

# Air Pollution: Set the Scene

**Class EE375**

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# What types of air pollutants that pose health risks?

Particulate matter  
(PM)

Ozone  
(O<sub>3</sub>)

Nitrogen dioxide  
(NO<sub>2</sub>)

Sulfur dioxide  
(SO<sub>2</sub>)



## NATIONAL AIR QUALITY AND GLOBAL GUIDELINES FOR PM<sub>2.5</sub>

The WHO developed air quality guidelines to protect human health, with a value for PM<sub>2.5</sub> of 10 µg/m<sup>3</sup> as an annual mean concentration in ambient air. While based on scientific evidence of health impacts, this level may seem aspirational, and even out of practical reach for some countries, given their starting points today. Taking this view, the WHO developed Interim Targets as milestones along the way towards an end-goal of achieving the Guideline value. These Interim Targets have been taken up in national air quality legislation with a number of countries in the region having put PM<sub>2.5</sub> standards in place.

	Annual mean PM <sub>2.5</sub> concentration	WHO Air Quality Criteria	National air quality standards
●	40 µg/m <sup>3</sup>		India
●	35 µg/m <sup>3</sup>	WHO Interim Target 1	China Grade II Malaysia
●	25 µg/m <sup>3</sup>	WHO Interim Target 2	Mongolia Philippines Sri Lanka Thailand Viet Nam
●	15 µg/m <sup>3</sup>	WHO Interim Target 3	Bangladesh China Grade I Indonesia Japan Pakistan Republic of Korea Singapore
●	10 µg/m <sup>3</sup>	WHO Guideline	
●	8 µg/m <sup>3</sup> *		Australia

