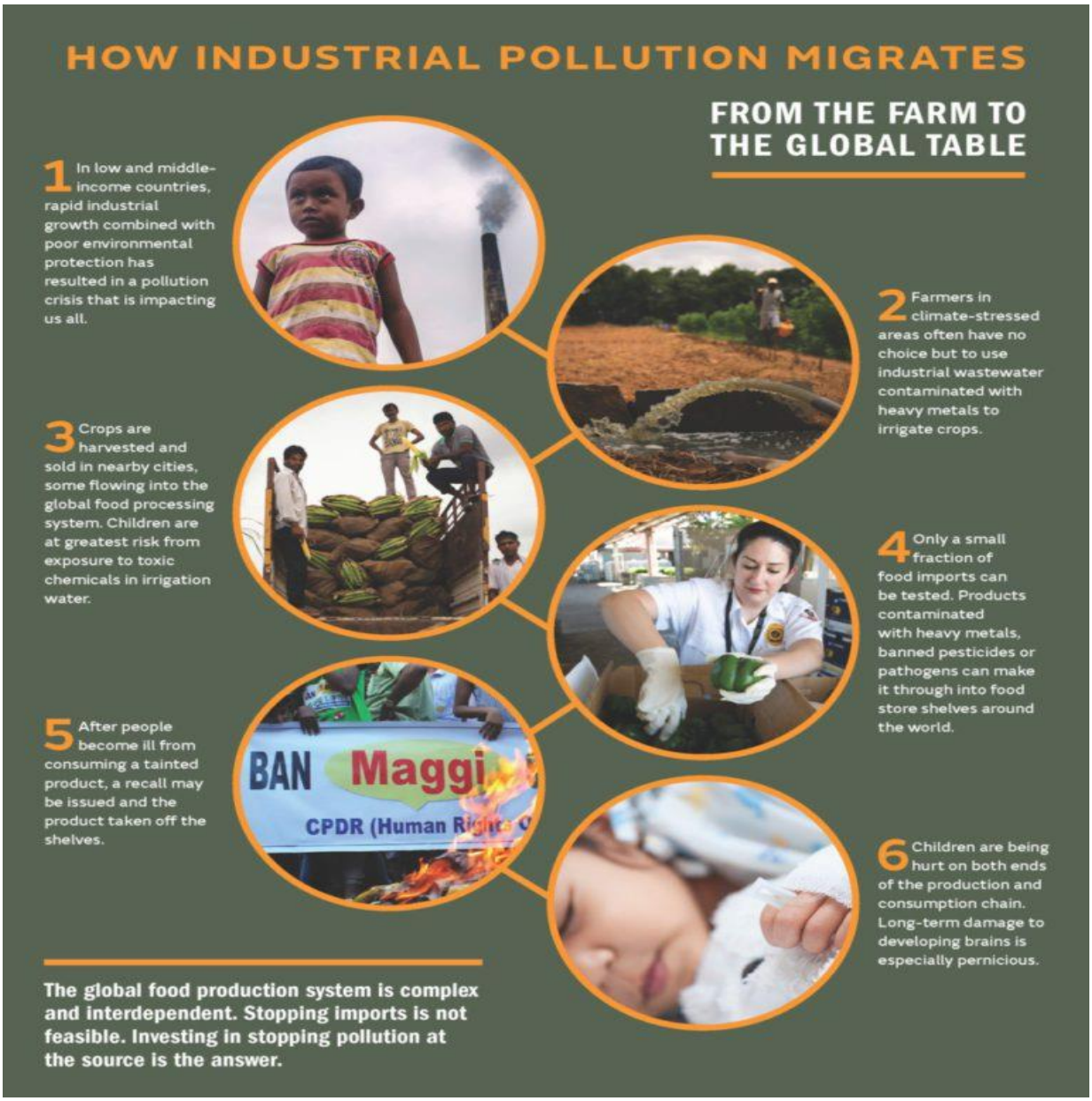


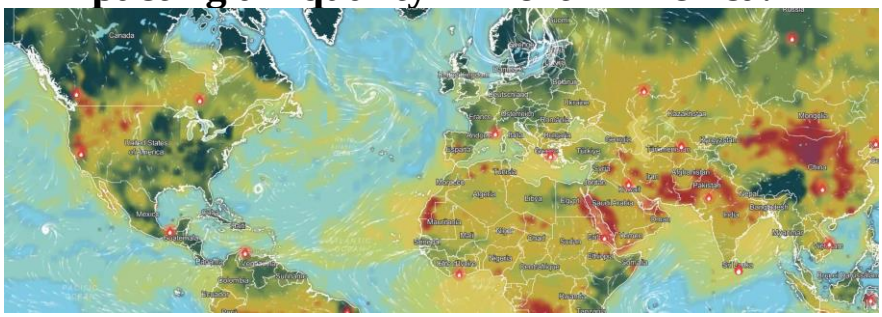
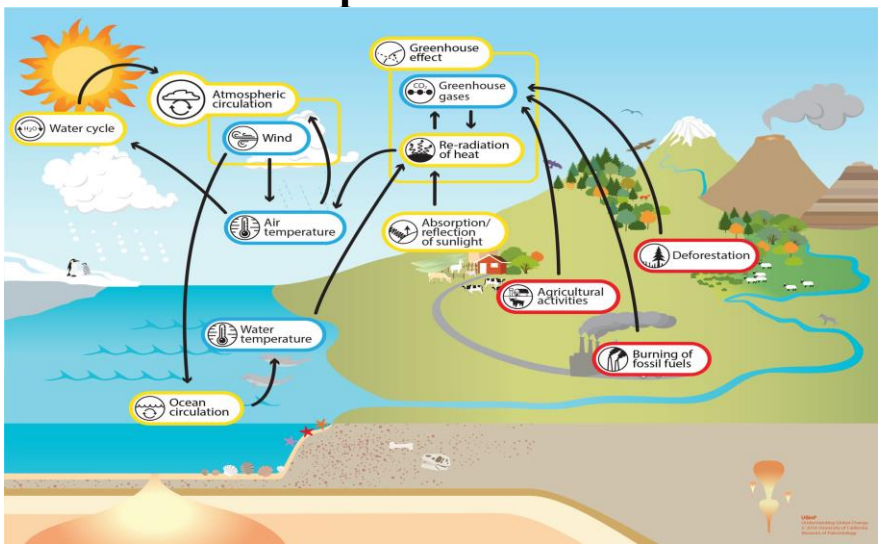

The 10 Most Polluted Cities in the EU
Average concentration of fine particles (PM2.5) in 2021 and 2022, in micrograms per cubic meter of air
1 Slavonski Brod 28.0
2 Nowy Sącz 27.9
3 Piotrków Trybunalski 25.2
4 Crémone 25.1
5 Łomża 24.6
6 Zory 24.3
7 Cracovie 24.1
8 Gliwice 21.9
9 Padoue 21.5
10 Zgierz 21.4
Maximum recommended long-term exposure threshold (WHO): 5 µg/m³

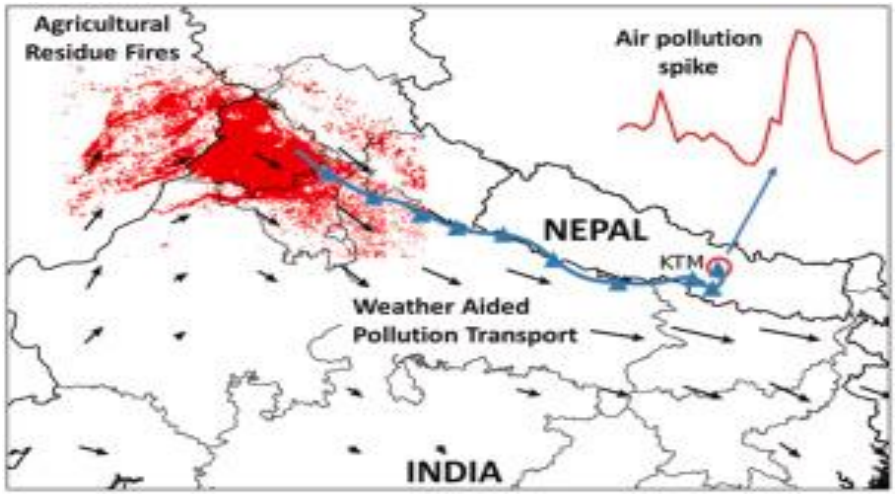
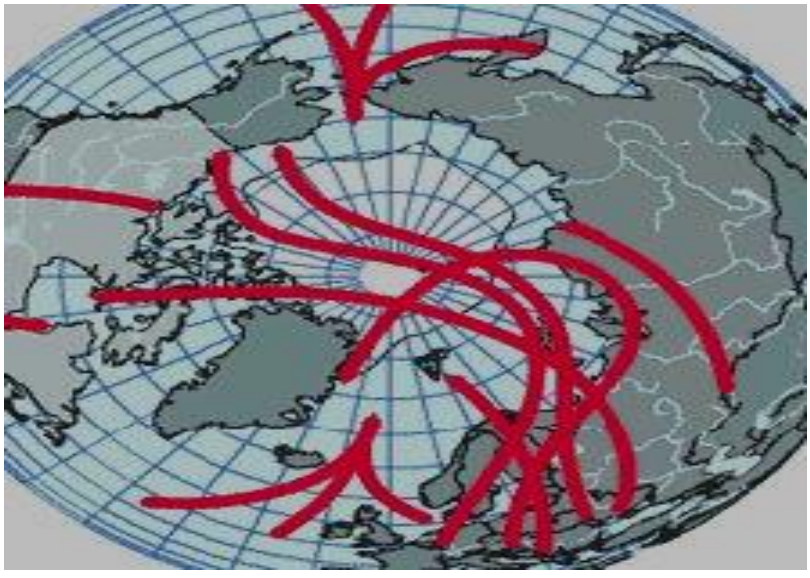
3. Why is air pollution considered a crisis without borders?

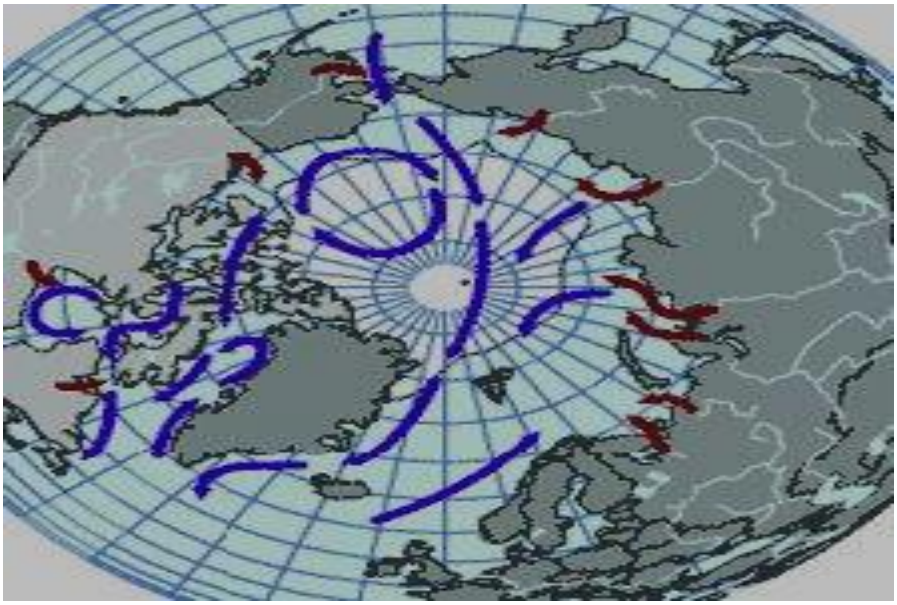
- As per the report ***Pollution Knows No Borders*** released by ***Pure Earth*** shows **how toxic pollution travels from country to country, not only in the air** and water, but **also in the food and products** we buy.

- **Air pollution knows no borders** because the **air we breathe moves freely across regions**, countries, and even continents due to atmospheric circulation.
- This movement of air is d**riven by wind patterns, temperature gradients,** and other **natural forces,** which means **pollutants emitted in one location can travel vast distances** and affect air quality far away.
- The **incredible distances** that **pollution can spread** means that it is **not contained within the boundaries of any single nation**.



Determinants	Analysis
Wind and Weather Patterns	• **Winds can carry pollutant**s, such as **particulate matter, sulfur dioxide, nitrogen oxides, and carbon monoxide,** hundreds to thousands of miles. • For instance, **pollution from industrial regions in East Asia can cross the Pacific Ocean, impacting air quality in North America.** 
Global Atmospheric Circulation	• The **strong winds** created by **atmospheric circulation** are believed to have the **ability to carry air pollution from one region of the planet to another.** • In Asia, for example, c**louds of industrial pollutants** are picked up by eastward **air currents in China** and **deposited across Japan and the Korean peninsula** 

Transboundary Pollution	• **Trans boundary pollution is the pollution that originates in one country but is able to cause damage in another country's environment, by crossing borders through pathways like water or air.** • It can occur through **air, water, or soil contamination.** • **Persistent Organic Pollutants (POPs)** are able to **travel great distances** by attaching to **dust particles** that are blown **north by the wind** when there is **no precipitation.**  

Ocean Currents and Evaporation	• **Ocean**s can also play a role, **as some pollutants settle into water, travel with currents**, and eventually **re-enter the atmosphere** through **evaporation**, where they **can continue to spread.**  

4. How India and Pakistan are divided by borders but united by smog?

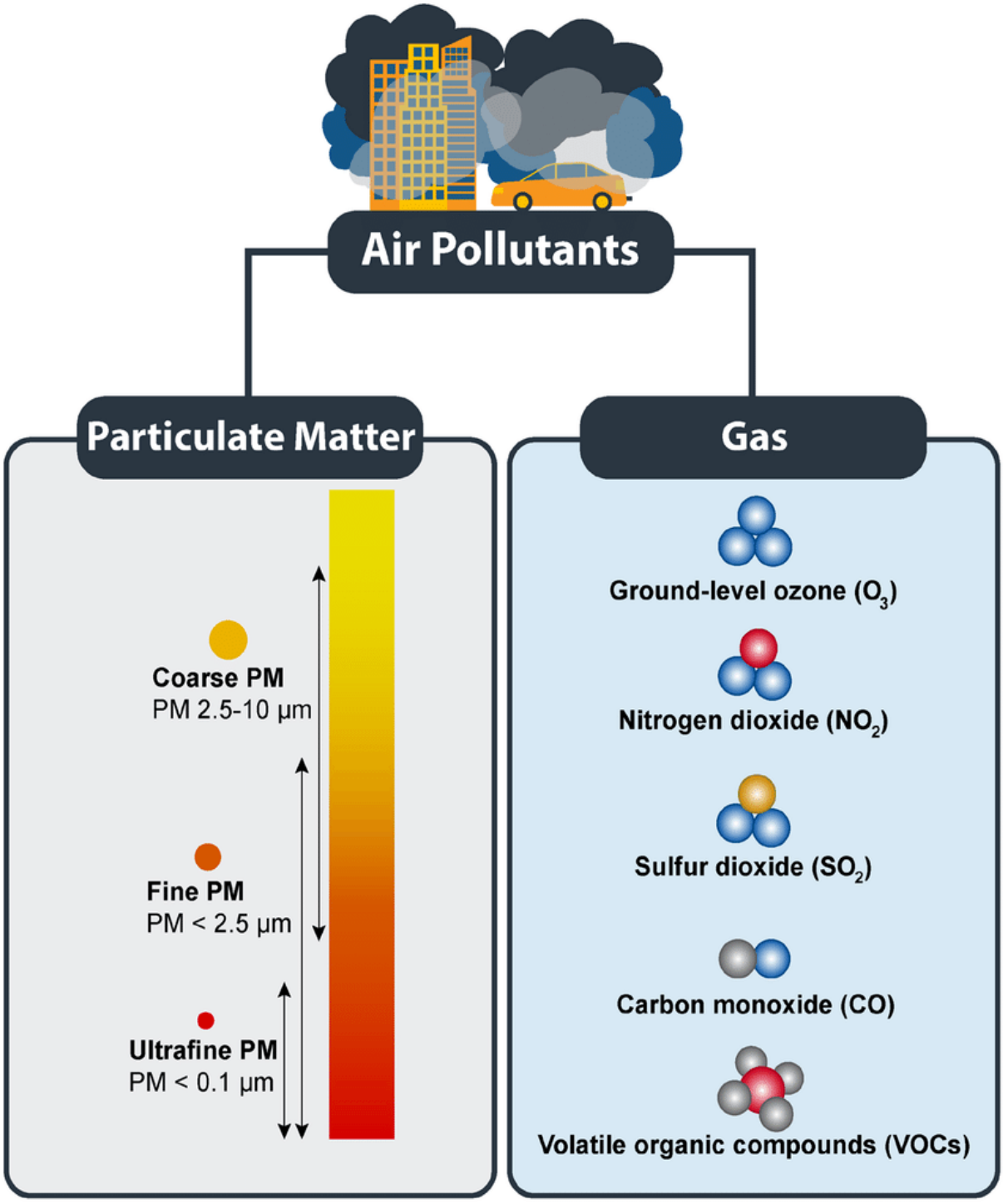
- A **thick toxic blanket of smog covering eastern Pakistan and entire northern India** is seen in a striking satellite image released by American space agency NASA.
- It shows location pins for **Lahore in Pakistan's Punjab and New Delhi,** with both cities under a **huge cloud of grey smog.**
- While Pakistan struggles with unprecedented levels of smog, **Delhi is not far behind in its battle against pollution.**
- Both countries share a troubling commonality, **the rapid deterioration of air quality in major urban centers.**
- **IQAir's data** showed that at **6 am on Tuesday (12, November) Lahore's AQI was 1045, followed by Delhi's at 329.**
- **Wind patterns** play a crucial role in **transporting pollution across the 500 to 1,000 kilometers** (310-620 miles) separating the **two Punjabs.**

