



CLEAN AIR

**A DOSSIER ON AIR POLLUTION
FOR HEALTH PROFESSIONALS
IN THE SOUTHEAST ASIAN REGION**



SEPTEMBER 2022

This dossier brings together crucial material regarding Air Pollution and Health from various scientific sources in an easy to read format for health professionals.



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Air pollution occurs when gasses, dust particles, fumes, or smoke (or odor) enter the indoor and outdoor environment in a way that makes it harmful to humans, animals, or plants. Examples of pollutants of major public health concern include oxides of nitrogen and sulfur, carbon monoxide, ozone, methane, hydrocarbons, sand or dust particles, and volatile organic compounds that can evaporate and enter the environment.

Household combustion devices, motor vehicles, waste burning, industrial facilities, refineries, coal power plants, and forest fires are common sources of air pollution. According to data from the World Health Organization (WHO), 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.

Some of the same pollution that compromises respiratory health also drives climate change. For example, the burning of fossil fuels (coal, oil, and gas) for electricity, heat, or transportation is a major driver of climate change and the main source of air pollution. Recent [research](#) from Harvard University, in collaboration with the University of Birmingham, the University of Leicester, and University College London, found that “more than 8 million people died in 2018 from fossil fuel pollution, significantly higher than previous research suggested—meaning that air pollution from burning fossil fuels like coal and diesel was responsible for about 1 in 5 deaths worldwide.”

It is not only the deaths from air pollution that is a concern. Air pollution causes daily disruptions in people’s lives from allergies, cold, cough, irritation of the eyes, nose, and throat, headaches, dizziness, fatigue, drive absenteeism from work and school, impaired productivity, and lead to mental health issues.

AIR POLLUTION

A PUBLIC HEALTH CONCERN IN SOUTHEAST ASIAN COUNTRIES



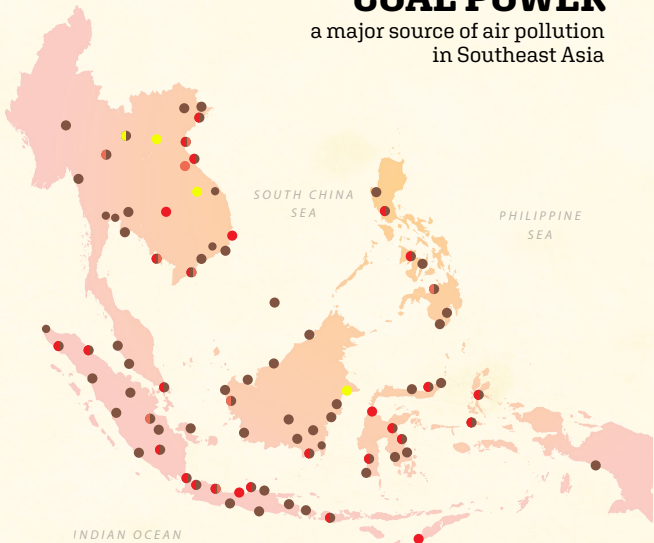
Air pollution is a public health crisis as most countries in Southeast Asia, particularly in urban areas, are experiencing high levels of air pollution exceeding the WHO limits. In Vietnam, [the air quality levels](#) are already at an unhealthy level for sensitive groups of people such as children and elderly adults. Six cities in Myanmar are ranked in the top 3% of the most polluted cities in the world. Similarly, high concentrations of sulfur dioxide pose serious environmental problems in Bangkok. In 2018, [a study](#) by the World Health Organisation reported that there were 45.3 air pollution-related deaths for every 100,000 people in the Philippines; this was the third highest in the world, after China's 81.5 pollution-related deaths and Mongolia's 48.8 deaths per 100,000 people. Over the last two decades, Indonesia has seen dramatic changes in its air quality. From 1998 to 2016, the country went from being one of the cleaner countries in the world to one of the twenty most polluted, as particulate air pollution concentrations increased [171 percent](#). Ninety-one percent of Indonesia's 268 million people live in areas where the annual average particulate pollution level exceeds the WHO guideline. According to the Air Quality Life Index (AQLI), "in the capital Jakarta, home to 11 million people in the city proper, particulate pollution levels are six times the WHO guideline. If this pollution persists, residents would lose 5.5 years of life expectancy if this pollution persists relative to if the air quality complied with the WHO guideline." Air pollution caused by forest fires, biomass, and agricultural burning is also of grave concern, especially for Indonesia, Malaysia, Singapore, and the Philippines. According to [researchers](#), burning biomass contributed to up to 40-60 percent of haze events in the major cities of Southeast Asia between 2003 and 2014.

Air pollution also has a substantial effect on Asian economies, with air pollution estimated by the Organisation for Economic Co-operation and Development (OECD) to account for a reduction of 1% to 2.5% in GDP across different economies in Asia by 2060.

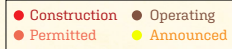
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COAL POWER

a major source of air pollution
in Southeast Asia



Source: <https://globalenergymonitor.org/projects/global-coal-plant-tracker/tracker/>



Access to electricity has a positive effect on the health and well-being of people worldwide. However, the use of coal to generate energy has negative health consequences. There is evidence of coal's impact on human health during every stage of its use for electricity generation – from mining to post-combustion disposal. In particular, coal combustion has been well-studied, with compelling evidence of widespread health effects on the population. When coal is burned, it produces air-borne pollutants of particulate matter, sulfur dioxide, oxides of nitrogen, carbon dioxide, mercury, arsenic, chromium, nickel, manganese, other heavy metals, acid gases (HCL, HF), hydrocarbons (PAHs), and varying levels of uranium and thorium in flyash.

Air pollution produced by coal combustion in power plants can affect the respiratory and cardiovascular systems and cause abnormal neurological development in children, poor growth of the fetus before birth, and can cause cancer. Coal used for heating and cooking indoors generates indoor air pollutants that cause respiratory ailments and cancer. Moreover, coal combustion contributes to climate change, which can harm human health on a global scale.