\*maximum concentration

# Where can we check for air quality level?

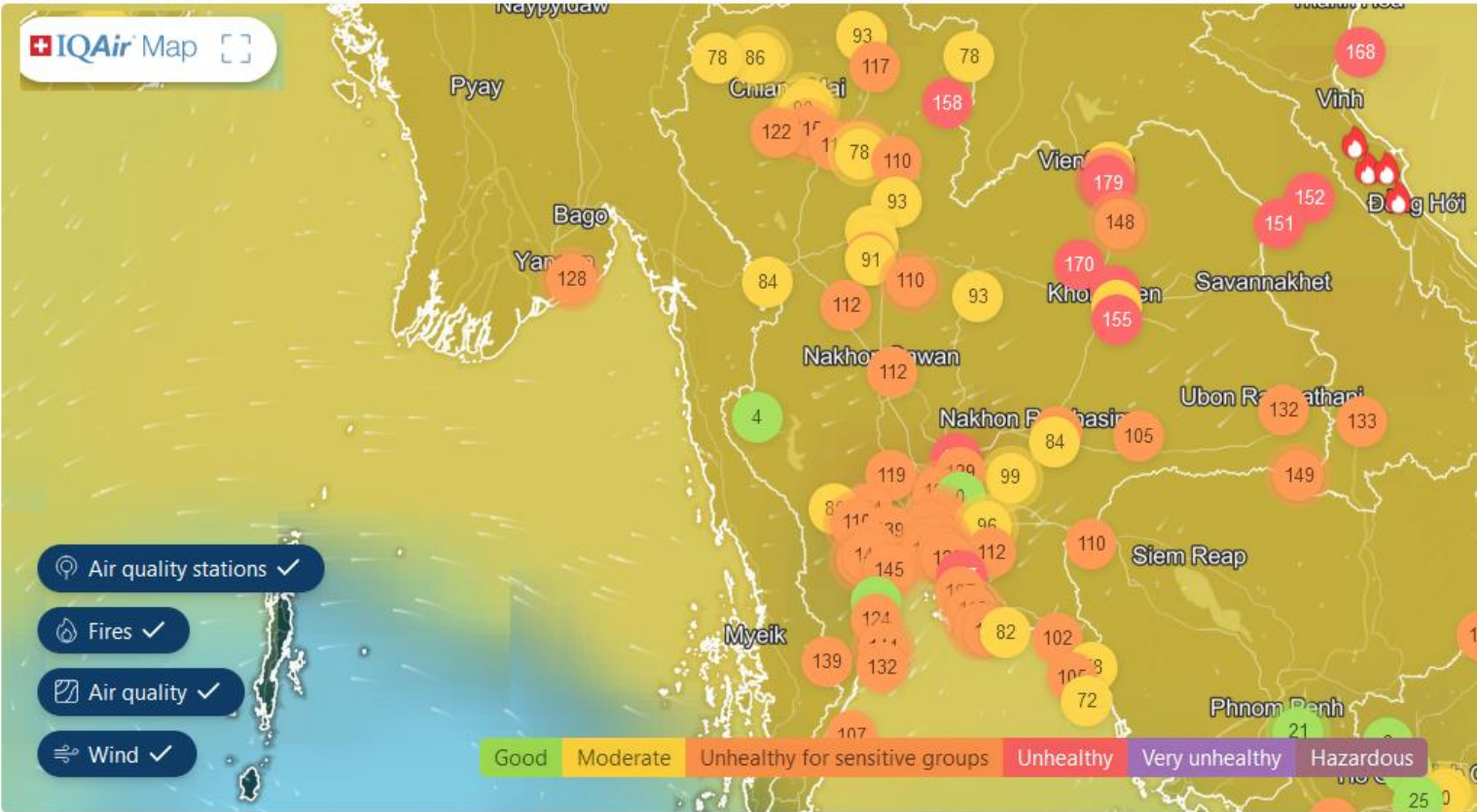
last update at 22:00, Oct 18

### LIVE AQI CITY RANKING

Real-time Thailand  
Most polluted city ranking

#	CITY	US AQI
1	Nong Bua Lamphu, Nong Bua La...	170
2	Nong Khai, Nong Khai	166
3	Nam Phong, Khon Kaen	163
4	Phu Phiang, Nan	163
5	Bang Khon Thi, Samut Songkhram	161
6	Thawi Watthana, Bangkok	158
7	Chon Buri, Chon Buri	157
8	Nakhon Pathom, Nakhon Pathom	156
9	Phra Samut Chedi, Samut Prakan	155

Air quality index (AQI) and PM2.5 air pollution in Thailand



<https://www.iqair.com/th-en/thailand>

# What are the costs of air pollution?

“On a particularly smoggy day, it’s not hard to imagine the toll that air pollution takes on our health and lives.

But what many don’t realize is that **the total impact of air pollution on human life and the global economy** may be far **more severe** than previously thought.”