- For **smog to cross the border**, **wind speeds between 5 to 20 km/h (3-12 mph) are ideal**, with **westerly or north westerly directions** acting as a kind of highway for **airborne particles.**
- When these conditions align, **smog can travel from one side of the border to the other i**n anywhere from **one to eight days,** depending on wind speed:
  - **At 5 km/h: Particles might take 4-8 days.**
  - **At 20 km/h: Smog could arrive in just 1-2 days.**

5. Enlist the highlights of the World Air Quality Report 2023?

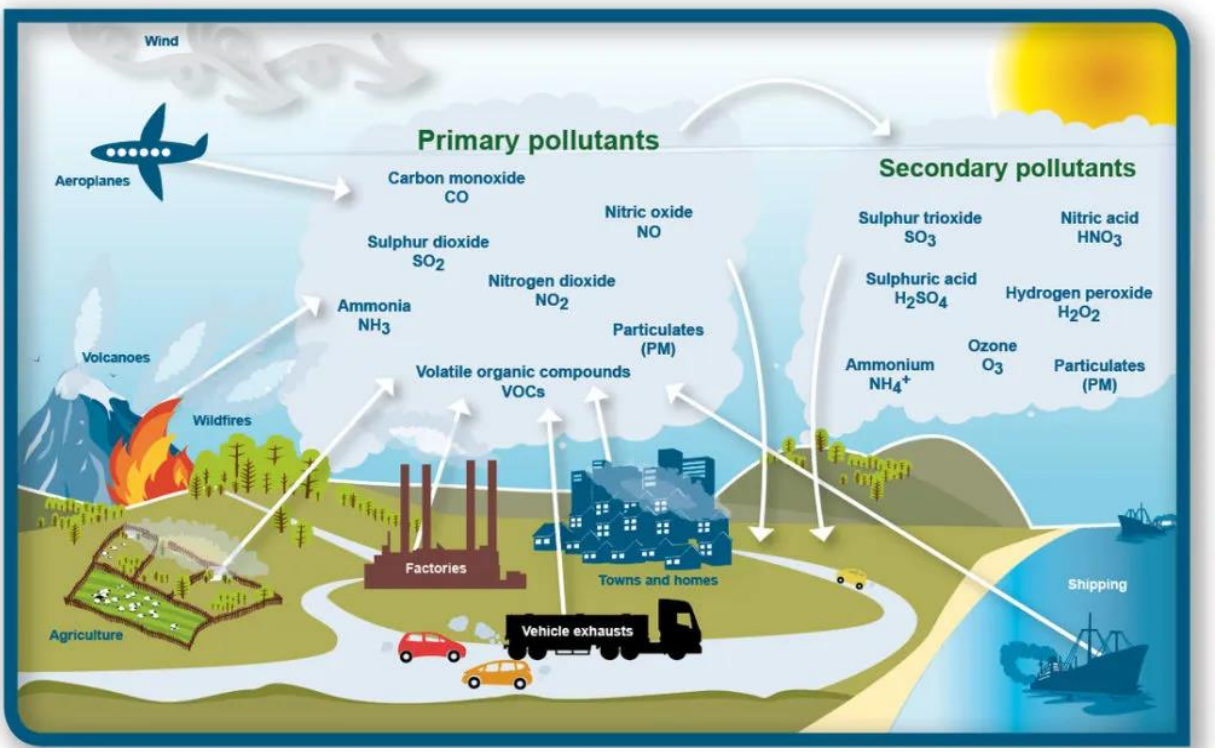
- According to the **World Air Quality Report 2023 by Swiss organization IQAir**, **Delhi has the** poorest air while **Bihar's Begusarai is said to be the world's most polluted metropolitan area**.
- As per the World Air Quality Report 2023**, India had the third worst air quality out of 134 countries in 2023** with an **average annual PM2.5 concentration of 54.4** micrograms per cubic meter **after Bangladesh** (79.9 micrograms per cubic meter) and Pakistan (73.7 micrograms per cubic meter).
- **In 2022, India was ranked as the eighth most polluted country** with an average PM2.5 concentration of 53.3 micrograms per cubic meter.
- **Delhi's PM2.5 levels worsened from 89.1 micrograms per cubic meter in 2022 to 92.7 micrograms** per cubic meter in **2023.**
- As per the report, **96 percent** of **India's population faces PM2.5** levels that **exceed the WHO annual guideline by more than seven times.**
- As per the report, worldwide **one in every nine deaths worldwide is caused by air pollution.**

6. Enlist various types of air pollutants?



The air pollutants can be classified into the following two types:

Air pollutant	Description
Primary air pollutants	• These **pollutants are emitted directly from a source,** such as a vehicle, volcanic eruption, or wildfire. • Examples include **carbon monoxide, nitrogen oxide, and sulfur oxide, particulate matter (PM).**
Secondary air pollutants	• These pollutants are **formed when primary pollutants react with other substances in the atmosphere.** • Examples include **ozone, secondary organic aerosol (haze), and acid rain.** ▪ **Ozone:** Formed when hydrocarbons and nitrogen oxides combine in the presence of sunlight ▪ **Nitrogen dioxide (NO2):** Formed when NO combines with oxygen in the air ▪ **Acid rain:** Formed when sulfur dioxide or nitrogen oxides react with water ▪ **Secondary organic aerosol (haze):** A secondary pollutant. • **Secondary pollutants are harder to control than primary pollutants** because they are **formed through complex chemical reactions that are not well understood.**



Classification of pollutant according to their existence in nature:

- **Quantitative Pollutants:** These occur in nature and become **pollutants when their concentration reaches beyond a threshold** level. E.g. **carbon dioxide, nitrogen oxide.**
- **Qualitative Pollutants:** These **do not occur in nature and are human-made**. E.g. **fungicides, herbicides, DDT** etc.

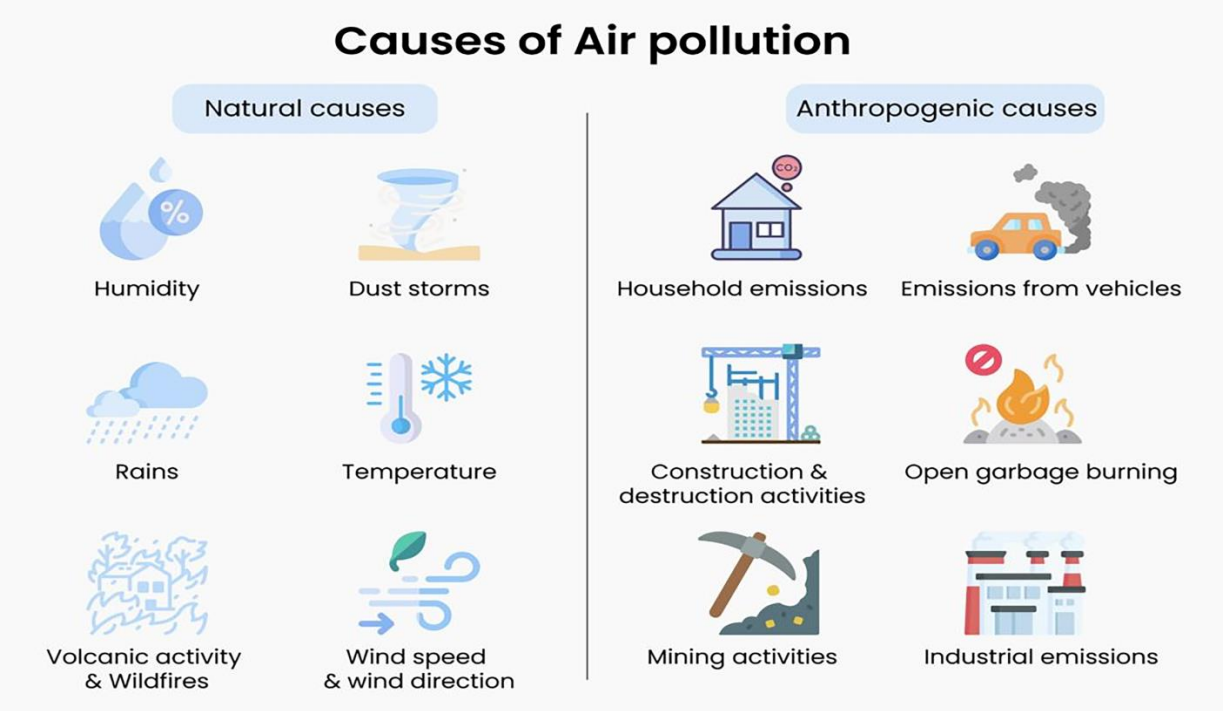
7. How Is Air Quality Measured?

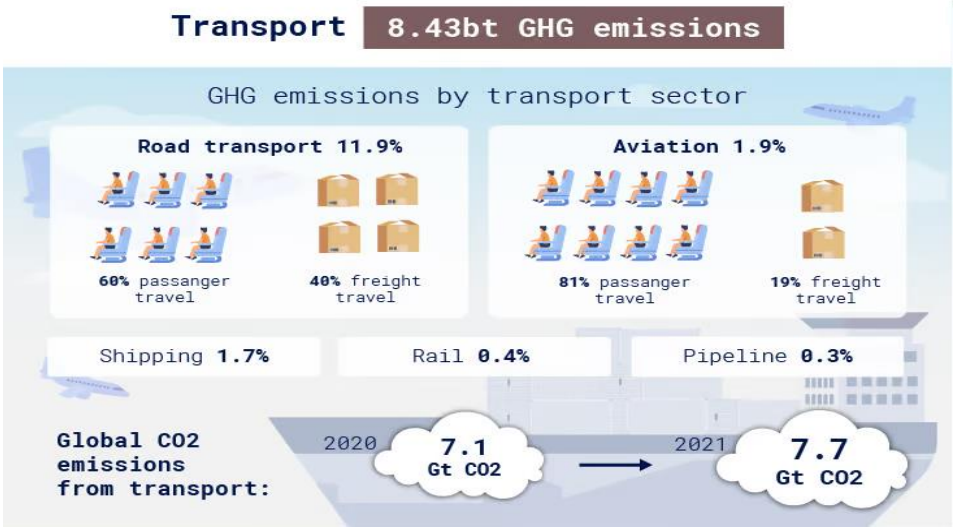
- Air quality is a **measure of how clean or polluted the air is**.
- Air quality is measured with the **Air Quality Index, or AQI.**
- The AQI works like a **thermometer** that **runs from 0 to 500 degrees.**
- The **AQI has six categories** that communicate the **level of health concern using specific colors.**
- **Instruments** on the **ground and satellites orbiting Earth** collect **information** about **what is in our air.**

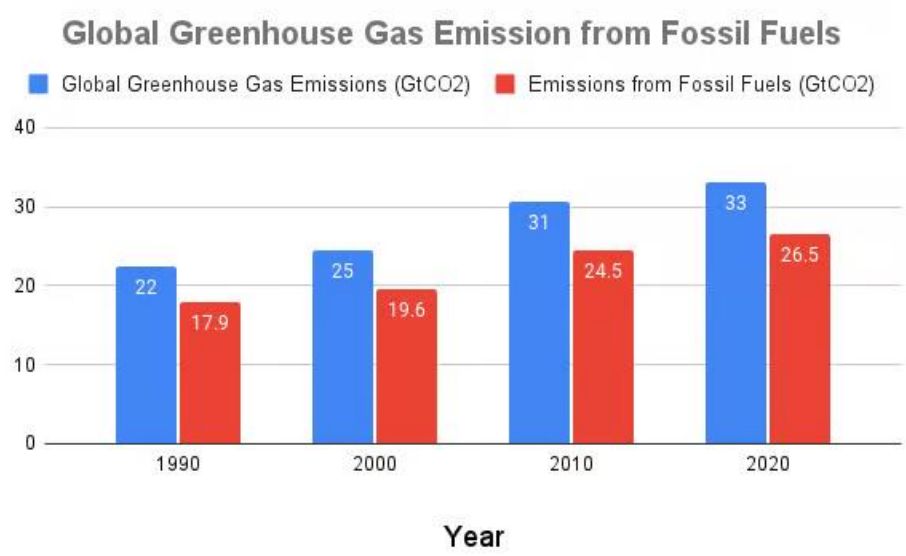
- For example, **satellites in NOAA's GOES-R (short for Geostationary Operational Environmental Satellites-R)** Series monitor the particle pollution in our atmosphere.