Most of the **coal plants in Southeast Asia** are in Indonesia [32 GW], Vietnam [19 GW], Malaysia [13 GW], and the Philippines [10 GW] as of 2019.

PEATLAND FIRES

a major source of haze
in the Southeast Asian region



Forest and peatland fires, which occur annually in Indonesia, affect the entire Southeast Asian region and result in extensive environmental destruction and threats to livelihoods. The entire region can experience higher outdoor air pollution levels during haze episodes. Most importantly, smoke-born damages resulting from haze are detrimental to the environment and have irreversible long-term impacts on human health. Peat smoke represents a significant concern due to its adverse health effects, notably respiratory diseases and symptoms. Indonesia's forest and peatland fires are estimated to cause approximately 110,000 premature deaths annually. For example, in 2015, **69 million people in Southeast Asia** were exposed to unhealthy air for nearly two months, with overall economic damage assessed at **US\$16 billion**. During this episode, the Indonesian government **reported** over 500,000 additional cases of respiratory illness. Experts estimated that the increased air pollution exposure caused more than 100,000 deaths across the region.

Effects of Peat Smoke on Health

The fine particles released from peat fires pose the most significant risk to human health. When these particles get into the eyes and lungs, symptoms of irritation such as coughing, wheezing and sore eyes are commonly experienced. These symptoms will become less pronounced as smoke levels decrease and eventually cease. The symptoms are more severe at higher levels and may affect regular activity. In asthmatics, the irritation of the lungs caused by particles released from peat fires may trigger a severe asthma attack. Elevated levels of particulate matter are also known to aggravate pre-existing chronic respiratory and cardiac conditions, increasing the risk of severe health outcomes in affected individuals.

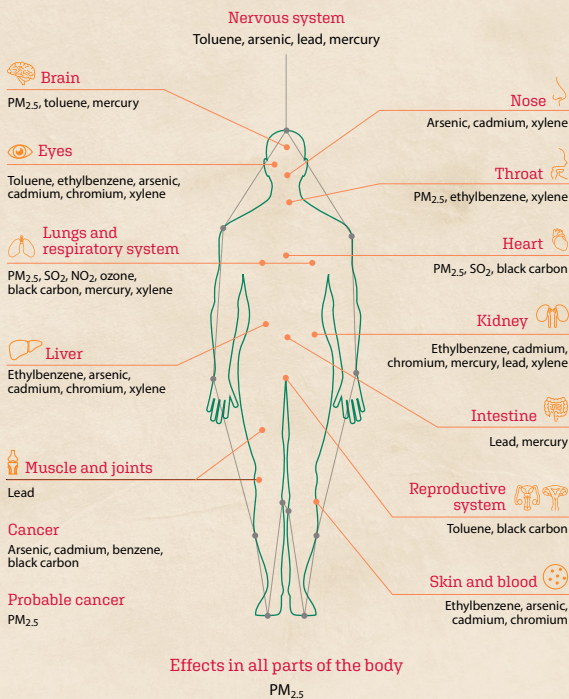


Health voices in the air quality issue are vital. We can encourage the healthcare sector to start reducing air pollution at the source, i.e waste segregation, no tobacco campaign at health care facilities, greenery belt at the hospital, or use of bicycles when going to work. On the other hand, healthcare professionals can take part in policy making by providing their expertise in generating awareness about the ill effects of air pollution and how the healthcare sector can reduce its greenhouse gas emissions without compromising healthcare quality by transitioning to more sustainable alternatives and clean, renewable energy sources.

Dr. Hervi Nuryania Mega Reza
Director of Operation, CahayaQalbu Clinic, Indonesia



WHAT ARE THE HEALTH IMPACTS OF AIR POLLUTION



PARTICULATE MATTER 2.5 (PM_{2.5})

There is a robust association between several adverse health effects and ambient air particulate matter levels. Very small (fine) particles exert disproportionately more adverse health effects than larger particles.

According to the [United States Environmental Protection Agency](#):

"Particles less than 10 micrometers in diameter (PM₁₀) pose a health concern because they can be inhaled into and accumulate in the respiratory system. Particles less than 2.5 micrometers in diameter (PM_{2.5}) are referred to as 'fine' particles and are believed to pose the largest health risks. Because of their small size [less than one-seventh the average width of a human hair], fine particles can lodge deeply into the lungs.

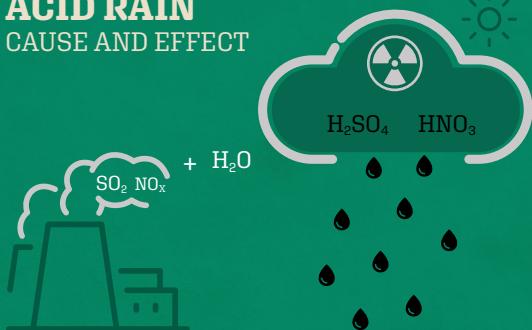
"Health studies have shown a significant association between exposure to fine particles and premature mortality. Other important effects include aggravation of respiratory and cardiovascular disease (as indicated by increased hospital admissions, emergency room visits, absence from school or work, and restricted activity days), lung disease, decreased lung function, asthma attacks, and certain cardiovascular problems such as heart attacks and cardiac arrhythmia. Individuals particularly sensitive to fine particle exposure include older adults, people with heart and lung disease, and children."

SULFUR DIOXIDE

Sulfur dioxide is produced when oil and coal containing sulfur burns. It can cause health issues, especially in people with existing heart or lung conditions. Sulfur dioxide irritates the respiratory tract and increases the risk of tract infections. It causes coughing and mucus secretion and aggravates conditions such as asthma and chronic bronchitis. Sulfur dioxide mixes with water to produce sulfuric acid (known as acid rain) which can impact urban infrastructure, forests, waterbodies, and aquatic life.