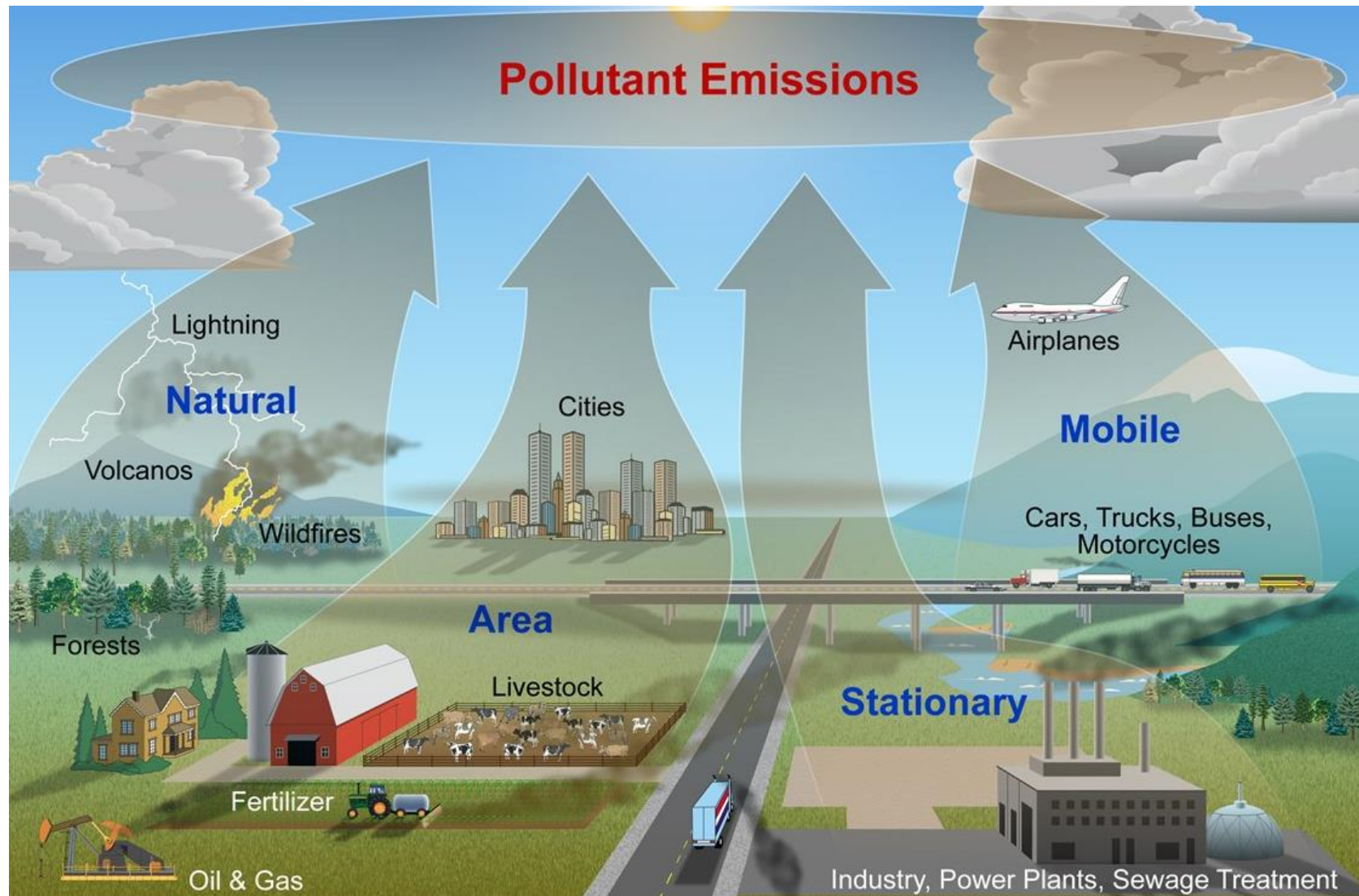
*Source: IQAir*

- Air pollution is one of the greatest environmental risk to health. → **lead to diseases** such as from stroke, heart disease, lung cancer, and both chronic and acute respiratory diseases, including asthma.
- In 2019, 99% of the world population was living in places where the WHO air quality guidelines levels were not met → **Risks to health effects**
- Mortality and cost estimates from the total impact attributable to PM2.5 and NO2 → over 160,000 **deaths** and \$85.1 billion USD **lost** in 2020 alone – in five cities located in Japan, India, China, Brazil and Mexico which represents only 1.7% of world population
- Some 91% of **premature deaths** occurred in low- and middle-income countries, and the greatest number in the WHO South-East Asia and Western Pacific regions.