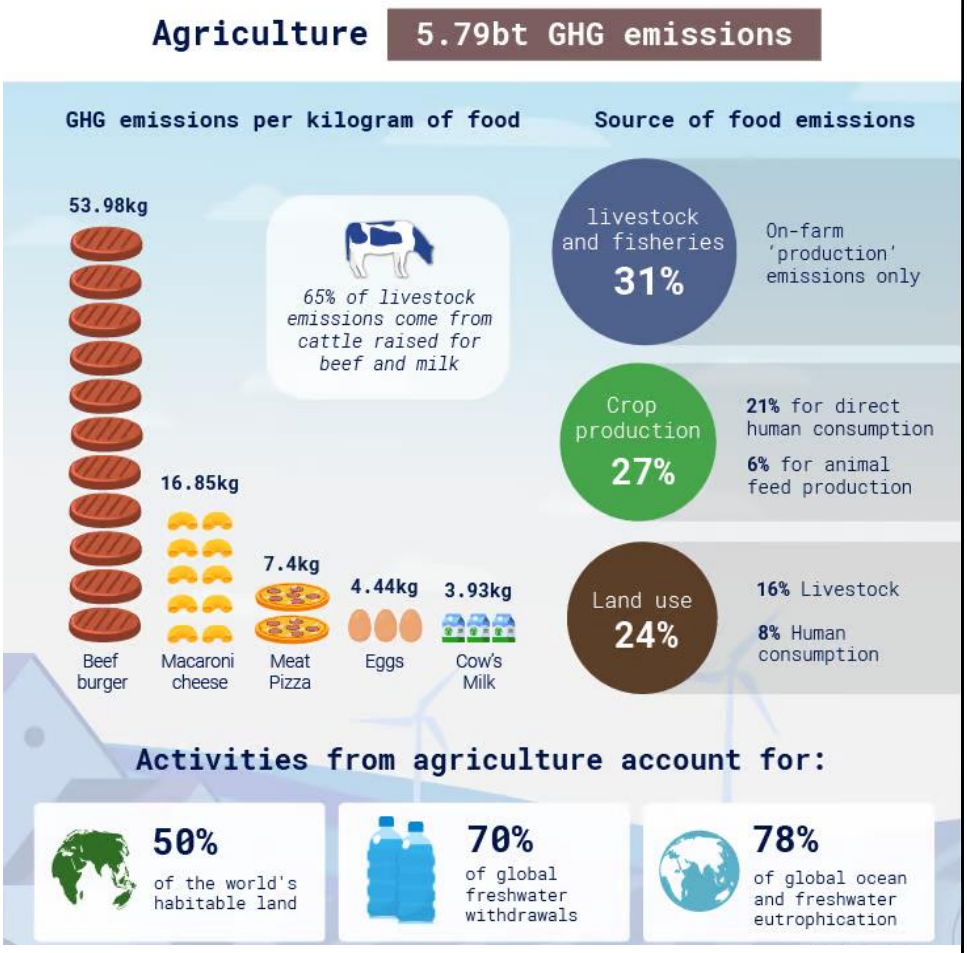
AQI Category, Pollutants and Health Breakpoints								
AQI Category (Range)	PM_{10} 24-hr	$PM_{2.5}$ 24-hr	NO_2 24-hr	O_3 8-hr	CO 8-hr (mg/m^3)	SO_2 24-hr	NH_3 24-hr	Pb 24-hr
Good (0-50)	0-50	0-30	0-40	0-50	0-1.0	0-40	0-200	0-0.5
Satisfactory (51-100)	51-100	31-60	41-80	51-100	1.1-2.0	41-80	201-400	0.5 – 1.0
Moderately polluted (101-200)	101-250	61-90	81-180	101-168	2.1- 10	81-380	401-800	1.1-2.0
Poor (201-300)	251-350	91-120	181-280	169-208	10-17	381-800	801-1200	2.1-3.0
Very poor (301-400)	351-430	121-250	281-400	209-748*	17-34	801-1600	1200-1800	3.1-3.5
Severe (401-500)	430 +	250+	400+	748+*	34+	1600+	1800+	3.5+

8. What are the causes of Air pollution?



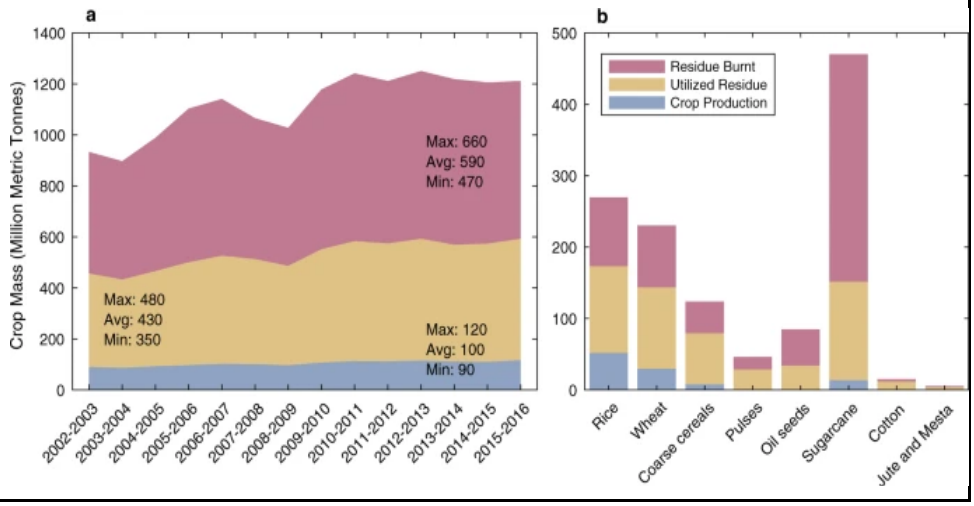
Causes of air pollution	Analysis
Natural Factors	• Certain natural phenomena, such as **volcanoes, forest fires, and dust storms, can contribute to air pollution.**
Fossil fuels	• **Petrol and diesel engines of cars**, ships, trains and other vehicles emit pollutants such as **carbon monoxide (CO), nitrogen oxides (NOx), particulate matter (PM), sulfur dioxide (SO2),** and **volatile organic compounds (VOCs)**. • **Friction from tires and brake wear** also create primary – i.e. direct – **particulate matter emissions**. In addition, the n**itrogen dioxide (NO2) and VOCs** released by road vehicles also undergo **photochemical reactions to form ozone (O3).** • **In Europe**, more than **40% of NOx and almost 40% of primary PM2.5** emissions are linked to road transport. • In the **United States, 35.8% of CO and 32.8% of NOx** stem from **road transport.** 

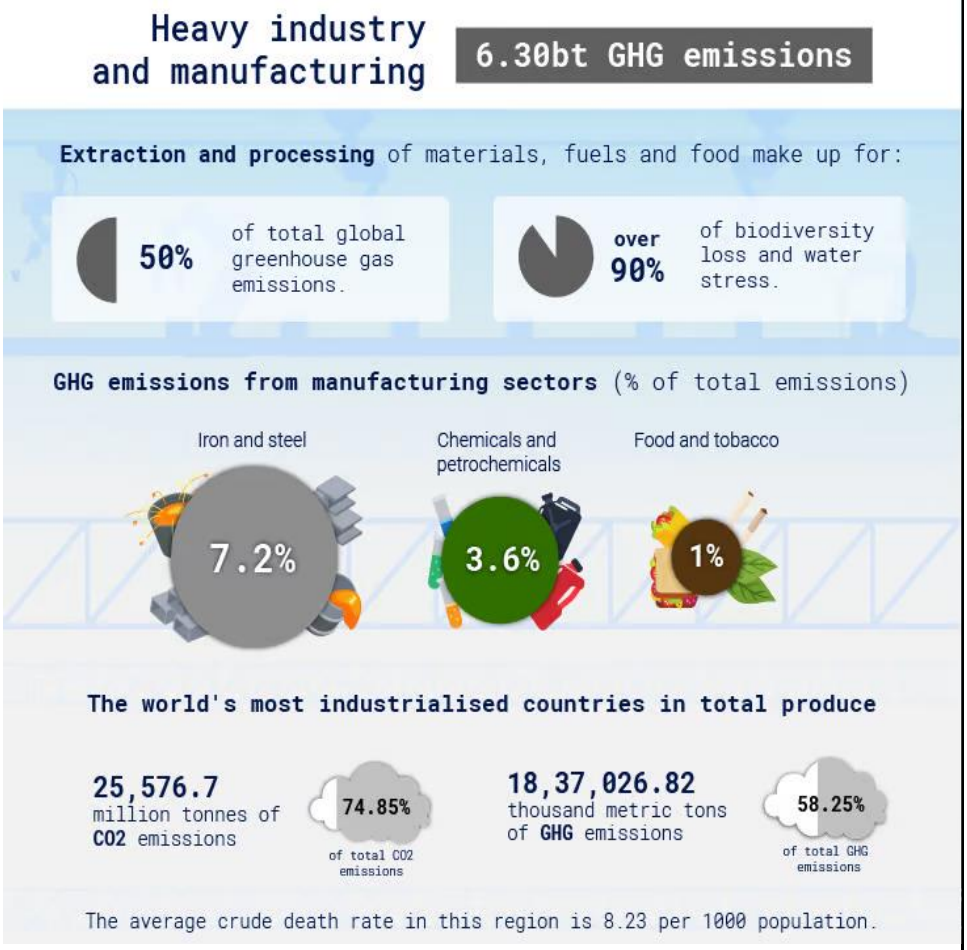
	
Agriculture	• **Agricultural practices** contribute to air pollution through the **release of ammonia, a hazardous chemical byproduct.** • The **use of insecticides, pe**sticides, and fertilizers in farming introduces **harmful chemicals into the air and water.** • A wide range of **nitrogen compounds (NO, NO2, N2), including ammonia (NH3),** can be attributed to **fertilizer production, farm machinery**, and livestock waste management in agriculture. • In **Europe, agricultural activities cause approximately 90% of ammonia emission**s and **80% of methane emissions.**

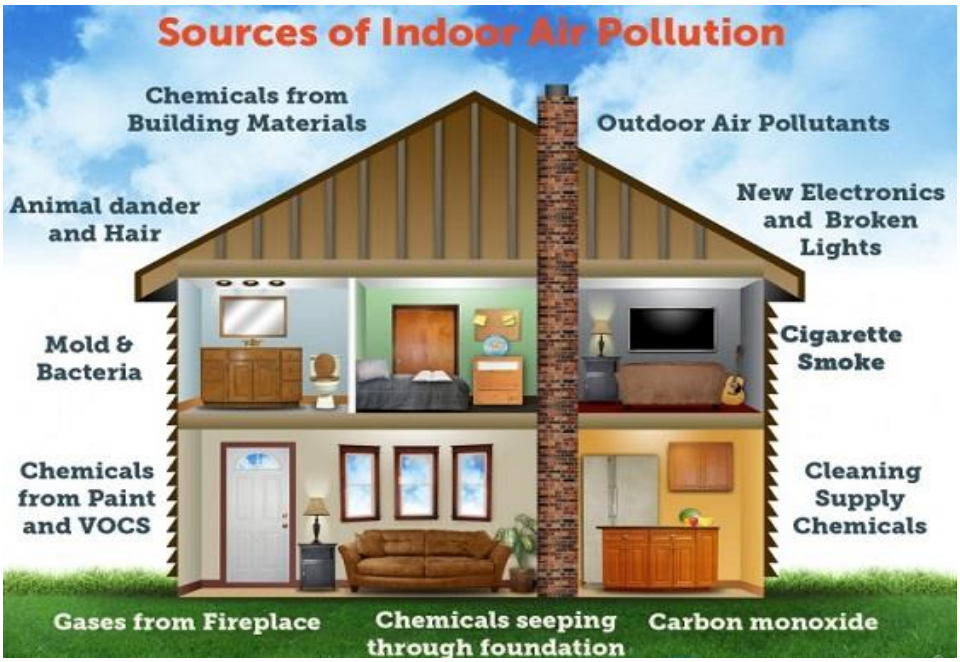


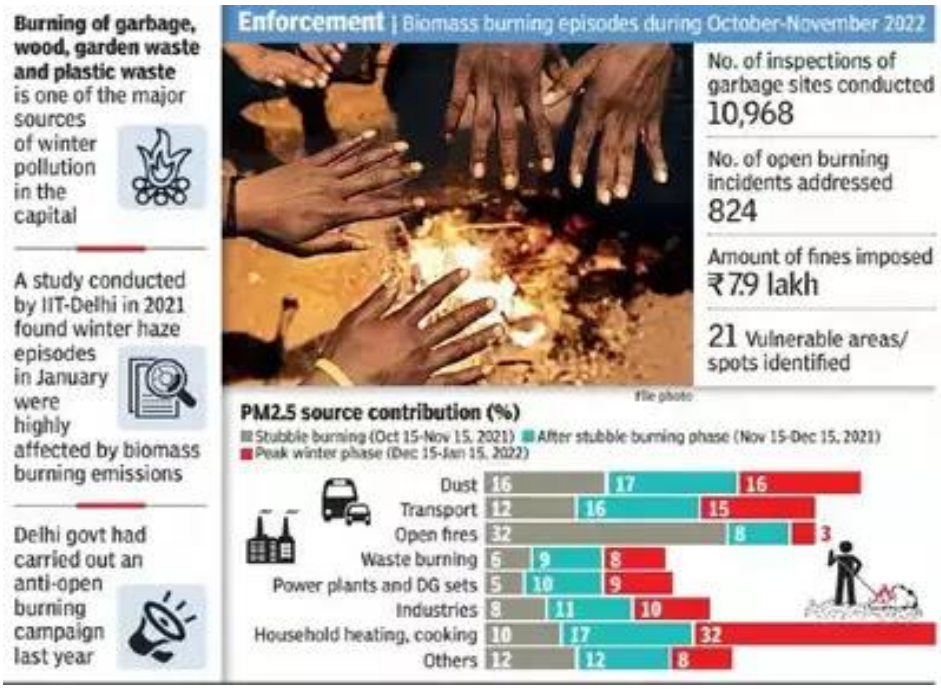
Stubble burning

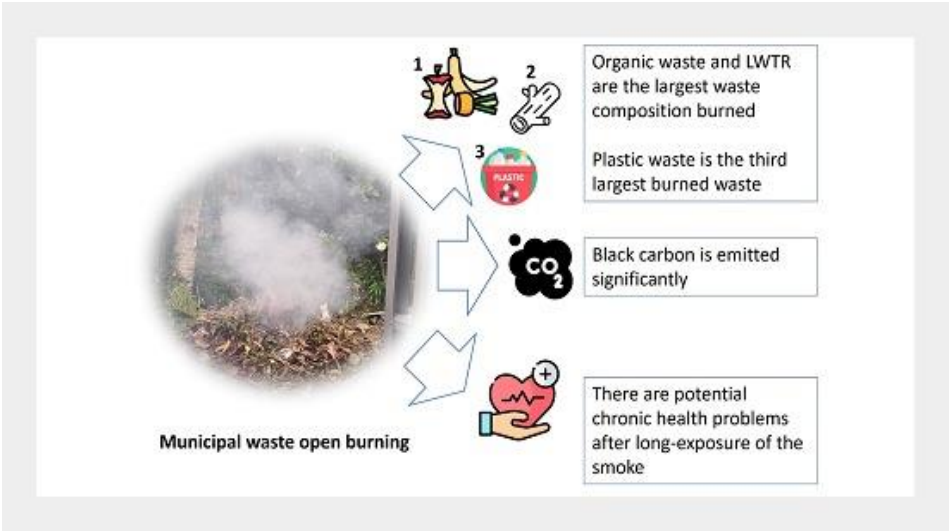
- **Stubble burning**, a common **agricultural practice to clear fields for new crops,** is another source of air pollution, generating **hazardous pollutants during the burning process.**



Industrial waste	• The combustion of fossil fuels such as **coal and oil in industrial processes in power plants, refineries, and factories release** a variety of pollutants, the majority of which are identical to those emitted by traffic and mobility. • Industrial activities release pollutants such as **carbon monoxide, hydrocarbons, organic compounds,** and various chemicals into the **air, adversely affecting air quality.** 
Indoor Pollution	**Household cleaning products and painting supplies** release hazardous chemicals into the air, **contributing to indoor pollution.**

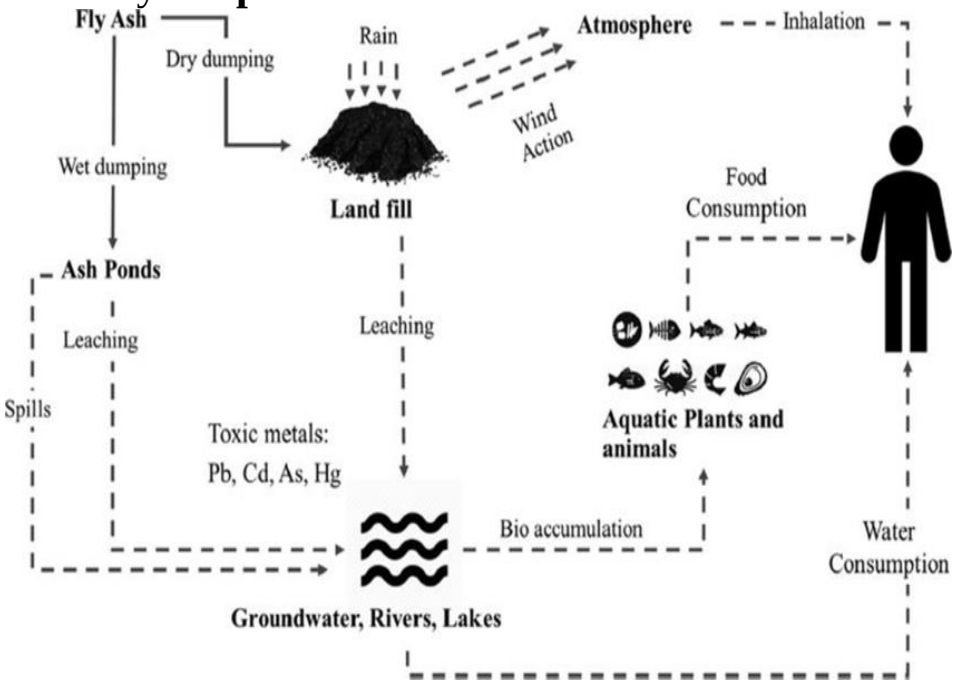
	• Around **2.1 billion people** worldwide (around a third of the global population) **cook using open fires or inefficient stoves fuelled by kerosene, biomass** (wood, animal dung and crop waste) and coal, which generates harmful household air pollution. • **Household air pollution** was responsible for an estimated **3.2 million deaths per year in 2020,** including over **237 000 deaths of children under the age of 5.** • The **combined effects of ambient air pollution** and household air pollution are associated with **6.7 million premature deaths annually.** 
Livestock	• **Half of direct agriculture emissions** come from **livestock**. • **Digestive processes in livestock release methane, a greenhouse gas**, as a by-product into the atmosphere.