ACID RAIN

CAUSE AND EFFECT



Acid Rain is caused by emissions of Sulfur dioxide (SO_2) and Nitrogen oxide (NO_x), which react with water molecules in the atmosphere, producing Sulphuric acid (H_2SO_4) and Nitric acid (HNO_3).

Lowers pH level in waterways, killing marine organisms

Acid deposition has many harmful ecological effects when the pH of most aquatic systems falls below 6 and especially below 5



Damages to man-made structures like buildings and statues is evident with signs of corrosion and erosion



Forests have been impacted by acid rain. It makes trees vulnerable to diseases, extreme weather conditions and insects



3 NITROGEN DIOXIDE

Nitrogen dioxide (NO_2) is one of a group of highly reactive gasses known as oxides of nitrogen or nitrogen oxides (NO_x). Other nitrogen oxides include nitrous acid and nitric acid. NO_2 is used as the indicator for the larger group of nitrogen oxides. NO_2 primarily gets in the air from the burning of fuel. NO_2 forms from emissions from cars, trucks and buses, power plants, and off-road equipment.

Breathing air with a high concentration of NO_2 can irritate airways in the human respiratory system. Such exposures over short periods can aggravate respiratory diseases, particularly asthma, leading to respiratory symptoms (such as coughing, wheezing, or difficulty breathing), hospital admissions, and visits to emergency rooms. Longer exposures to elevated concentrations of NO_2 may contribute to the development of asthma and potentially increase susceptibility to respiratory infections.

Nitrogen dioxide along with other NO_x reacts with other chemicals in the air to form both particulate matter and ozone. Both are also harmful when inhaled due to their effects on the respiratory system.

4 VOLATILE ORGANIC COMPOUNDS (VOCs)

Volatile organic compounds (VOCs) are chemicals that contain carbon and can quickly turn into vapors or gasses. These VOCs can be released by several products or items in everyday life. The simplest way to determine the presence of VOCs in the air is through their distinct odors.

5 HEAVY METALS IN COAL DUST

Trace amounts of toxic heavy metals and other chemicals are naturally infused into the mined coal. These substances are liberated when coal is burnt and ultimately concentrate either in the air, the bottom ash, or the fly ash. Along with an increased risk of cancer from toxic heavy metal exposure, coal dust and ash can affect human development, create lung, and heart problems, cause stomach ailments, and contribute to premature mortality.

Some common toxic heavy metals in coal emissions and their health impacts

Typically, coal power emissions and coal ash consist of arsenic, lead, mercury, selenium, and hexavalent chromium, among other carcinogens and neurotoxins.

Arsenic (As)

Arsenic is a carcinogen in humans. It has been shown to cause skin and lung cancer. Many scientists believe there is no safe level of exposure to a carcinogen. Exposure to arsenic can cause weakness, poor appetite, nausea, vomiting, headache, muscle cramps, and even death. Eye contact can cause irritation, burns, and red, watery eyes. Inhaling arsenic can irritate the nose and throat causing coughing and wheezing. Chronic arsenic exposure has been associated with spontaneous abortions and stillbirths. There is limited evidence that arsenic is a teratogen in animals. Scientists believe that until further testing has been done, it should be treated as a possible teratogen in humans. Repeated skin contact can cause thickened skin and/or patchy areas of darkening and loss of pigment. Some persons may develop white lines on the nails. Long-term exposure can also cause an ulcer or hole in the "bone" (septum) dividing the inner nose, hoarseness, and sore eyes. Arsenic may damage the nervous system causing numbness, "pins and needles," and/or weakness in the hands and feet. Arsenic may damage the liver.

Chromium (Cr)

Contact can irritate and burn the skin and eyes with possible eye damage. Inhaling chromium can irritate the nose and throat causing coughing and wheezing. Exposure to chromium fumes can cause "metal fume fever." This is a flu-like illness with symptoms of metallic taste in the mouth, headache, fever and chills, aches, chest tightness, and cough. The symptoms may be delayed for several hours after exposure and usually last for a day or two. Inhaling chromium can cause a sore and/or a hole in the "bone" (septum) dividing the inner nose, sometimes with bleeding, discharge, and/or formation of a crust. Chromium may cause a skin allergy. If an allergy develops, very low future exposure can cause itching and a skin rash. Chromium may cause an asthma-like allergy. Future exposure can cause asthma attacks with shortness of breath, wheezing, coughing, and/or chest tightness. Prolonged skin contact can cause burns, blisters, and deep ulcers. Chromium may affect the liver and kidneys. Coal ash ponds are known to leach hexavalent chromium, a form of chromium that is extremely toxic at very low doses.

Lead (Pb)

Lead is a neurotoxin and is known to cause low IQ among children. Lead is a probable carcinogen in humans. There is some evidence that lead and lead compounds cause lung, stomach, brain, and kidney cancers in humans and they have been shown to cause kidney cancer in animals. Many scientists believe there is no safe level of exposure to a carcinogen. Lead may be a teratogen in humans since it is a teratogen in animals. It may decrease fertility in males and females and damage the developing fetus and the testes (male reproductive glands). Lead can cause eye irritation, headache, irritability, reduced memory, disturbed sleep, and mood and personality changes. Exposure can cause upset stomach, poor appetite, weakness, and fatigue. Repeated exposure to lead can cause *lead poisoning*. Symptoms include metallic taste, poor appetite, weight loss, colic, nausea, vomiting, and muscle cramps. Higher levels can cause muscle and joint pain, and weakness. High or repeated exposure may damage the nerves causing weakness, "pins and needles," and poor coordination in the arms and legs. Lead exposure increases the risk of high blood pressure. Lead may cause kidney and brain damage, and damage to the blood cells causing anemia. Repeated exposure causes Lead to accumulate in the body. It can take years for the body to get rid of excess Lead.