*Source: WHO (2021)*

*Source: IQAir*

# Where do air pollutants come from?



# The costs of air pollution from using fossil fuels

The Cost of Air Pollution Counter uses the same methodology as a 2020 report by Greenpeace that calculated shocking estimates of the costs of using of fossil fuels like coal, oil, and gas:

- **4.5 million premature deaths** each year due to air pollution from fossil fuels
- **US \$8 billion (3.3% of the world's total GDP) lost each day** from reduced life expectancy, premature birth, illnesses that result in hospital visits and missed work, and financial burdens resulting from illnesses
- **40,000 deaths of children under five** every year from PM2.5 exposure from fossil fuels
- **1.8 billion days of work lost from illnesses** related to PM2.5 from fossil fuels, resulting in economic losses of US\$101 billion

*The cost of reducing air pollution may seem high. But the health costs and economic costs of air pollution are clearly much higher.*

# Air pollutions and climate change - connections



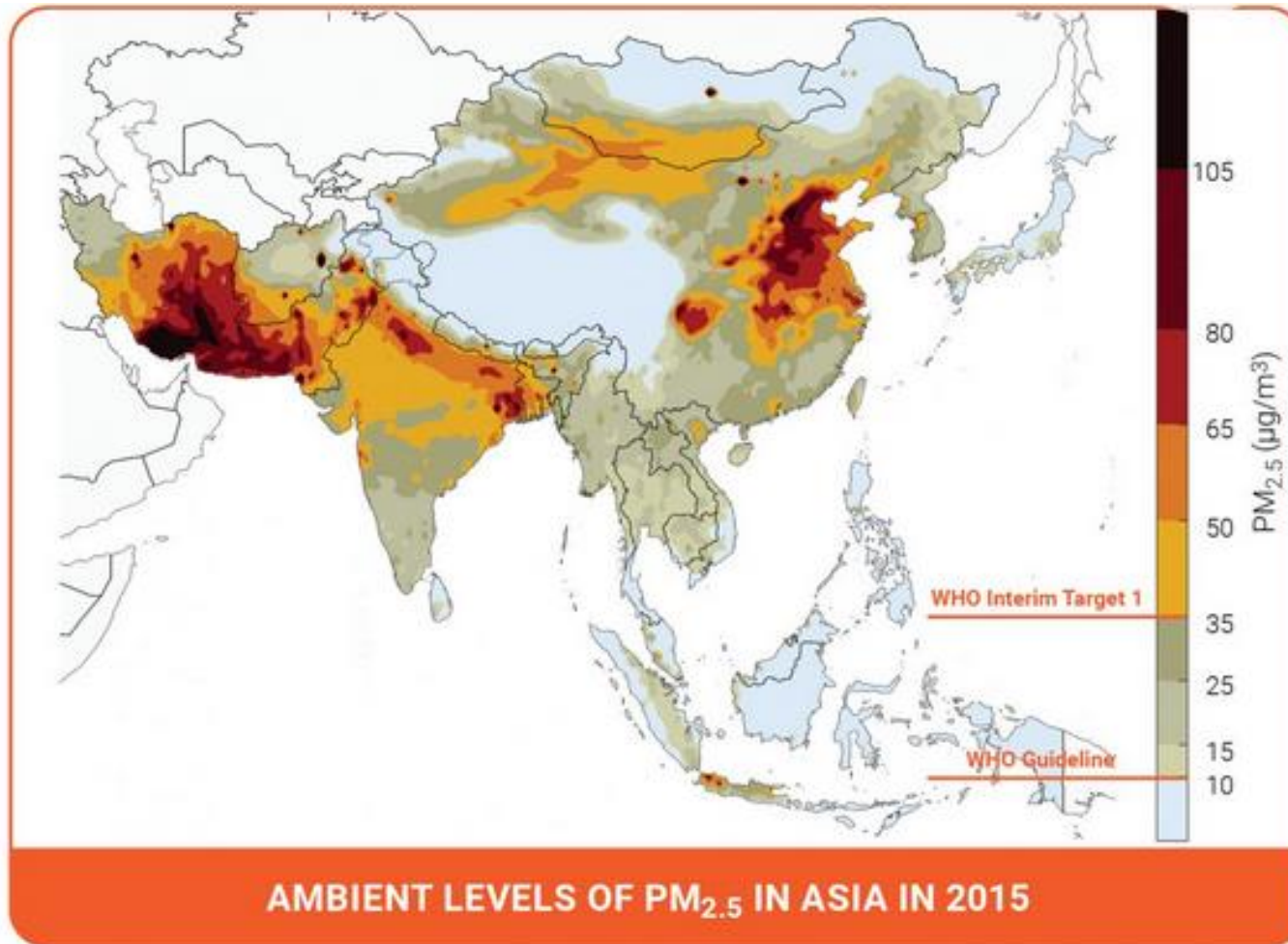
*Link to video*