Wildfires	• **Climate change** is not just increasing **wildfire but also spiking air pollution.** • As many as **90% of the wildfires are caused by anthropogenic reasons**, a small spark can turn acres of forest area into ashes. • The **soot and dust particles, smoke** (that contains several toxic chemicals) can **stay suspended in the air for days.**
Open Burning of Garbage Waste	• **Open burning of garbage** is very harmful to the environment. • Open air garbage burning releases **toxins such as black carbon, soot, and carcinogens.**  • Open garbage burning **causes skin irritation, aggravates asthma and other respiratory diseases and illnesses,** increases the **risk of heart diseases**, and difficulties in **breathing, nausea and headaches.**



Fly ash

- The **ash produced mostly by thermal power** plants as **by-products of coal burning** operations is t**ermed Fly ash.**
- It consists primarily of **oxides of silicon, aluminum, iron and calcium.**
  - Fly ash **pollutes the air as well as water.**



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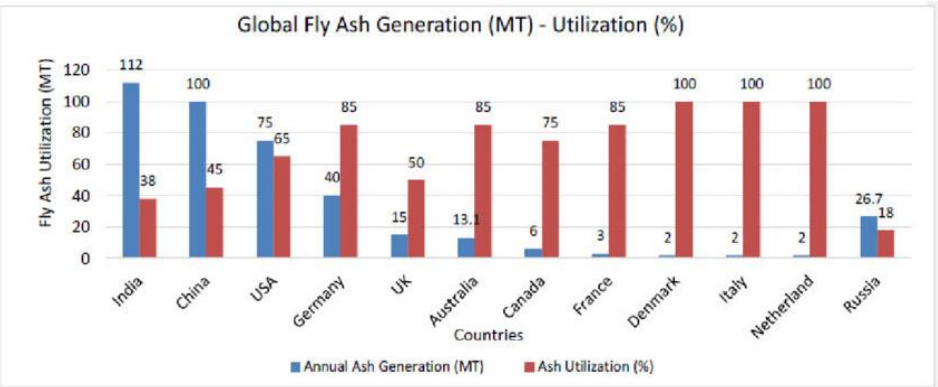
<tr><td></td><td> 
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<tr><td>Construction and Demolition</td><td>

Construction and demolition sites are a rich source of PM and other air pollutants including VOCs, etc.
People living near these sites experience various health concerns like difficulty in breathing, irritation in the eyes, nose, and throat, etc.
Several construction sites and raw materials such as bricks and concrete cause haze and foul air which is hazardous for people especially, children and elderly citizens.


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<tr><td>Smog</td><td>

Smog is a type of air pollution derived from vehicular emissions and industrial fumes that react in the atmosphere with sunlight to form secondary pollutants.

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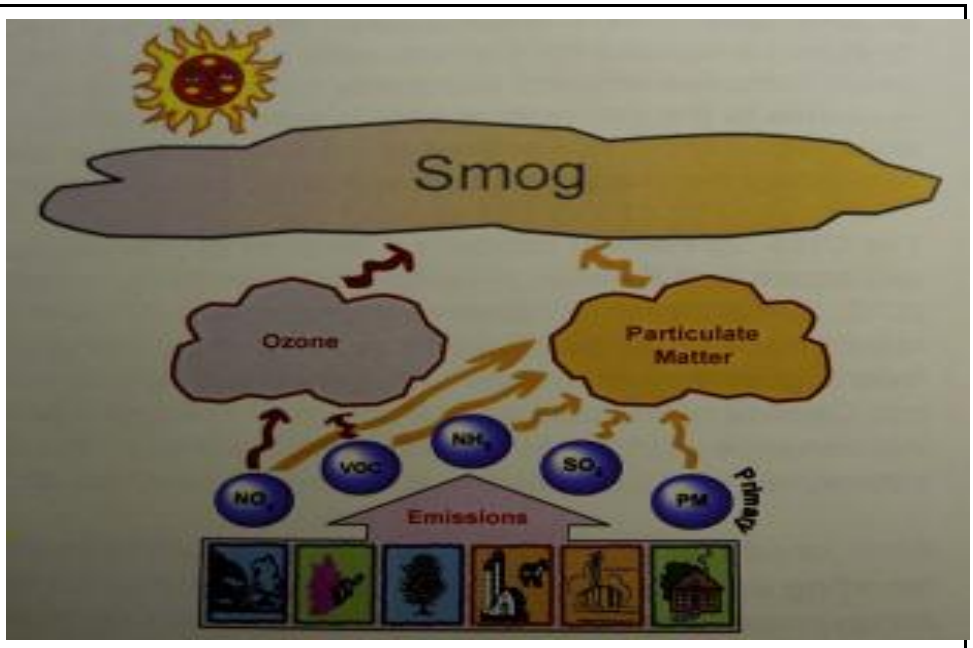
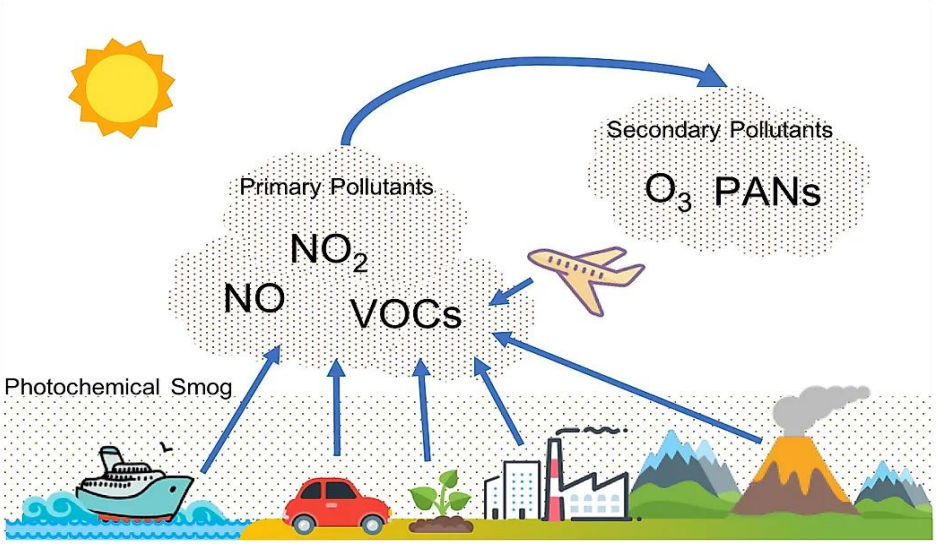
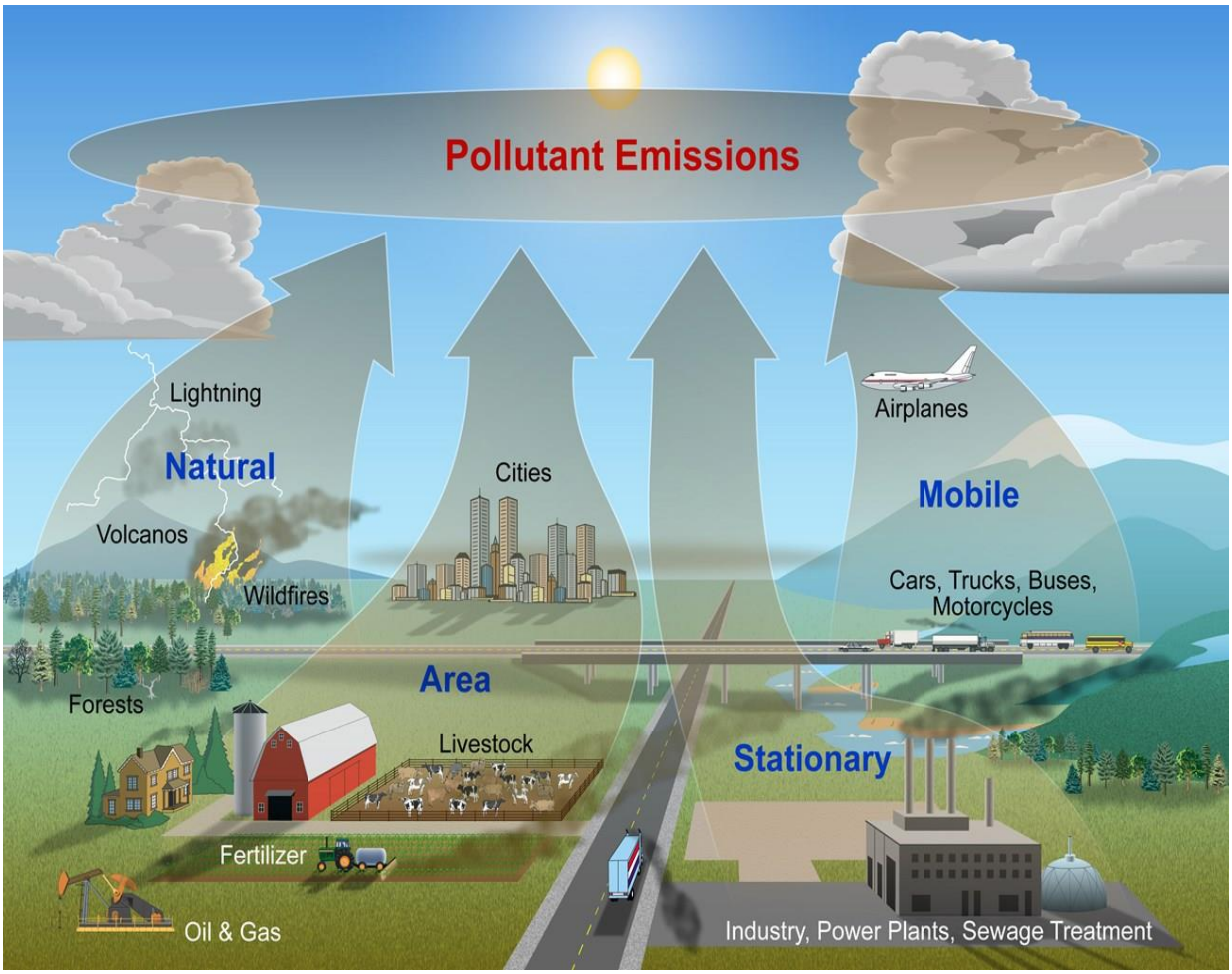
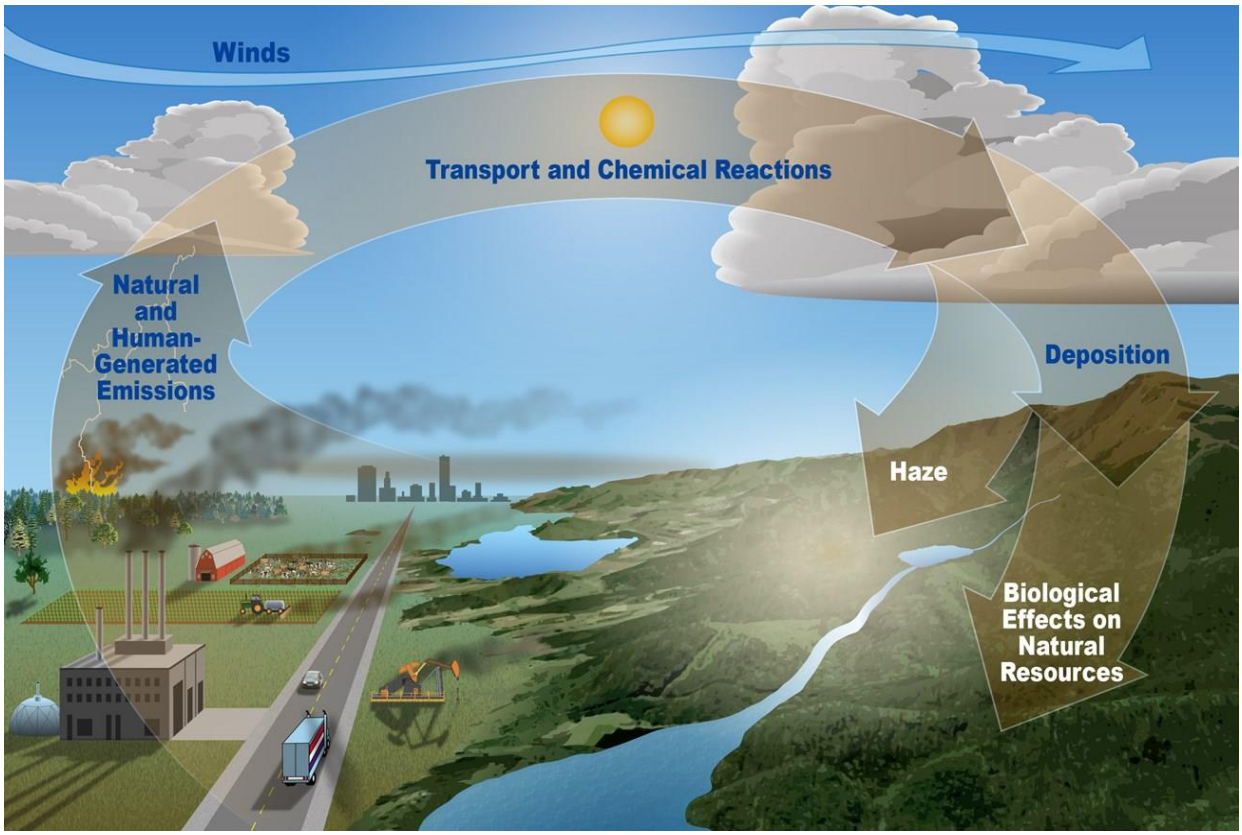


- There are mainly two types of smog namely **sulfurous smog and photochemical smog.**
- **Sulfurous smog:**
  - **Sulfurous smog,** also known as **"London smog,"** is caused by a **high concentration of sulfur oxides in the air,** which is caused by the use of sulfur-containing f**ossil fuels, particularly coal. Dampness and a high concentration of suspended particulate matter** in the air aggravate this type of smog.
- **Photochemical smog:**
  - **Photochemical smog, also known as "Los Angeles smog**," is most prevalent in **urban areas with a high concentration of automobiles.**
  - It is a **mixture of pollutants** that are formed when **nitrogen oxides and volatile organic compounds (VOCs)** react to **sunlight, creating a brown haze above cities**.