Mercury (Hg)

Coal ash is known to leach mercury; the nervous system is very sensitive to all forms of mercury. Methylmercury and metallic mercury vapors are more harmful than other forms because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems. Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea, vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation. Very young children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and may accumulate there, possibly causing damage to the developing nervous system. It can also pass to a nursing infant through breast milk. However, the benefits of breastfeeding may be greater than the possible adverse effects of mercury in breast milk. Mercury's harmful effects that may affect the fetus include brain damage, mental retardation, incoordination, blindness, seizures, and inability to speak. Children poisoned by mercury may develop problems in their nervous and digestive systems, and kidney damage.

Selenium (Se)

Selenium is considered a signature pollutant of coal power plants. Breathing selenium can irritate the nose, throat, and lungs causing coughing, wheezing, and/or shortness of breath. Contact can irritate and burn the skin and eyes. Selenium can cause nausea, vomiting, diarrhea, abdominal pain, and headache. There is limited evidence that selenium may decrease fertility in females. High or repeated exposure can cause a skin rash (dermatitis). Repeated exposure can cause a garlic odor on the breath, metallic taste, irritability, fatigue, increased dental cavities, loss of nails and hair, and mood change (depression).

“
Let us work together for clean air, so that our children, their children, their children's children can breathe fresh, healthy air. I pray that we don't come to a point in the future where each one of us will be carrying oxygen tanks to survive and line up for a refill. Let us do our share to maintain a breathable atmosphere with clean air.

Dr. Sherjan Kalim
Chair, Sustainability Committee,
Cotabato Regional and Medical Center, Philippines



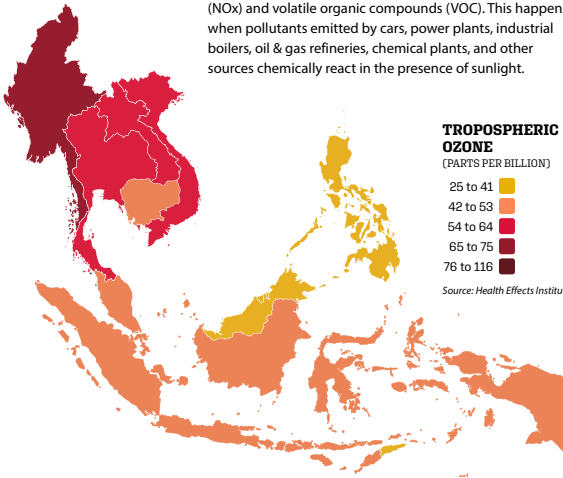
5 BLACK CARBON

Black carbon is the sooty black material emitted from gas and diesel engines, coal-fired power plants, and other sources that burn fossil fuel. It comprises a significant portion of particulate matter or PM, which is an air pollutant. Black carbon is a global environmental problem that has negative implications for both human health and our climate. Inhalation of black carbon is associated with health problems, including respiratory and cardiovascular disease, cancer, and even birth defects. And because of its ability to absorb light as heat, it also contributes to climate change. For example, as black carbon warms the air, rapid changes in patterns of rain and clouds can occur.

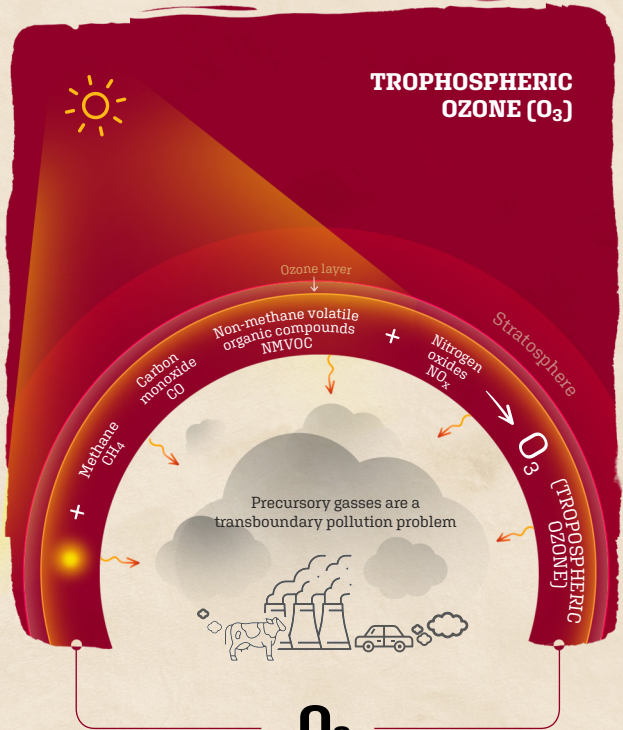
6 TROPOSPHERIC OZONE

Ozone can be “good” or “bad” for health and the environment, depending on where it is found in the atmosphere. Stratospheric ozone (found 32 kms above ground) is “good” because it protects living things from ultraviolet radiation from the sun. Ground-level ozone, also known as Tropospheric ozone, is “bad” because it is a greenhouse gas and air pollutant, which is harmful to human and ecosystem health. It can trigger a variety of health problems, particularly for children, the elderly, and people of all ages who have lung diseases such as asthma. It is also a major component of urban smog.

Ground-level ozone is not emitted directly into the air but is created by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOC). This happens when pollutants emitted by cars, power plants, industrial boilers, oil & gas refineries, chemical plants, and other sources chemically react in the presence of sunlight.



TROPOSPHERIC OZONE (O₃)



is known as a 'secondary' pollutant because **it is not emitted directly**, but instead forms when precursor gasses react in the presence of sunlight



Warms the atmosphere



Damages plants and affects cultural production by reducing:

- health and productivity of crops
- plants ability to sequester carbon
- photosynthesis



O₃ pollution causes **over 150000 premature deaths every year, and millions more chronic diseases, particularly in children and older adult**

Source: Climate & Clean Air Coalition



METHANE AND HEALTH

Methane is a colorless, odorless, and highly flammable gas, which is the primary component of natural gas, biogas, and marsh gas. Depending on its origin it may be referred to as either of these. It is a powerful greenhouse gas emitted by human activities such as oil and gas production, waste landfills, and the raising of livestock, as well as by natural sources such as wetlands and volcanoes.