## China: Fighting Air Pollution and Climate Change through Clean Energy Financing



*Link to video*

# Air Pollution Case in Asia- Pacific: Risk exposure

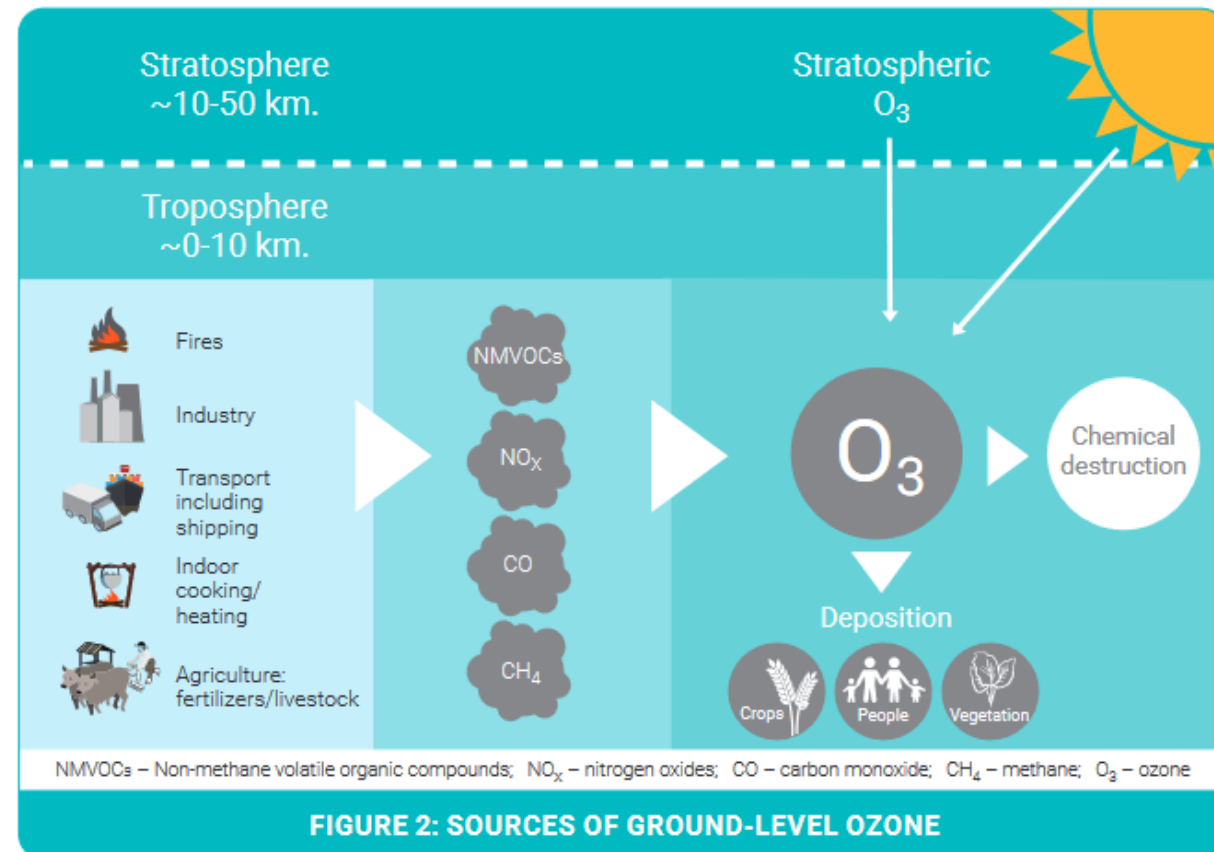
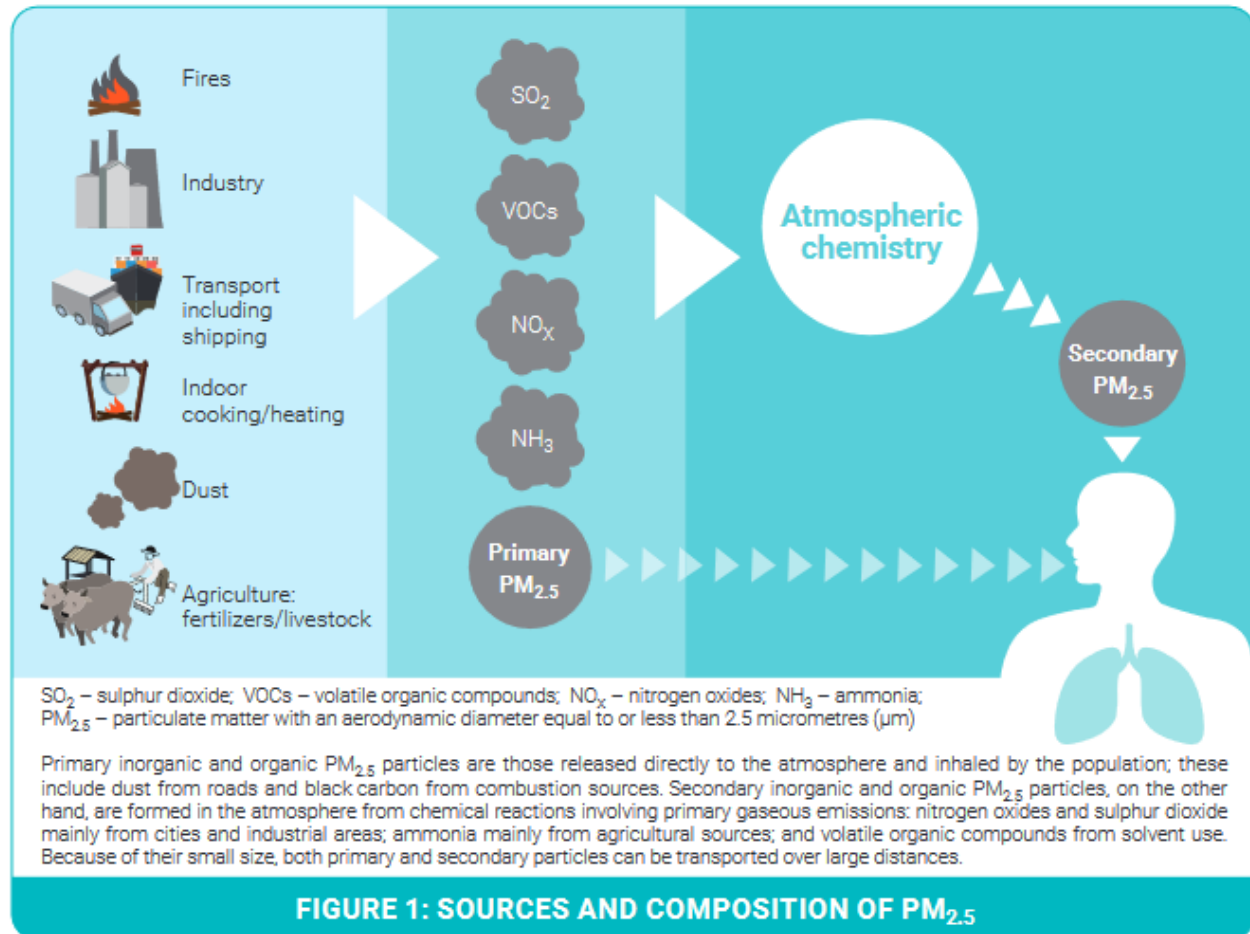


- 92% of population – about 4 billion people – are **exposed to levels of air pollution** that **pose** a significant risk to their health.
- Air pollution - not only a major health risk, but also lead to **damaging impacts on the environment and agricultural crop yields**. → significant economic consequences, affecting economic growth as well as welfare.