- It **tends to occur more often in summer,** because that is when there is **enough sunlight.**

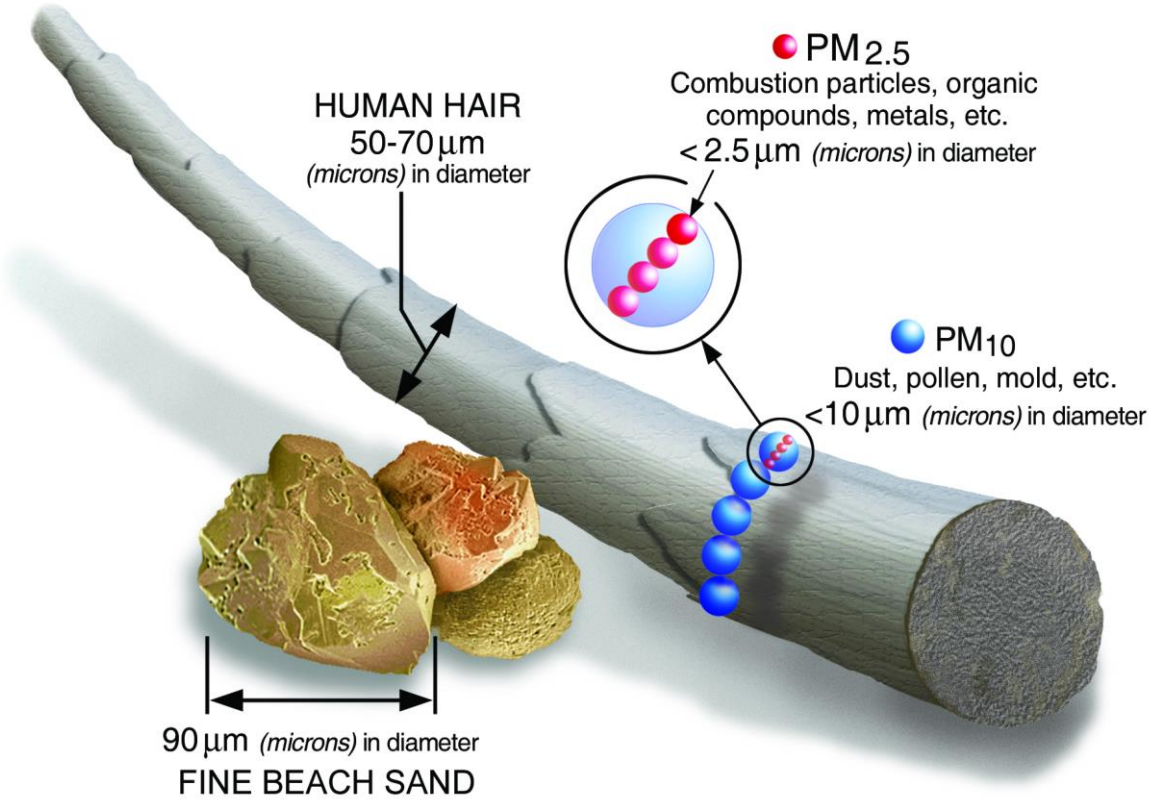




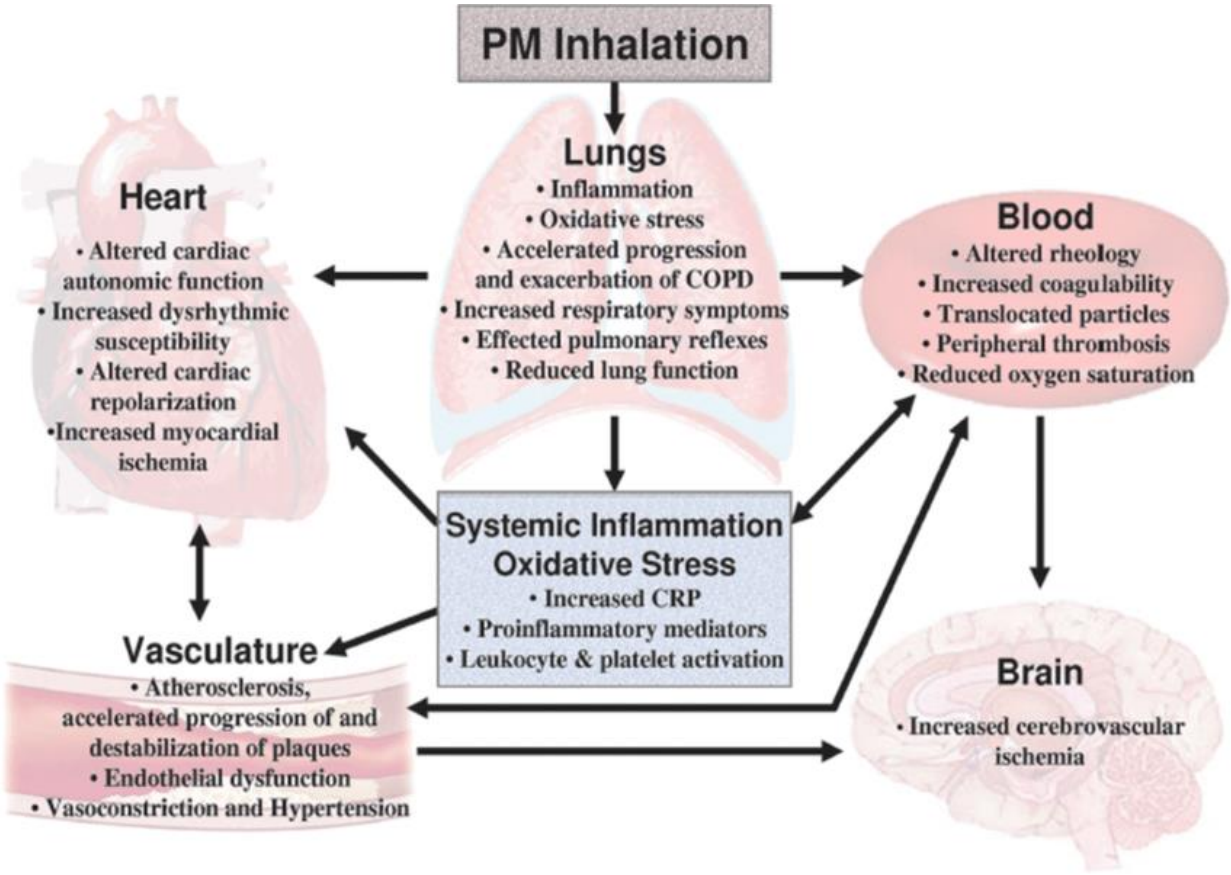


9. What is PM, and how does it get into the air?

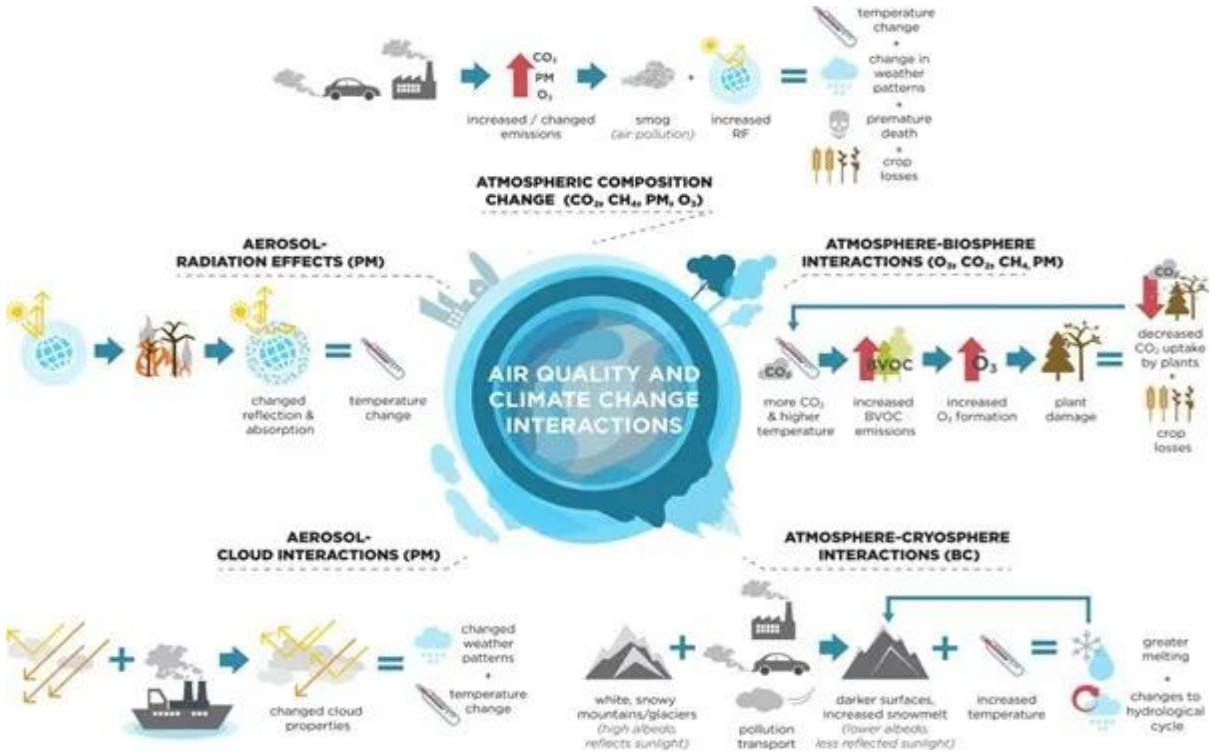
- **PM stands for particulate matter** (also called particle pollution) and it is a **mixture of solid particles and liquid droplets** found in the air.
- Some particles, such as **dust, dirt, soot, or smoke, are large or dark** enough to be seen with the **naked eye.**
- Others are so small they can **only be detected using an electron microscope.**
- **Particle pollution includes:**
  - **PM10:** inhalable particles, with diameters that are generally **10 micrometers and smaller**; and
  - **PM2.5:** fine inhalable particles, with diameters that are generally **2.5 micrometers and smaller.**

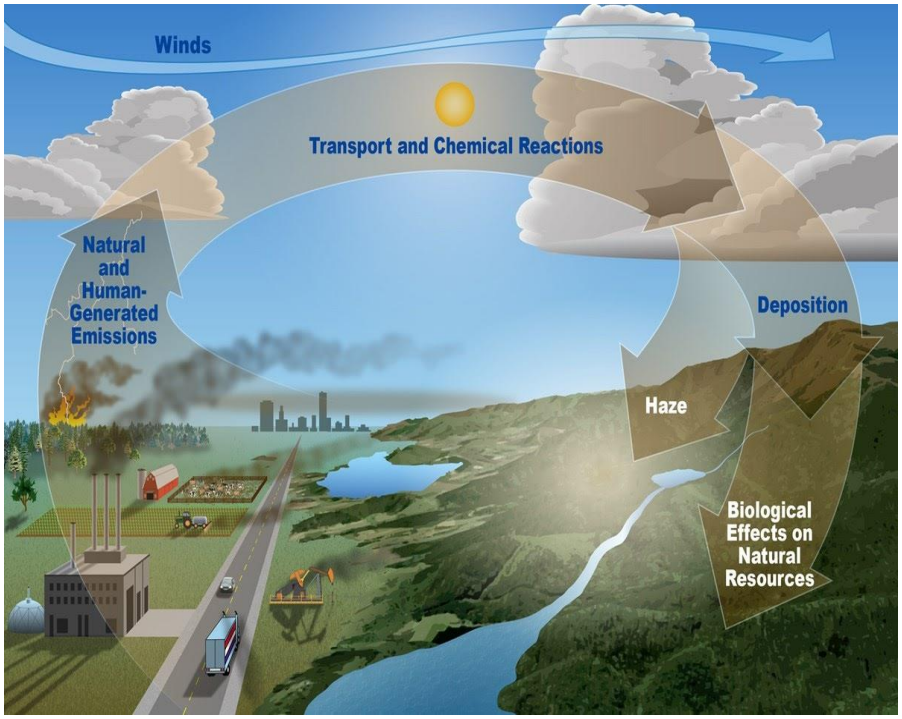


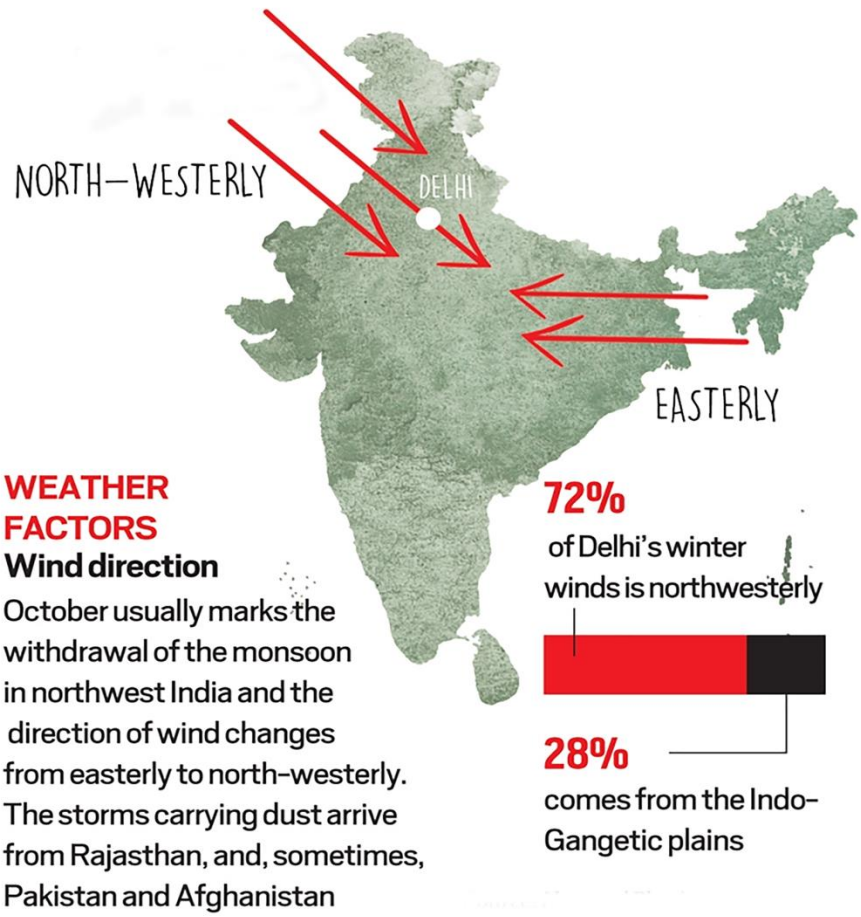
- Most particles form in the atmosphere as a **result of complex reactions of chemicals such as sulfur dioxide and nitrogen oxides**, which are pollutants emitted from power plants, industries and automobiles.
- Some are emitted **directly from a source, such as construction sites, unpaved roads, fields, smokestacks or fires.**
- Particulate matter contains microscopic solids or liquid droplets that are so small that they **can be inhaled and cause serious health problems**.



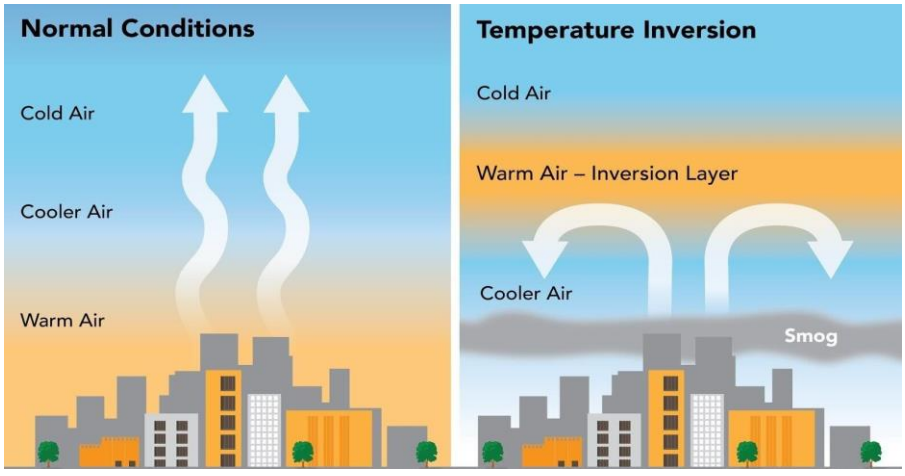
10. Mention how weather affects the air quality?