Methane is used for domestic cooking and heating, in energy generation, and in industry to refine petrochemicals and to produce plastics, fertilizers, anti-freeze, and fabrics.

Methane is present in the atmosphere (and its [levels are increasing](#)); therefore, the public may be exposed to very low levels when breathing in the air. Low-level exposure to methane can also occur from the use of natural gas products or gas appliances in the home. Low-level exposure would not be expected to cause adverse health effects.

Occupational exposure to methane may occur in the workplace where it is extracted, produced, or used. Exposure to high levels of methane can reduce the amount of oxygen breathed from the air. This can result in mood changes, slurred speech, vision problems, memory loss, nausea, vomiting, facial flushing, and headache. In severe cases, there may be changes in breathing and heart rate, balance problems, numbness, and unconsciousness. If exposure to methane is large or continues for a longer period, it can result in death.

[Methane is a key precursor gas](#) of the harmful air pollutant, tropospheric ozone. Globally, increased methane emissions are responsible for half of the observed [rise in tropospheric ozone levels](#). While low-level methane does not cause direct harm to human health or crop production, ozone is responsible for about [1 million premature respiratory deaths](#) globally. Methane is responsible for about half of these deaths.

Methane is a short-lived climate pollutant with an atmospheric lifetime of around 12 years. While its lifetime in the atmosphere is much shorter than carbon dioxide (CO₂), it is much more efficient at trapping radiation. Per unit of mass, the impact of methane on climate change over 20 years is 86 times greater than CO₂; over a 100-year period, it is 28 times greater. Data from the Intergovernmental Panel on Climate Change suggests that more than half of the warming we experience over the next two decades due to current emissions will be from the continued release of methane and other short-lived pollutants into the atmosphere.

Climate change has many widespread impacts, including an increased risk of harm to public health from extreme weather events such as stronger hurricanes, droughts, and heat waves. Additionally, warmer weather extends the lives and ranges of mosquitos and ticks, expanding their ability to spread vector-borne diseases such as Lyme disease, dengue, zika, and chikungunya.

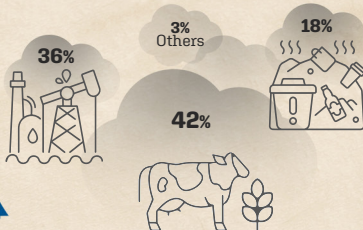


METHANE (CH_4)

Lifetime in atmosphere:
12 years

Precursory gasses create greenhouse effect,
trap the heat from the sun

Atmosphere



Atmosphere

Methane emissions

caused by human activities are one of the most significant drivers of climate change.

Methane is also the main precursor of tropospheric ozone, a powerful greenhouse gas and pollutant.



Responsible for 40% of warming since the industrial revolution

86x

times more powerful than CO_2 over a 20-year period

Causes roughly **50% of the 1+ millions deaths** due to ozone air pollution



- Respiratory diseases
- Heart disease
- Damaged airways and lung tissues



Upto 15% annual yield losses of wheat, rice and maize



WHO IS MOST AT RISK

While air pollution is a problem that affects everyone, some groups of people are more vulnerable than others. These groups are multiple and may be overlapping; they include **children, pregnant women, fetus, elderly, people living in poverty, people with respiratory ailments (asthma and chronic bronchitis), and people with cardiovascular disease or diabetes.**

When ambient air quality standards are set, special attention must be paid to ensure that the established levels are stringent enough to protect these vulnerable populations and not only those who are fully grown and in good health. vulnerable populations and not only those who are fully grown and in good health.

HOW CAN HEALTHCARE PROFESSIONALS ADVOCATE FOR CLEAN AIR?

Health professionals are usually the most trusted voices in their communities. Country leadership looks to them for advice, families confide in them, and citizens want to adhere to what the country's leading medical professionals have to say about their health. When doctors, nurses, hospitals, and health systems take public stances on air pollution and climate change, it can reframe these issues as questions of public health and help move public opinion and policy. The voices of health workers are critical in promoting actions that address air pollution and its impacts on health. Health care professionals can make a big difference — with their patients, in their practices, and in their health care institutions.



ON THE ISSUE OF AIR POLLUTION, HEALTH PROFESSIONALS CAN:

1. Highlight the health impacts of pollution and humanize the issue in the media, with the public and policymakers or with other colleagues and within professional medical associations.
2. Generate local health evidence from their clinics and communities on the health impacts of air pollution.
3. Provide health advisories for protecting their patients and the vulnerable population from the dangers of air pollution.
4. Highlight the health co-benefits of clean air and advocate for actions that promote clean air to their patients, communities, and policymakers.
5. Advocate for robust health adaptation and mitigation plans to combat the adverse health impacts of poor air quality, especially on the economically disadvantaged and marginalized populations.
6. Advocate for a just transition from dependence on fossil fuels to an economy that values health and is based on clean, renewable, healthy energy.





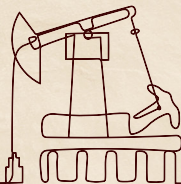
A GLOBAL CALL FOR HEALTH CARE PROFESSIONALS ON THE FOSSIL FUEL NON-PROLIFERATION TREATY

The [Healthy Climate Prescription](#) letter that health professionals signed in the lead-up to COP26 called on nations to deliver a rapid and just transition away from fossil fuels. Now, there is an opportunity to get involved in an important initiative that supports that goal - an international treaty among governments committing to stop the expansion of fossil fuel projects and to phase out existing projects.