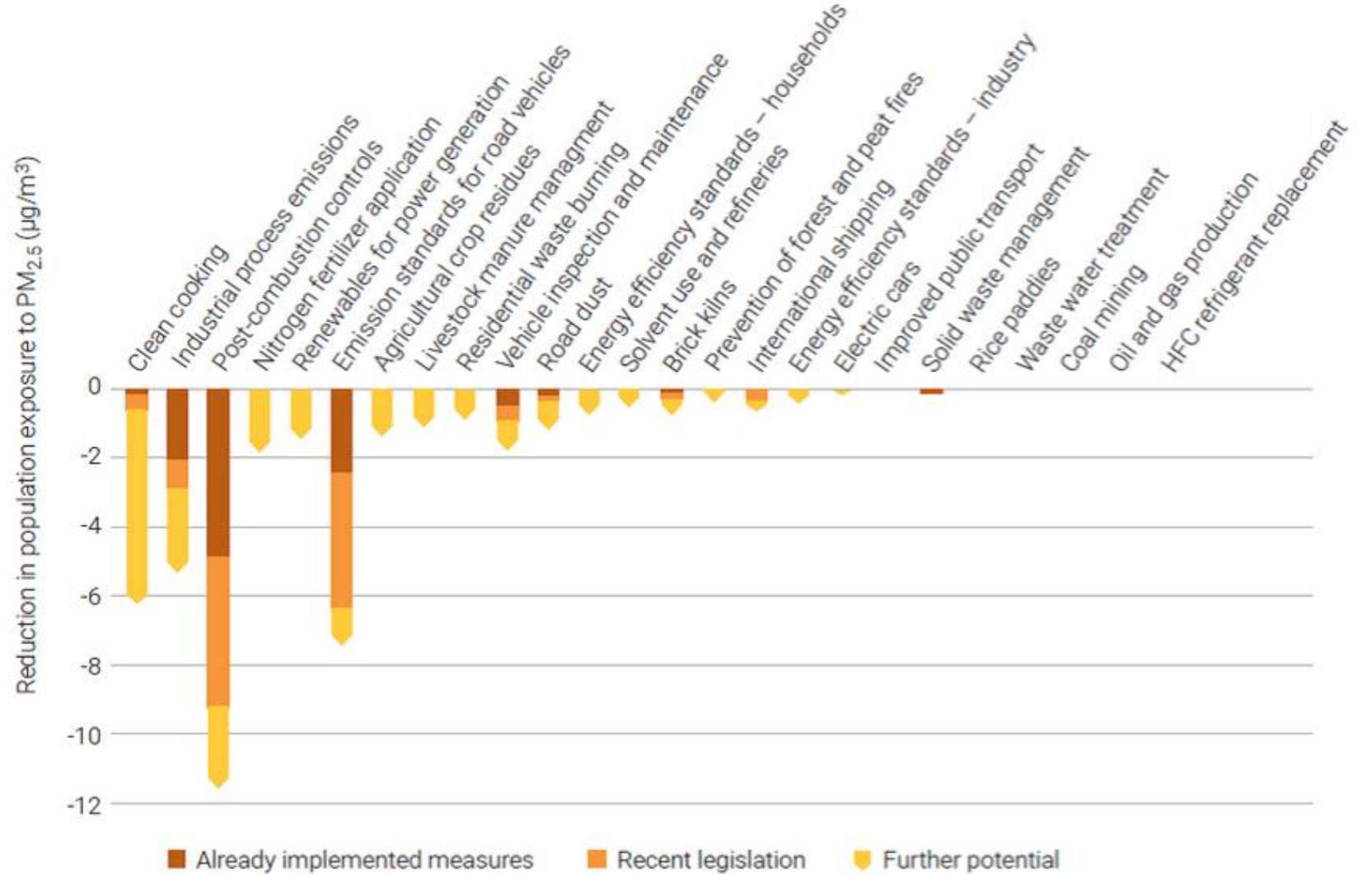
*2.3 billion people in the region are exposed to levels of air pollution several times the WHO guideline for safe air.*