Determinants	Analysis
Wind and temperature	• **Wind carries air contaminants** away from their source, **causing them to disperse**. • In general, the **higher the wind speed, the more contaminants are dispersed** and the lower their concentration. • However, **high wind can also generate dust** which is a **problem in dry windy rural areas**. • As the **ground heats during daytime** the air becomes more turbulent, **especially in the middle of the day**. • **Air turbulence causes polluted air to disperse** as it moves away from its source. • In contrast, **stable conditions often occur at night when the air is cooler.** 

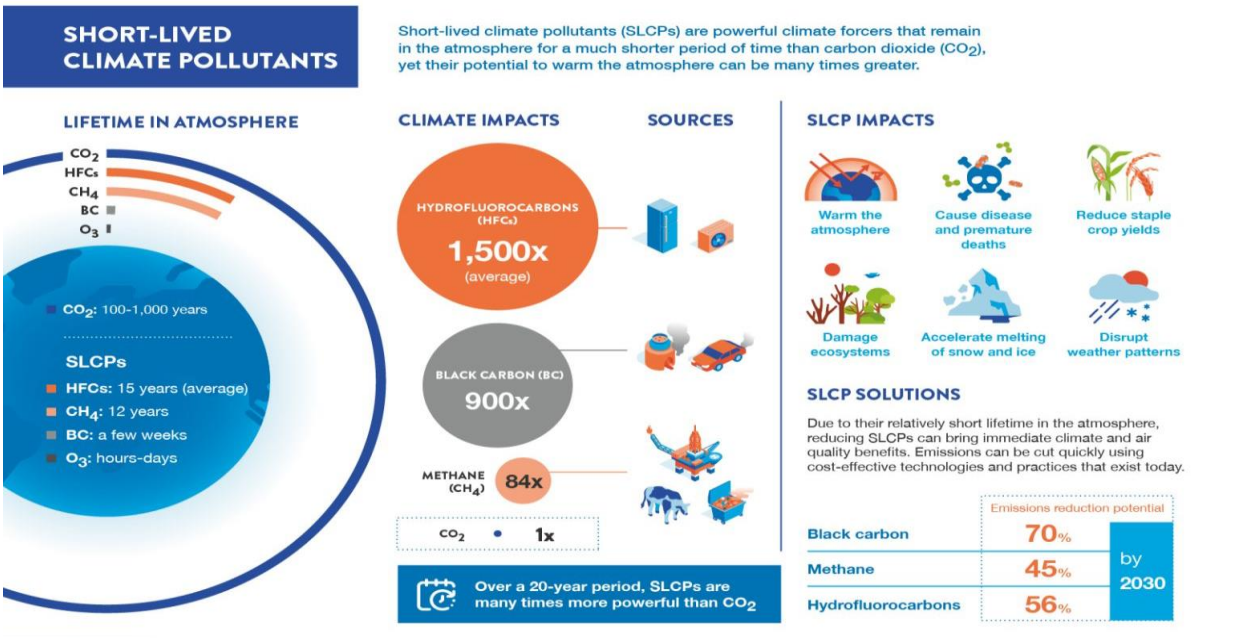


Inversion layers	• **Air usually cool**s with **increasing height** in the **atmosphere**. • However, sometimes **an upper air layer is warmer than a lower one**. • This is called an i**nversion.**



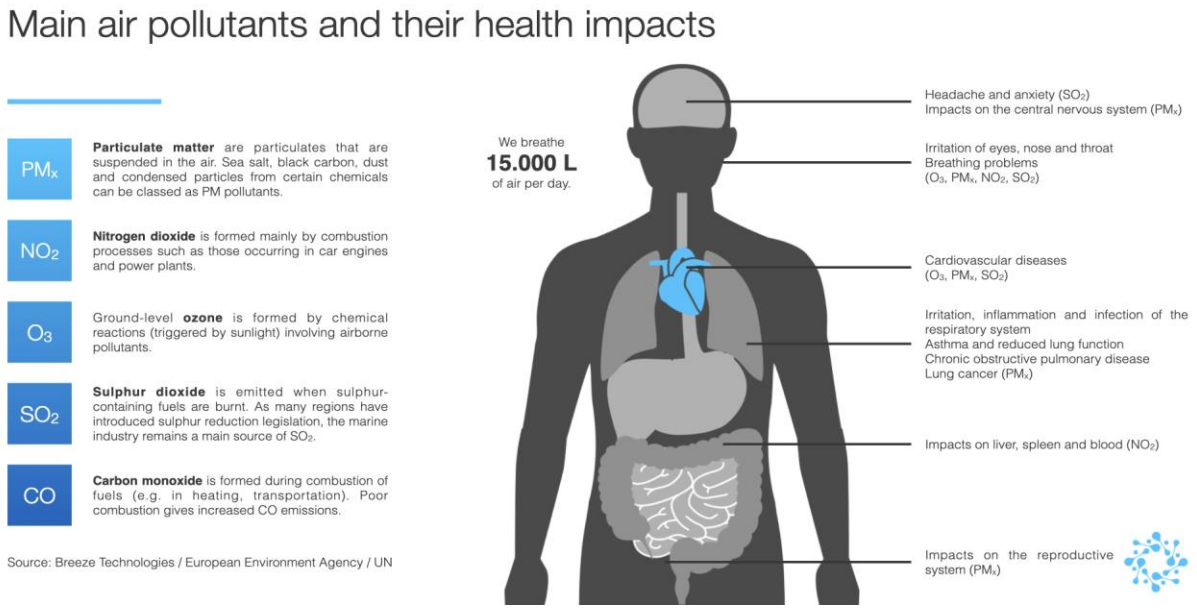
11. What are short-lived climate pollutants and how do they impact climate and health?

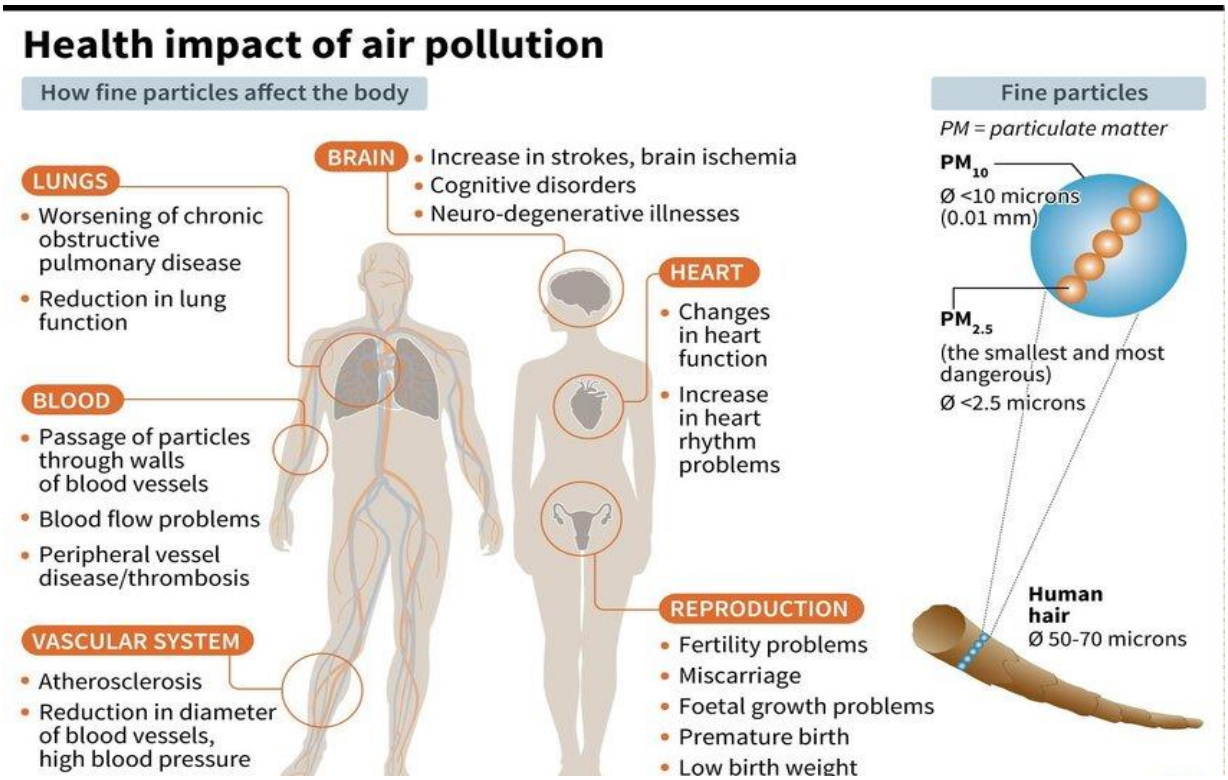
- **Air pollutants**, such as **methane and black carbon,** are powerful **short-lived climate pollutants (SLCPs)** that contribute to **climate change and ill health**.
- Although **SLCPs persist** in the **atmosphere for short lifetimes**, their **global warming potential** is often much **greater than carbon dioxide (CO2).**
- **Black carbon**, a component of fine particulate matter, **is one of the largest contributors to global warming after CO2.**
- **Black carbon warms the earth's atmosphere by absorbing sunlight**, thereby accelerating the melting of snow and ice.
- **Methane** has a warming impact **86 times stronger than CO2 per unit of mass over a 20 year period**.
- **Methane (CH4) is estimated to have a GWP of 27-30 over 100 years**.
- **Ozone and black carbon** affect weather **processes and decrease agricultural yields,** thus threatening food security.



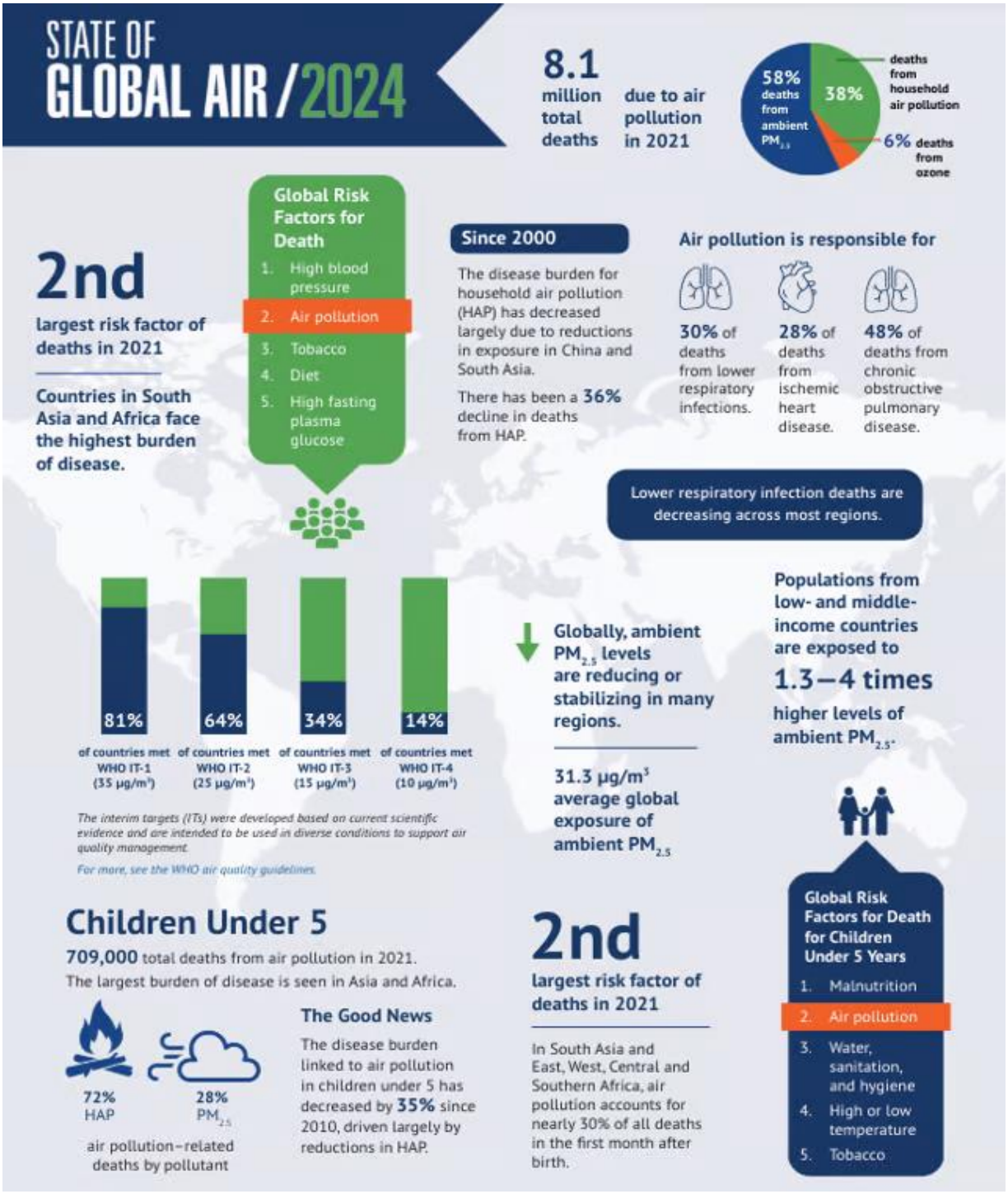
12. What is the impact of air pollution on health?

- **Air pollution poses serious health risks,** including respiratory diseases such as **asthma and chronic bronchitis, cardiovascular conditions, and premature mortality.**

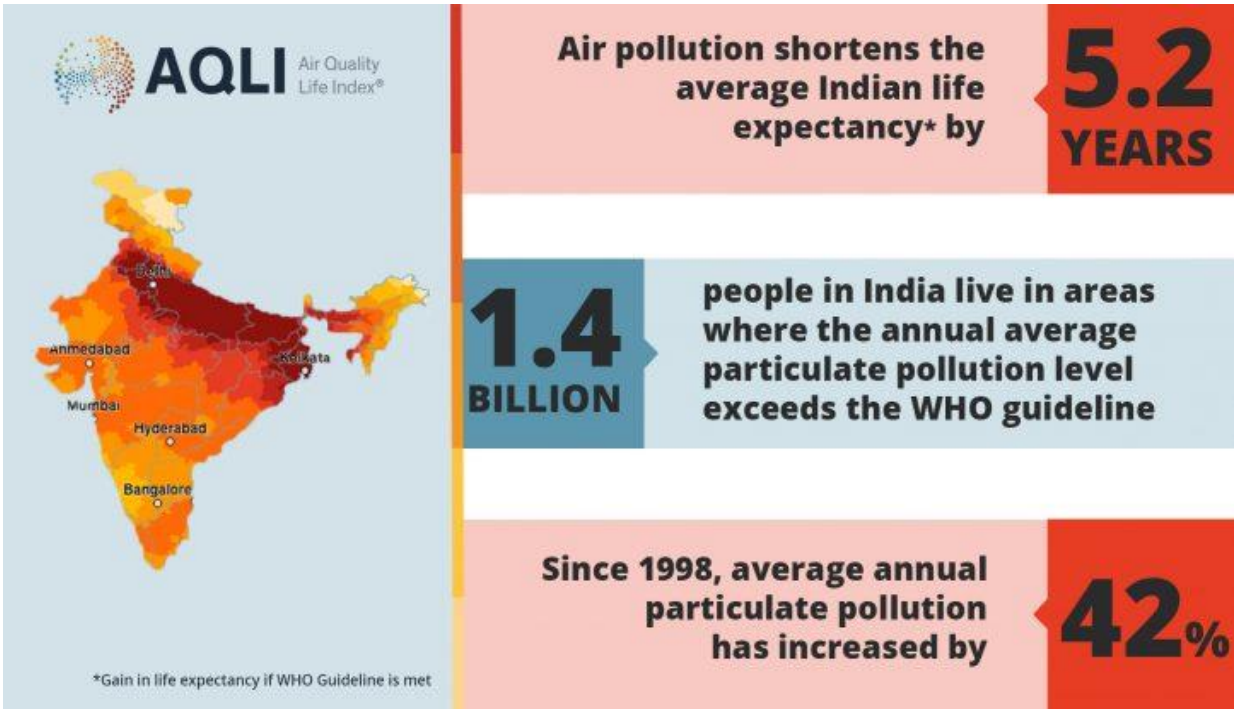




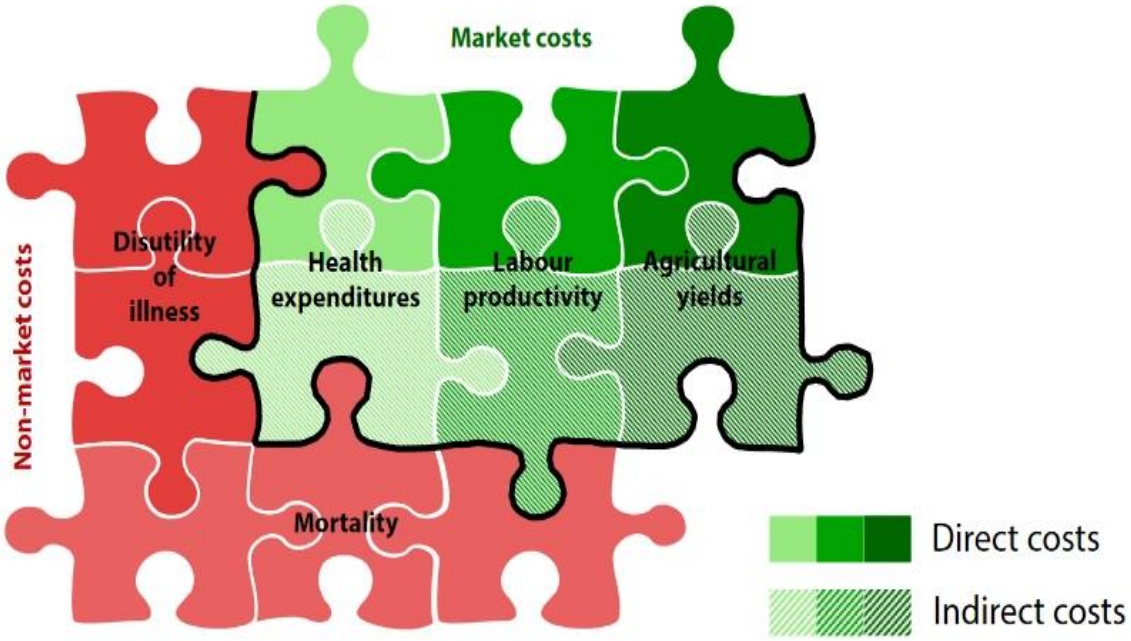
- In **2021, air pollution was a major global killer**, contributing to **8.1 million deaths worldwide.**
- The report, published by the **US-based Health Effects Institute (HEI) in partnership with UNICEF**, also highlighted the **devastating impact on young children.**