A global effort is underway to establish a Fossil Fuel Non-Proliferation Treaty, and the health community is ready to add their support to this call. Health organizations are joining academics, scientists, Nobel laureates, cities, faith leaders, and young people in endorsing the call for a treaty to stop fossil fuels with a new letter of support specifically from the health community.

Like the Framework Convention on Tobacco Control, the proposed Fossil Fuel Non-Proliferation Treaty would aim to be an evidence-based international agreement to control a category of substances well-known to be harmful to human health, in order to ensure the right of all people to the highest standard of health.

The letter for endorsement can be found at:
<https://fossilfueltreaty.org/health-letter>



AIR POLLUTION-RELATED POLICY, LAWS, AND PROGRAMS OVERVIEW FOR INDONESIA

Air pollution is a significant issue in Indonesia, especially in urban areas like Jakarta, Bandung, and Bogor. The country's leading sources of dirty air include motor vehicles, dust, burning of biomass, peatland and forest fires, secondhand tobacco smoke, and coal-fired energy generation.

Evidence shared above reiterates that air pollution is harmful to people's health. According to a 2015 Harvard University and Greenpeace Southeast Asia research, coal plants in Indonesia are responsible for an estimated 7,100 premature deaths yearly. While deaths attributable to outdoor air pollution include 36,527 cases of stroke, 16,781 died from ischemic heart disease, and 4,951 from lung cancer. Jakarta alone is surrounded by giant coal-fired power plants stationed in [Banten](#) and [West Java](#).

Table 1: Emission standards for coal-based power plants in major countries

Unlike Indonesia, most major countries have adopted very tight emission standards for coal-based plants.

	PM	SO ₂		NO _x		Mercury
		New plants	Existing plants	New plants	Existing plants	
EU	50–100	200	400	200 (after 2015)	500 (after 2015)	0.03 (Germany)
US	22.5	160 (after 2005)	160 (1997–2005);	117	117 (after 2005); 160 (1997–2005);	0.001–0.006
China	30	100	200; 400*	100	100 (2004–11); 200 (before 2004);	0.03
India	100 (till 2003); 50 (2004–16); 30	100	600 (<500 MW); 200 (> = 500 MW)	100	600 (till 2003); 300 (2004–16)	0.03
Indonesia	150–100	750	750	850	750	None

Unit: mg/Nm³

*SO₂ standards of 400 mg/m³ for your provinces with high sulphur coal

Source: World Resource Institute Asia. Environmental Science and Technology.

Air Quality Management Laws, Policies, and Programs in Indonesia

Management of Mobile Sources

- 1999 Ministry of Energy and Mineral Resources Decree (No. 1585/K/32/MPE) – required the phase-out of lead in gasoline for the whole country by 1 January 2003, with unleaded gasoline made available to residents of greater Jakarta from July 2001.
- 2001 Governor of DKI Jakarta Decree No. 1041 – In Jakarta, the standards for in-use vehicles are stricter than those of the national Government. The legislation was implemented to support the development of the inspection and maintenance system for private passenger vehicles in Jakarta.
- Local Act No. 2/2005 – The province of Jakarta is one of the first provinces to issue a bylaw to prevent, control, monitor, and mitigate air pollution. Jakarta issued a series of implementing regulations that include: Gas Fuel Usage for Public Transport and Government Operational Vehicles (Governor Regulation No. 141/2007), Vehicle Emission Test and Vehicle Maintenance (Governor Regulation No. 92/2007) and replaced by Governor Regulation No. 66/2020, and Non-Smoking Areas (Governor Regulation No. 75/2005 and No. 88/2010).
- Act No. 22/2009 – replaces Act No. 14/1992 on Traffic and Road Transportation and is the legal basis for the management of land transportation, including the control of vehicle emissions.
- Various emission standards for motor vehicles by the Ministry of Environment and Forestry (MoEF), including, old-type motor vehicles (MoEF Decision 5/2006), new type and in-production small two-wheeler and three-wheeler vehicles (MoEF Regulation 4/2009), new type and in-production two-wheeler vehicles (MoEF Regulation 23/2012), and new type and in-production four-wheeler or more vehicles (MoEF Regulation 20/2017)
- Minister of Energy and Mineral Resource Regulation No 19/2010 on Utilizing CNG for Transportation – The regulation issue to solve the problem of limited CNG supply for transportation, especially for BRT Trans Jakarta.
- Minister of Energy and Mineral Resource Decree No 2932.K/12/MEM/2010 on Retail Price of CNG for Transportation – the Decree was issued to solve the uncertainty price of CNG for transportation, especially for BRT Trans Jakarta about the retail price for the industry. CNG retail price for the sector is higher than transportation because it follows the price of diesel fuel for the sector as non-subsidy fuel (higher price). Based on this situation, CNG retailers are just willing to sell CNG to industries that target to improve their profit.
- Local Act No 5/2014 – on Transportation which regulates better traffic and transport management, includes the opportunity to use environmentally friendly fuels.

Management of Stationary Sources

- Act No. 5/1984 on Industrial Activities – prohibits activities that damage the quality of the environment and ecosystem. PP No. 13/1995 on Industrial Business License, one of the implementing regulations of this Act, binds industry to comply with environmental regulations as one of the requirements to obtain a business license.
- PP No. 27/1999 concerning Environmental Impact Analysis – requires the proponents of activities to prepare and implement an environmental management and monitoring plan.
- Act No. 30/2007 concerning Energy – requires energy management to be based on the principle of sustainability and environmental protection, among others. This Act regulates energy resilience, new and renewable energy, energy prices, and the establishment of the National Energy Council (NEC)¹. This Act also stipulates that energy conservation is given incentives, while energy dissipation is imposed disincentives.
- Presidential Regulation No. 5/2006 concerning National Energy Policy – states that the contribution of fossil oil as a source of energy is targeted to be reduced from 52% in the year 2003 to 26.2% in the year 2025 of the total energy demand, as well as targets for other sources of energy.
- Presidential Instruction No. 10/2005 concerning Energy Conservation and Regulation of the Ministry of Energy and Mineral Resources No. 31/2005 on Energy Efficiency – requires government agencies to undertake energy conservation in offices, office equipment, and transportation, and for industries to undertake energy audits and promote the use of energy-saving products or technology.
- MoE Regulation No. 21/2008 concerning Emission Standard for Thermal Power Generation Activities requires thermal power plants to install a Continuous Emission Monitoring System (CEMS) and prepare an emission inventory for GHGs and air pollutants such as SO₂, NO_x and particulates emitted. This regulation was revised by MoEF Regulation 15/2019 which included the mercury standard for the coal plants.