# Air Pollution Case in Asia- Pacific: Sources of air pollutants

The most damaging air pollutants are **PM<sub>2.5</sub>** and **Ground-level Ozone** → Vary by country and linked to many activities. Urban and heavily industrialized areas with high population densities have the highest levels of air pollution.



# Air Pollution Case in Asia-Pacific: Clean Air Measures



IMPACTS ON POPULATION-WEIGHTED EXPOSURE TO PM<sub>2.5</sub> IN 2030 FROM IMPLEMENTATION OF 25 CLEAN AIR MEASURES, RANKED BY FURTHER POTENTIAL

# Air Pollution Case in Asia- Pacific: Clean Air Measures

## Regional application of conventional measures

Post-combustion controls	Introduce state-of-the-art end-of-pipe measures to reduce sulphur dioxide, nitrogen oxides and particulate emissions at power stations and in large-scale industry
Industrial process emissions standards	Introduce advanced emissions standards in industries, e.g., iron and steel plants, cement factories, glass production, chemical industry, etc.
Emissions standards for road vehicles	Strengthen all emissions standards; special focus on regulation of light- and heavy-duty diesel vehicles
Vehicle inspection and maintenance	Enforce mandatory checks and repairs for vehicles
Dust control	Suppress construction and road dust; increase green areas

## Next-stage air quality measures that are not yet major components of clean air policies in many parts of Asia and the Pacific

Agricultural crop residues	Manage agricultural residues, including strict enforcement of bans on open burning
Residential waste burning	Strictly enforce bans on open burning of household waste
Prevention of forest and peatland fires	Prevent forest and peatland fires through improved forest, land and water management and fire prevention strategies
Livestock manure management	Introduce covered storage and efficient application of manures; encourage anaerobic digestion
Nitrogen fertilizer application	Establish efficient application; for urea also use urease inhibitors and/or substitute with, for example, ammonium nitrate
Brick kilns	Improve efficiency and introduce emissions standards
International shipping	Require low-sulphur fuels and control of particulate emissions

# Air Pollution Case in Asia- Pacific: Clean Air Measures (Con't)

## Measures contributing to development priority goals with benefits for air quality

Clean cooking and heating	Use clean fuels – electricity, natural gas, liquefied petroleum gas (LPG) in cities, and LPG and advanced biomass cooking and heating stoves in rural areas; substitution of coal by briquettes
Renewables for power generation	Use incentives to foster extended use of wind, solar and hydro power for electricity generation and phase out the least efficient plants
Energy efficiency for households	Use incentives to improve the energy efficiency of household appliances, buildings, lighting, heating and cooling; encourage roof-top solar installations
Energy efficiency standards for industry	Introduce ambitious energy efficiency standards for industry
Electric vehicles	Promote the use of electric vehicles
Improved public transport	Encourage a shift from private passenger vehicles to public transport
Solid waste management	Encourage centralized waste collection with source separation and treatment, including gas utilization
Rice paddies	Encourage intermittent aeration of continuously flooded paddies
Wastewater treatment	Introduce well-managed two-stage treatment with biogas recovery
Coal mining	Encourage pre-mining recovery of coal mine gas
Oil and gas production	Encourage recovery of associated petroleum gas; stop routine flaring; improve leakage control
Hydrofluorocarbon (HFC) refrigerant replacement	Ensure full compliance with the Kigali Amendment