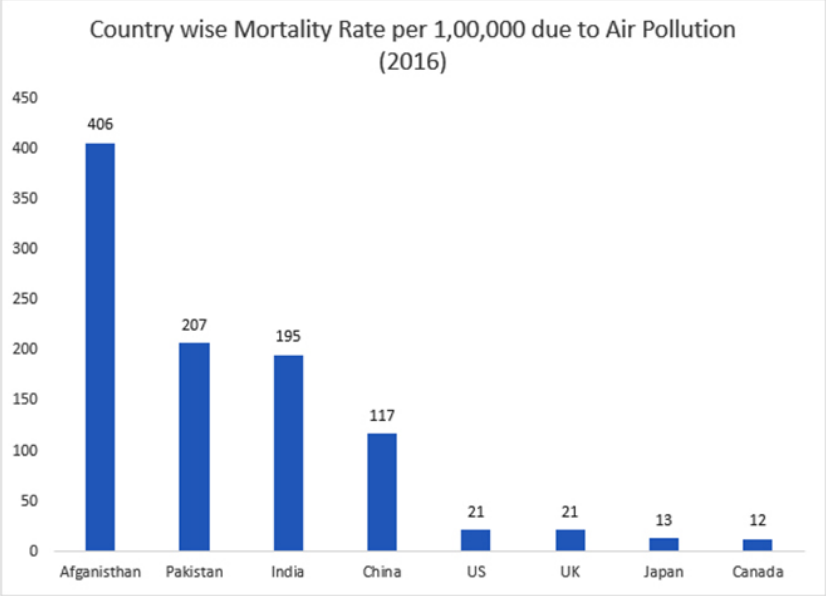


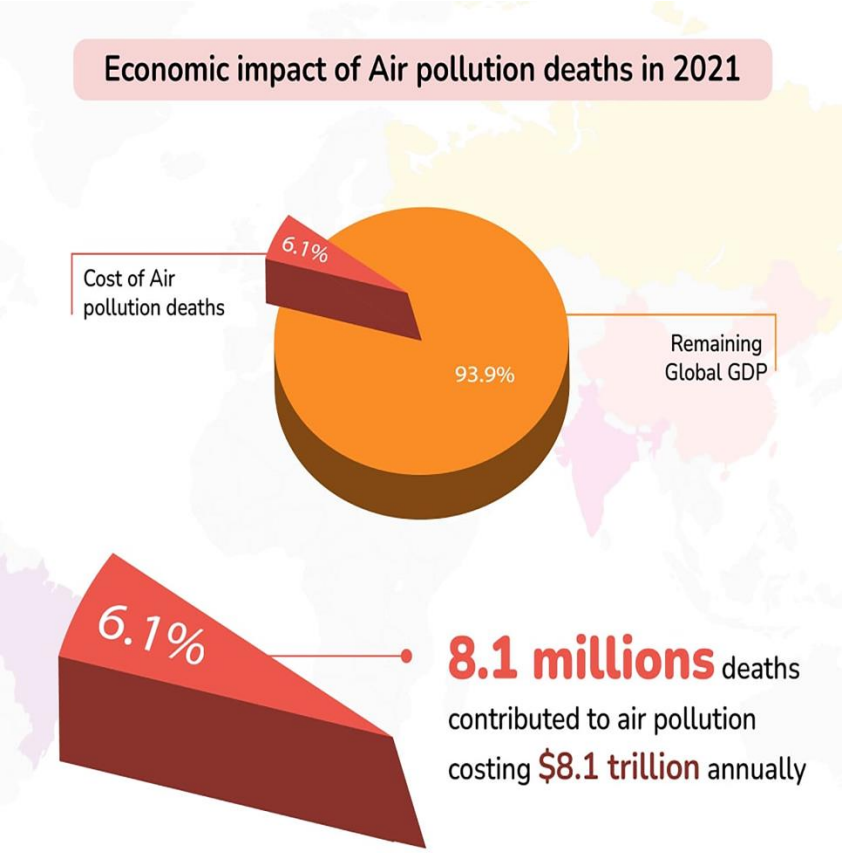
- **According to a study published in The Lancet Planetary Health journal, 1.7 million deaths** were attributable **to air pollution in 2019**, which is around **18% of all deaths in India.**

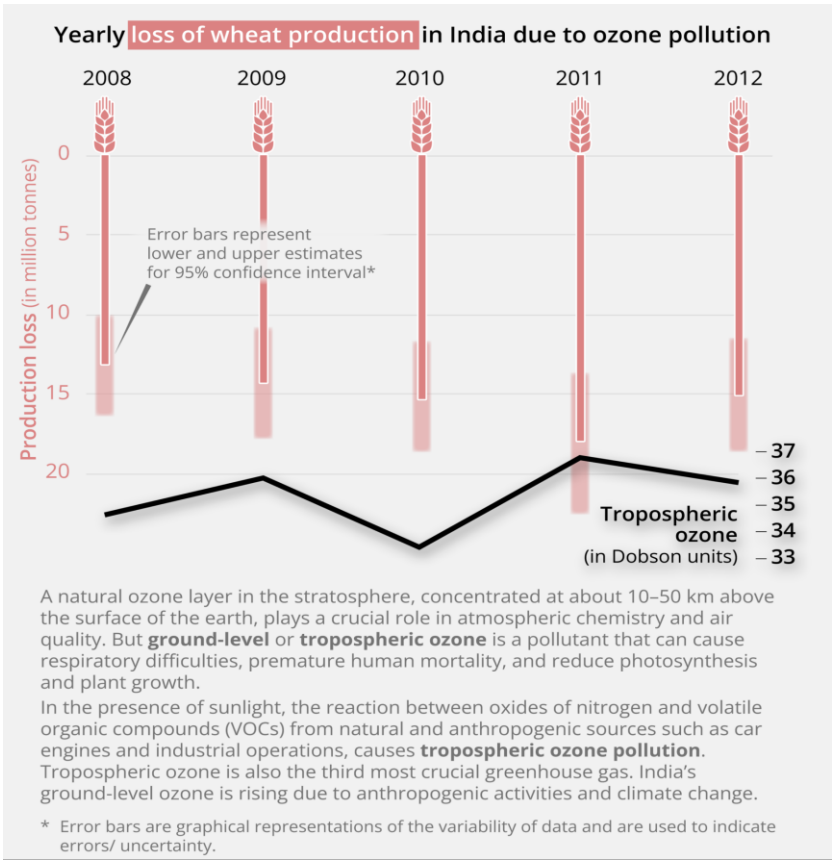


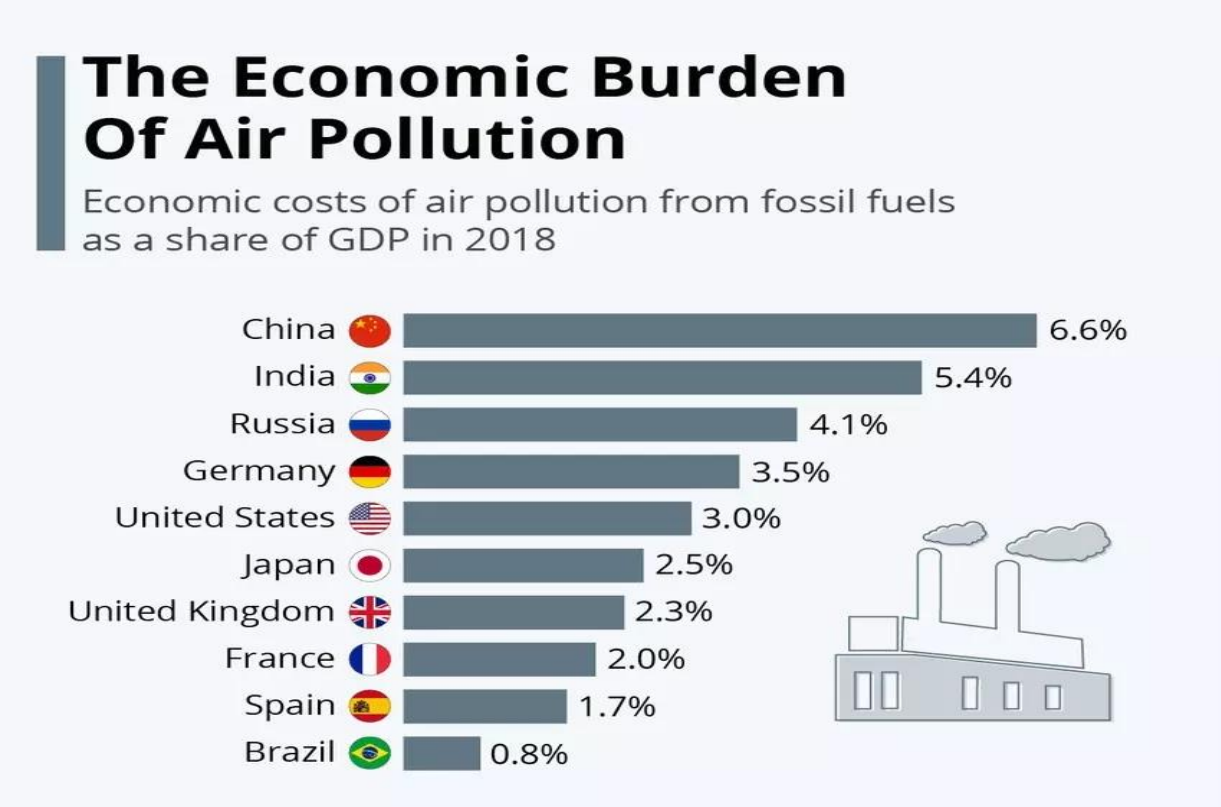
13. What are the Economic impacts of air pollution?



Impact	Analysis
Healthcare costs	• The **World Bank estimates** that the health damage **caused by air pollution costs $8.1 trillion a year, equivalent to 6.1% of global GDP.** 
Affects productivity	• **Air pollution hampers** workforce productivity and economic activity and around **1.2 billion work days** are **lost globally every year**, which could reach **3.8 billion days by 2060.** • In India, **reduced productivity, work absences and premature deaths** caused by **air pollution** cost the economy an **estimated $95 billion** or **3% of the country's GDP** in 2019. • Despite the **EU's** recent progress, **air pollution still causes €600 billion in losses each year**, or **4% of its annual GDP.**

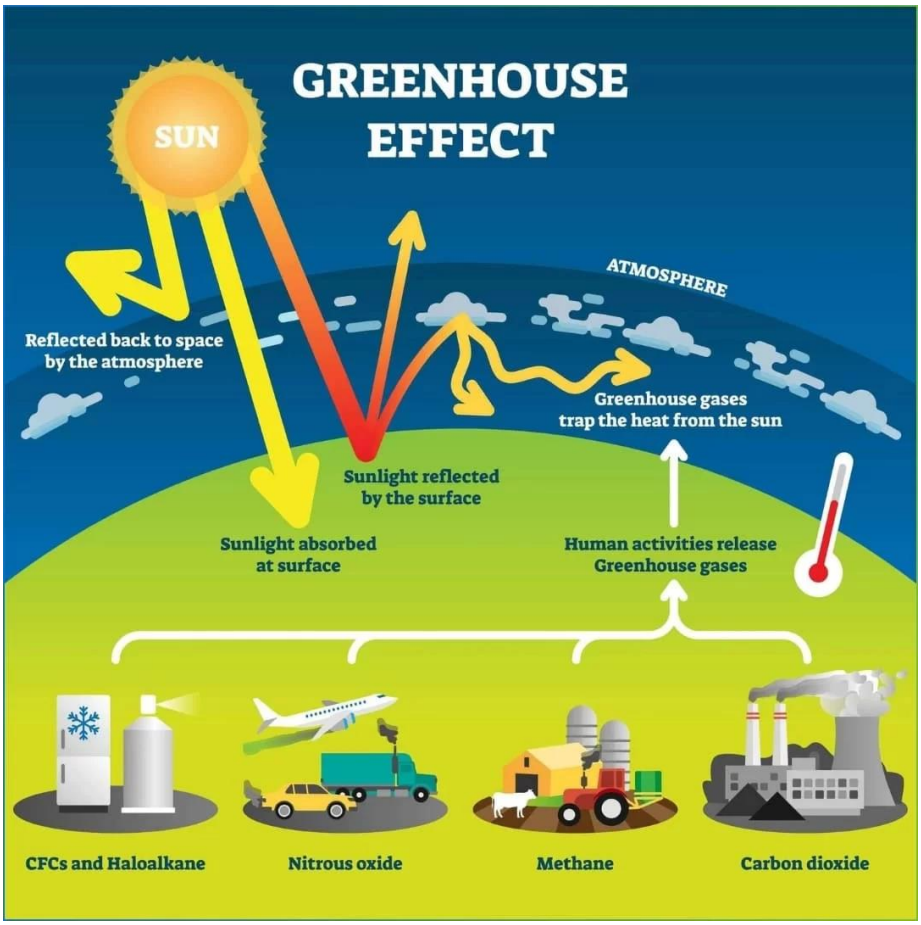
	
Agriculture	• High air pollution affects the **global crop yields**. As many greenhouse gasses emission contributes to **acid rains and smog** it affects crop production. • **Ground-level ozone and Nitrogen dioxide** significantly affect crop yields. • A study indicates that **5% to 12% yield losses globally** due to these pollutants and it **resulted in around $20 billion per year loss in the economy**

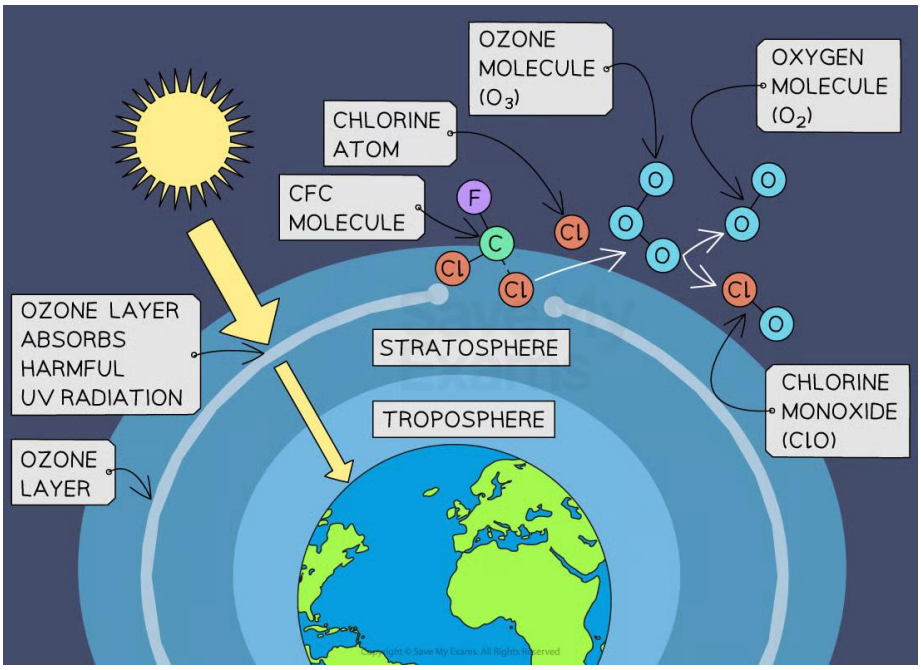

Yearly loss of wheat production in India due to ozone pollution
2008
2009
2010
2011
2012
Production loss (in million tonnes)
0
5
10
15
20
Error bars represent lower and upper estimates for 95% confidence interval*
37
36
35
34
33
Tropospheric ozone (in Dobson units)
A natural ozone layer in the stratosphere, concentrated at about 10–50 km above the surface of the earth, plays a crucial role in atmospheric chemistry and air quality. But ground-level or tropospheric ozone is a pollutant that can cause respiratory difficulties, premature human mortality, and reduce photosynthesis and plant growth.
In the presence of sunlight, the reaction between oxides of nitrogen and volatile organic compounds (VOCs) from natural and anthropogenic sources such as car engines and industrial operations, causes tropospheric ozone pollution. Tropospheric ozone is also the third most crucial greenhouse gas. India's ground-level ozone is rising due to anthropogenic activities and climate change.
* Error bars are graphical representations of the variability of data and are used to indicate errors/ uncertainty.