In 2015, Indonesia ratified the ASEAN Agreement on Transboundary Haze Pollution. The Agreement is the first regional arrangement in the world that binds a group of contiguous states to tackle transboundary haze pollution resulting from land and forest fires. Despite these regulations, the National Ambient Air Quality Standards (NAAQS) of Indonesia are not aligned with the 2021 WHO Air Quality Guidelines.

In 2021 the average PM_{2.5} concentration in Indonesia's air quality was 6.9 times higher than the WHO air quality guideline value. The emission standards for coal-fired power plants must be reviewed and reinforced to protect public health. [Modelling from Greenpeace Indonesia](#) shows that with the loosest emissions standards for coal plants that were enacted in 2019, there will be six to seven thousand premature deaths due to the emissions from the coal plants surrounding the Jakarta area. Emission standards of SO₂ and NO_x on 100 mg/m³ and PM_{2.5} on 10mg/m³ will give a health benefit on a far reduced estimated impact, down below one thousand premature death. Most importantly, the government must rapidly divest from coal-fired energy sources and other fossil fuels and transition towards healthier choices.

AIR POLLUTION-RELATED POLICY, LAWS, AND PROGRAMS OVERVIEW FOR THE PHILIPPINES

Three decades since the passage of the country's Clean Air Act, air pollutant emissions from mobile, stationary, and area sources have increased and continued to worsen air quality in the Philippines. Meanwhile, clean air standards and policies that control emissions from each source have fallen behind international best practices, and some critical clean air strategies included in the law have not been fully implemented.

In 2021, the average PM2.5 concentration in the Philippines was three times higher than the new WHO standards. Pollution from PM2.5 and NO2 is linked to approximately 66,000 premature deaths and costs USD87.6 billion (PHP4.5 trillion) every year.

In the 2019 study conducted by the Centre for Research on Energy and Clean Air (CREA), pollution from coal was responsible for an estimated 640 air pollution-related deaths in 2019, as well as 1,300 new cases of childhood asthma, 149,000 days of work absence (sick leave) and 240 preterm births. Without more robust emission standards, the cumulative impact of these plants during the next decade would be over 178,000 exacerbated cases of non-communicable diseases and lower respiratory infections, 7,000 premature deaths, and an economic cost of approximately USD2 billion (PHP103 billion) as a result of lower life expectancy, economic output, and quality of life and increased healthcare cost.

Raising the country's emission limits to the current WHO standards is an urgent priority. In addition, investing in and strengthening our air quality monitoring is necessary. Access to real-time air quality monitoring to measure air pollutants that are dangerous to human health is vital for assessing the effectiveness of interventions.



Air Quality Management Laws, Policies, and Programs in the Philippines

Following are some of the relevant laws and policies of the Philippines on air quality

- The Philippine Clean Air Act of 1999 or the RA8749 is the legislation that regulates and maintains air quality in the Philippines. The law provides for a "comprehensive air quality management policy and program which aims to achieve and maintain healthy air for all Filipinos." implementation of the Act is a multi-sectoral undertaking to be spearheaded by the Environmental Management Bureau (EMB) of the Department of Environment and Natural Resources (DENR). Among others, they are tasked with revising air pollution control techniques, reviewing emission standards, and having the right to enter or access any premises to inspect any pollution or waste source, control device, monitoring equipment or method, and test any emission.
- Executive Order No. 489 - The Inter-Agency Committee on Environmental Health was formed, spearheaded by the DOH with DENR as its vice-chair. Part of its functions is to formulate policies, promulgate guidelines, and develop programs for environmental health protection, including those around air quality and air pollution.
- DENR Administrative Order (AO) No. 2002-23 - Provides guidelines on the management and operations of the Air Quality Management Fund.
- DENR Memorandum Circular (MC_ No. 2005-13 - Provides guidelines for the Designation of Attainment and Nonattainment Areas in an Airshed. The designation of attainment and nonattainment areas shall be based on monitoring data collected using the reference methods and other equivalent methods approved by the Bureau in Part II (National Ambient Air Quality Guidelines) and/ or other relevant information, including meteorological data and data covering existing nearby sources.
- DENR AO No. 2007-22 - Establishes guidelines for Continuous Emission Monitoring Systems (CEMS) for stationary sources and allows the use of parametric or predictive methods approved by EMB sets criteria or specifications for when CEMS is required.
- DENR-DTI-DOTC Joint AO No. 2007-01 - Amended guidelines and procedure for the monitoring of accredited and authorized private emission testing centers (PETC) and LTO emission testing activities; provides a schedule of fines for PETC accreditation violations.
- EMB MC No. 2007-003 - Sets the policies for permitting and compliance of industrial facilities; outlines allowing procedure and policy on compliance testing; circular is addressed to all EMB Regional Directors and EMB Division Chiefs.
- EMB MC No. 2008-005 - Air emission control techniques for industrial processes.