The Economic Burden Of Air Pollution
Economic costs of air pollution from fossil fuels as a share of GDP in 2018
China 6.6%
India 5.4%
Russia 4.1%
Germany 3.5%
United States 3.0%
Japan 2.5%
United Kingdom 2.3%
France 2.0%
Spain 1.7%
Brazil 0.8%

14. Mention how air pollution contributes to climate change?

- **Air pollutants** not only severely **impact public health**, but also the **earth's climate and ecosystems globally.**
- **Air pollution contributes** to climate change in several ways, including:

Impact	Analysis
Greenhouse gasses	• Air pollutants like **methane and black carbon are short-lived climate pollutants (SLCPs)** that t**rap heat in the atmosphere**, causing global warming. • **Methane is 84 times more potent than carbon** dioxide, another greenhouse gas. 

Ozone depletion	• **Ozone depletion** is the **thinning of the ozone layer** in Earth's atmosphere, which allows **more harmful ultraviolet (UV) radiation** to reach the planet. • The main reasons for the ozone hole are **chlorofluorocarbons, carbon tetrachloride, methyl bromide and hydrochlorofluorocarbons.** 

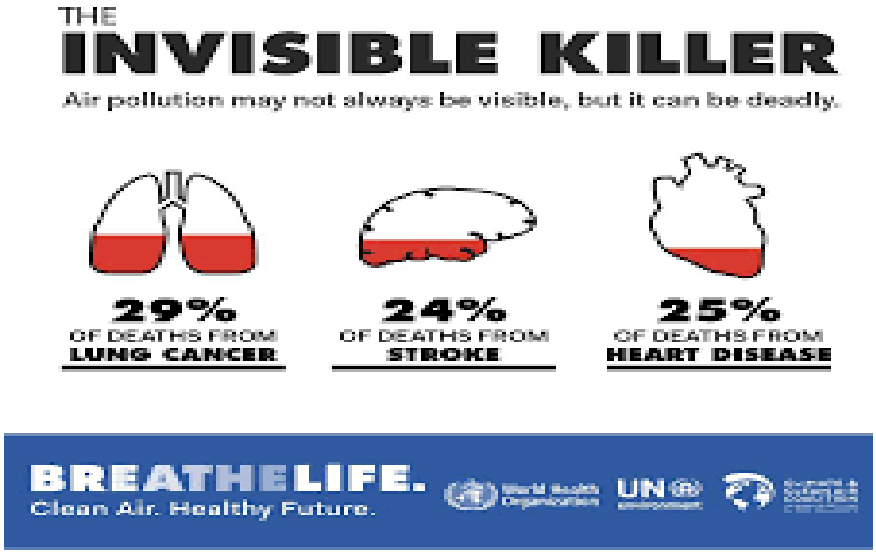
15. Enlist global initiatives to combat air pollution?

Initiatives	Analysis
Global Methane Pledge	• The **Global Methane Pledge (GMP)** is a **voluntary framework** supporting nations to take action to **collectively reduce methane emissions by 30% from 2020 levels by 2030.** • This could **eliminate over 0.2˚C of warming by 2050.**

	• The **GMP** was announced at **COP 26** in **November 2021** by the **European Union and the United States.** • As of **September 2024, over 155 countrie**s have **joined the GMP.** • **India has opted not to sign the Global Methane Pledge.** 
International Clean Air Day	• **Since 2020**, each **7th of September** has been recognised as **International Day of Clean Air for Blue Skies (Clean Air Day)**. • This event recognises the **importance of reducing air pollution** – the single greatest environmental health risk globally, and one of the main avoidable causes of death and disease globally.

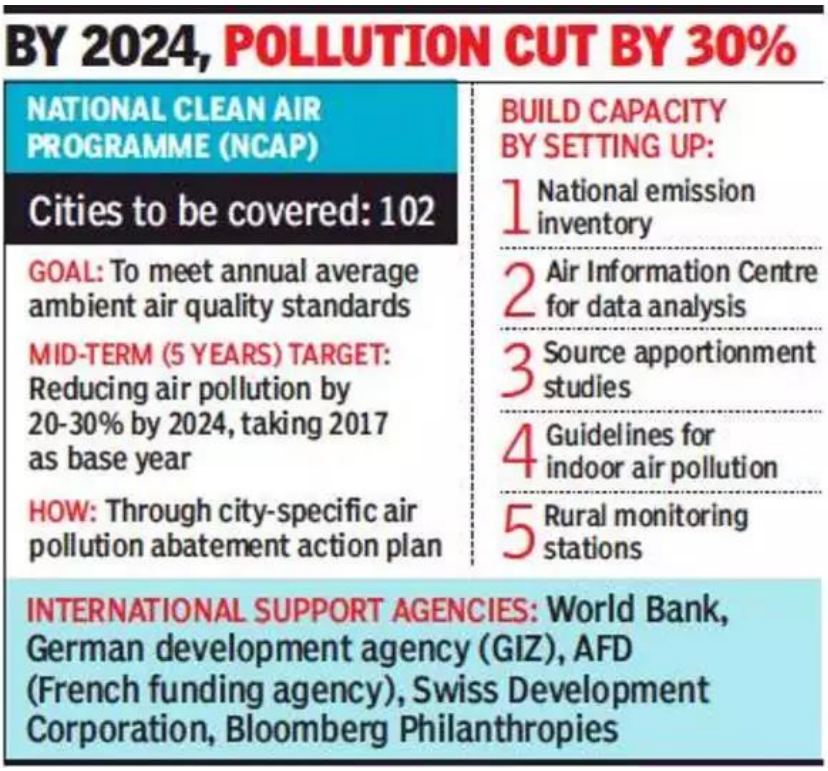
BreatheLife campaign

- **Brea the Life** is a **joint campaign of the Clean Air and Climate Coalition, World Health Organisation, United Nations Environment Programme,** and **World Bank** to mobilize cities and individuals **to protect our health and our planet** from the effects of **air pollution.**



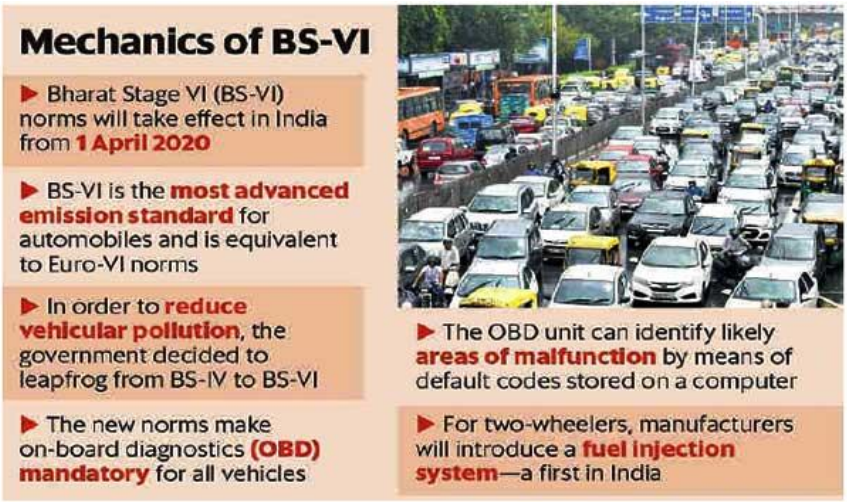
16. Enlist initiatives taken by India to combat air pollution?

Initiatives	Analysis
The Winter Action Plan 2024	• **Delhi government launched a 21-point winter action plan** to **combat air pollution,** featuring real-time drone surveys and a special task force. 
National Clean Air Programme (NCAP)	• **The National Clean Air Programme (NCAP)** was launched in **2019 as a long-term,** time-bound, national-level strategy **to tackle the country's air pollution** problem comprehensively. • **NCAP aims to achieve a 20-30% reduction** in **Particulate Matter concentrations by 2024,** keeping 2017 as the base year for comparing concentrations.



New Commission for Air Quality Management

- **The Commission for Air Quality Management (CAQM)** was established as a **statutory body** by the **government in August 2021** as an overarching body to **carry out air quality management in Delhi NCR.**

BS-VI Norms	• **BSVI, or Bharat Stage Emission Standard 6**, is a set of regulations that c**ontrol the amount of pollutants** emitted by vehicles in India. • The government of India **introduced BSVI in April 2020 to replace BS4** and reduce pollution levels. • **BS6-**compliant engines use modern technology like **Lean NOx traps (LNTs), selective catalytic reduction (SCR)** units, and **diesel particulate filters (DPFs**) to meet the emission targets. 
Graded Response Action Plan	• The **Graded Response Action Plan (GRAP)** is a set of measures that are **implemented to reduce air pollution** in the **National Capital Region (NCR) of India.** • The plan is based on the **National Air Quality Index (AQI)** and is activated when the **air quality reaches a certain level.**

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<tr><td>National Electric Mobility Mission Plan (NEMMP)</td><td>

- Under **NEMMP 2020**, the Government has launched **Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India (FAME India)** scheme to promote manufacturing of **electric and hybrid vehicle technology.**

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</table>

(R&D) initiatives	• **Wind Augmentation and Air Purifying Unit (WAYU):** ▪ A device developed by the **Department of Science and Technology (DST) and CSIR-NEERI** that can reduce air pollution **in industrial complexes, residential areas, and schools**. ▪ This device uses wind generators to **dilute pollutants and filters to remove them.**  • **Air Pollution Control Division (APCD):** ▪ A division of **CSIR-NEERI that conducts research on air quality management,** including monitoring, prediction, and simulation. ▪ The **APCD also uses emission inventories** and dispersion modeling to identify impacts.

17. What could be the possible way ahead?

Way ahead	Analysis
Psychological Nudging	• **New research by the University of Kent** has found that using **low-cost psychological interventions** can **reduce vehicle engine idling** and in turn improve air quality, especially when there is **increased traffic volume at railway level crossings.** • **Convincing individuals to shift** from **personal vehicles to public transport** or carpooling necessitates a major shift in behavior
Enforcement of Regulations	• **Implementing and enforcing regulations against forest fires, smoking in public spaces**, and the **use of firecrackers during fe stivals** require a robust legal framework and e ffective law enforcement.
Community Engagement	• **Engaging local champions** and **communities** in clean air initiatives requires sustained efforts in awareness building and community p articipation. Building a sense of **responsibility and ownership among residents** can be a game changer in **combating air pollution.**

	
Integrated Urban Planning:	• **Develop and implement comprehensive urban planning** that integrates **sustainable transportation, waste management,** and green spaces. • **Prioritize mixed-use developments** to reduce commuting distances and promote walkability.
Government Policies and Incentives:	• **Formulate and enforce** policies that promote **clean transportation, energy efficiency, and waste reduction.** • **Provide financial incentives for businesses and individuals** adopting eco-friendly practices and technologies.

18. What is the relevance of the topic for UPSC CSE?

- **For Prelims:** Air pollution, Solid Waste Management, National Green Tribunal, National Clean Air Programme, System of Air Quality and Weather Forecasting and Research (SAFAR) Portal, New Commission for Air Quality Management, Graded Response Action Plan

- **For Mains:** Major Driving Factors of Air Pollution, Reasons for Persistent Air Pollution in India Despite Significant Initiatives

Some previous years prelims questions.

Q1 According to the Environmental Protection Agency (EPA), which one of the following is the largest source of sulfur dioxide emissions? **(2024)**

(a) Locomotives using fossil fuels
(b) Ships using fossil fuels
(c) Extraction of metals from ores
(d) Power plants using fossil fuels

Ans: (d)

Q2. In the context of WHO Air Quality Guidelines, consider the following statements: **(2022)**

1. The 24-hour mean of PM2.5 should not exceed 15 µg/m3 and annual mean of PM2.5 should not exceed 5 µg/m3.
2. In a year, the highest levels of ozone pollution occur during the periods of inclement weather.
3. PM10 can penetrate the lung barrier and enter the bloodstream.
4. Excessive ozone in the air can trigger asthma.

Which of the statements given above are correct?

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

Ans: (b)

Q3. In the cities of our country, which among the following atmospheric gasses are normally considered in calculating the value of the Air Quality Index? **(2016)**

1. Carbon dioxide
2. Carbon monoxide
3. Nitrogen dioxide
4. Sulfur dioxide
5. Methane

Select the correct answer using the code given below:

(a) 1, 2 and 3 only
(b) 2, 3 and 4 only
(c) 1, 4 and 5 only
(d) 1, 2, 3, 4 and 5

Ans: (b)

Some previous years mains questions.

Q1. Describe the key points of the revised Global Air Quality Guidelines (AQGs) recently released by the World Health Organisation (WHO). How are these different from its last update in 2005? What changes in India's National Clean Air Programme are required to achieve revised standards? **(2021)**

Some questions from this year and previous years interview transcripts.

Board Lieutenant General Raj Shukla sir:

- Why is there air pollution in delhi?

Board Sheel Vardhan Sir:

- What is NGT? its role, why and when it was set up ?
- So do you think NGT has really made an impact?

- Why do we take actions when air is polluted and not put limitations on when it is clean to maintain the good AQI?

Board Suman Sharma mam:

- How Delhi air is polluted by parali from Punjab?
- If you are DM in Punjab, how will you solve it?

Board Suman Sharma mam:

- What are we doing for air and water pollution?

Board BB Swain sir:

- How to tackle stubble burning?
- Tell an issue of stubble burning apart from pollution.

Board Sheel Vardhan Singh sir:

- Tell me why groundwater is getting polluted? and solutions.
- As we know there is stubble burning in states surrounding NCR, what are its solutions?
- How will you pursue farmers in this case at an individual level?

Some questions for QUIZ.

Q1. Consider the following pollutants:

1. Nitrogen dioxide
2. Sulphur dioxide
3. Ammonia
4. PM 10
5. Ground-level ozone
6. Lead

How many of the above pollutants are considered in the calculation of AQI?

(a) Only three
(b) Only four
(c) Only five
(d) All six

Ans: (d)

Some questions for POLL.

Q1. Are you satisfied with the steps taken to combat Air pollution in the Delhi region?
(a) YES
(b) NO
(c) Can't say.

Q2. Are developed countries spending enough to combat pollution?
(a) YES
(b) NO
(c) Can't say.

■■■■