- DENR AO No. 2010-06 - Sets emission standards for source-specific air pollutants applicable to co-processing of alternative fuels and raw materials for clinker for cement production
- DENR AO No. 2010-23 - Revised Emission Standards for motor vehicles equipped with compression-ignition and spark-ignition engines, which applies to all new and in-use motor vehicles equipped with spark-ignition and compression-ignition engines for purposes of registration. It also revised Annexes B and C of IRR. Supersedes DENR A.O. 2003-51, and DENR A.O. 2007-27.
- DENR AO No. 2013-13 - Sets standard values in evaluating outdoor air quality in a surrounding environment (ambient air). Sets the Provisional National Ambient Air Quality Guideline Value (NAAQGV) for PM_{2.5}; value upgrades effective January 1, 2016, later modified by DAO 2020-14.
- DENR AO No. 2013-25 - Sets a ban on importation of Ozone Depleting Substances and provides for phaseout schedule and control of the importation of Ozone Depleting Substances; includes a list of groups of controlled substances.
- DENR AO No. 2015-04 - Sets emission limits/ standards effective July 01, 2015, for vehicles loaded with EURO IV fuel. Provides comparative quality of Euro IV and Euro II fuel.
- DENR AO No. 2016-23 - Effective July 01, 2016, all new vehicles equipped with Euro 4 engines before issuance of Certificate of Conformity should comply with the annexed UN Regulation 83-05B and 49-04.
- DENR AO No. 2017-14 - Establishes an online information database system for monitoring of Environmental Compliance Certificate and Environmental Management Plan; requires all Environmentally Critical Projects with individual air emission equipment to transmit data from its CEMS to EMB online information data system; provides fines for failure to communicate real-time images of stack emission from CCTV to the EMB server; provides penalties for incomplete online reporting of air pollution parameters data (at least 75% of captured data must be submitted online).
- Land Transportation Office (LTO) MC No. 2017-2078 - The Euro 4 emission standards shall be implemented starting 02 January 2018 for new vehicles introduced in the Philippines. Euro 2 compliant vehicles that issued their respective Certificate of Stock Report until 31 December 2017 but have not yet sold in the market shall still be accepted for initial registration.
- DENR AO No. 2020-14 - Establishes Air Quality Index breakpoints, describing six air quality levels for PM_{2.5} and the equivalent cautionary statements for the public. Further amends the guideline values for PM_{2.5}.

AIR POLLUTION: A REGIONAL PROBLEM THAT NEEDS REGIONAL SOLUTIONS

Air pollution knows no borders. Management of air pollution sources, particularly those which affect territories over thousands of kilometers, require high levels of coordination and cooperation among several institutions across states and countries. In other words, we need to evolve a new framework that focuses on reducing air pollution in an 'airshed', i.e., the entire area over which the pollutants disperse due to meteorological and geographical factors. The concept is very similar to a 'watershed', an area of land that drains all the streams and rainfall into a common outlet like a river.

In an airshed approach, institutions in different jurisdictions would need to coordinate reductions in air emissions from all sources including industry, energy, vehicular, and residential sources. Formal coordination mechanisms through working groups and advisory committees between local, regional, state, and central authorities can provide pathways to effective regulatory and scientific cooperation across jurisdictions and sectors. The key is also to build trust and dialogue to achieve compliance with regulations and respond to political demands.

In Southeast Asia, particularly in Malaysia, Singapore, Brunei, Thailand, Philippines, and Indonesia, transboundary haze pollution occurs every year, resulting in numerous ecological, economic, and health impacts. This recurring regional crisis spurred affected nations to create the ASEAN Agreement on Transboundary Haze Pollution (AATHP) in 2002 "to prevent and monitor transboundary haze pollution due to land and/ or forest fires, through concerted national efforts and intensified regional and international cooperation. "The [Roadmap](#) on ASEAN Cooperation towards Transboundary Haze Pollution Control (AATHP) with Means of Implementation was then developed 14 years after to further operationalize the implementation of the AATHP, with a goal "to achieve a Haze-Free ASEAN by 2020." However, the AATHP has failed to achieve that goal, primarily due to the constraints brought about by the commitment to the ASEAN Way, which hampers an effective regional response to the crisis. Unless this is addressed and without an effective region-wide solution, the yearly transboundary haze will continue in Southeast Asia.



WHAT SHOULD THE GOVERNMENTS OF SOUTHEAST ASIAN REGIONS DO?

National level:

- ✓ Invest in increasing air quality monitoring capacity and disclosing data to the public about the health impacts of the air quality in the form of health advisories.
- ✓ Urgently revise their existing air quality standards and align them with the WHO guidelines of 2021, putting public health at the center of the standard setting process.
- ✓ Invest in policies and mechanisms to ensure enforcement of its air quality standards.
- ✓ Set stringent emission standards for refineries, industries, transportation, etc.
- ✓ Have robust health adaptation and mitigation plans to combat the adverse health impacts of poor air quality.
- ✓ Commit to phasing out of fossil fuels and invest in low carbon and healthy sources of energy options.

Regional level:

- ✓ Recognize that air pollution knows no boundaries and that there is a need for urgent cross border collaboration.
- ✓ Set up effective mechanisms to ensure regional collaboration, exchange of information, data, policies, and action to strategically tackle the air pollution and health crisis.
- ✓ Commit to phasing out of fossil fuels and invest in low carbon and healthy sources of energy options.





Health Care Without Harm (HCWH) works to transform health care worldwide so that it reduces its environmental footprint, becomes a community anchor for sustainability and a leader in the global movement for environmental health and justice.

The Health Care Without Harm Global Network is composed of regional offices in Europe, South East Asia, and the United States; a Latin America regional team and a global secretariat. Strategic partner organizations represent us in Australia, Brazil, China, India, Nepal and South Africa.

Health Care Without Harm and its partners also lead Global Green and Healthy Hospitals, a worldwide network of hospitals and health systems with more than 1,500 members in 75 countries, representing the interests of over 60,000 hospitals and health centers.

We also work in partnership with international organizations, including the World Health Organization (WHO), United Nations Development Program (UNDP), International Federation of Medical Students Associations (IFMSA), Global Climate and Health Alliance (GCHA), and World Federation of Public Health Associations (WFPHA).