



accenture



A Brighter Future Starts with Clean Air

Empowering Youth to Act for Better Air Quality

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Introduction to Biru School Alliance

Biru School Alliance (BSA) is an educational and collective action program designed to raise awareness about air pollution and its impact on health—particularly for children.

The program aims to build an educational ecosystem that supports clean air solutions by engaging parents, teachers, students, and school staff in the Greater Jakarta area. Biru School Alliance is a collaboration between Bicara Udara and Accenture Indonesia.

Running from January to September 2025, BSA offers a holistic approach by combining interactive educational tools with creative activities that actively involve the school community. Through this program, schools are empowered to become agents of change—promoting healthier lifestyles and advocating for policies that support cleaner air.

Get to Know Us!



Accenture is a global multinational professional services company originating in the United States and headquartered in Dublin, Ireland, that specializes in information technology (IT) services and management consulting.



Bicara Udara is a non-profit organization founded by mothers concerned about the impact of air pollution on children's health and future. With over 87,000 direct participants and a digital reach of nearly 2.8 million, Bicara Udara drives public education through Biru Talks (public discussion platform), Biru Voices (ambassadors program), and the Biru School Alliance (school program).

Bicara Udara also actively advocates for clean air policies—engaging policymakers, convening multi-sectoral organizations, and contributing to national efforts such as the Ministry of Health's Committee for Combating Respiratory Diseases and Air Pollution.

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The Importance of Learning About Air Pollution

Learning about air pollution is crucial for secondary and senior high school students as it connects science, social science, economics, and entrepreneurship, offering valuable interdisciplinary knowledge that prepares them for real-world challenges.

Understanding the science behind air pollution equips students with skills to analyze data and develop innovative solutions, which are highly sought after in fields like environmental science and engineering in college. Exploring the social and economic impacts fosters critical thinking and empathy, helping students understand how policies and societal behavior shape environmental outcomes.

Additionally, developing entrepreneurial ideas to combat air pollution nurtures creativity and problem-solving skills, essential for future careers in sustainability and business. By learning about air pollution, students not only contribute to a cleaner, healthier planet but also gain a competitive edge in university applications and career paths focused on addressing global environmental challenges.

Subject	Learning Output	Knowledge Partner
STEM	Understand the scientific causes, types, and effects of air pollution. Develop skills to measure and analyze air quality using tools like AQI and sensors.	Nafas Indonesia, KlinAir, Perhimpunan Dokter Paru Indonesia
Social Science	Analyze the social and cultural impacts of air pollution on communities, especially vulnerable populations. Explore policy interventions and governance frameworks.	World Resources Indonesia, Vital Strategies, Biru Voices

Economics	Evaluate the economic costs of air pollution, including healthcare and productivity losses. Propose market-based solutions such as carbon trading and green technology.	World Resources Indonesia, Academician
Entrepreneurship	Develop innovative solutions to air pollution problems through green technologies. Design and present sustainable business models for clean air initiatives.	Nafas Indonesia
Civic Education	Promote awareness and advocacy for air quality improvements. Engage in campaigns to encourage behavioral changes and policy support for clean air.	Bicara Udara

Program Objectives

for Secondary and Senior High School Students in the Biru School Alliance



1. Understand the Science of Air Pollution

- ◇ Equip students with knowledge about the causes, types, and effects of air pollution on health, ecosystems, and the climate, fostering a scientific understanding of clean air solutions.

2. Promote Awareness and Advocacy

- ◇ Encourage students to raise awareness within their schools and communities about the importance of clean air by participating in campaigns, workshops, and educational activities.

3. Empower Sustainable Action

- ◇ Enable students to design and implement actionable solutions to reduce air pollution, including adopting sustainable lifestyles, advocating for policy changes, and leading community initiatives.

4. Foster Collaborative Problem-Solving Skills

- ◇ Develop teamwork and leadership skills by involving students in collaborative projects with peers, teachers, and parents to address local air pollution challenges and promote long-term sustainability.

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A Brighter Future Starts with Clean Air

Empowering Youth to Act for Better Air Quality



Unit 1

Understanding Air Pollution

Learning Objectives

Students can analyze air pollution conditions globally and locally, air pollution types and sources, their impacts, and explore the mitigation strategies, including the influencing factors driving air pollution improvement.



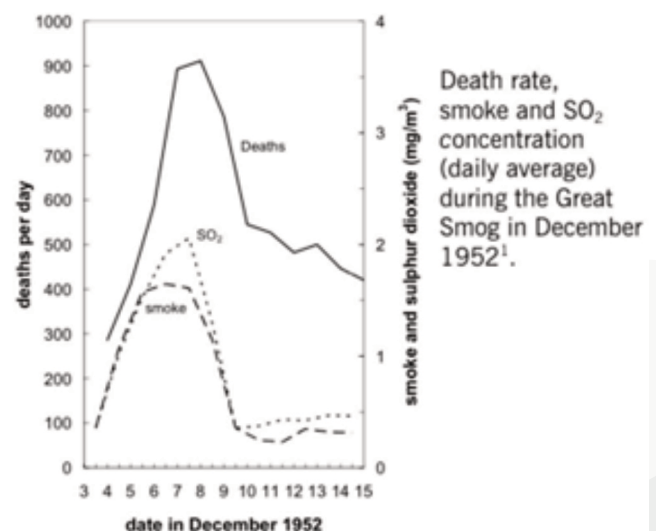
1. Global Perspectives

1.1. United Kingdom (UK): Have you heard about London Smog?

The Great Smog in London happened in December 1952. It was the most significant between 1948 and 1962 due to the rapid urbanisation, industrialization, and fuel use change, e.g., from wood to coal. The smoke made it so people couldn't see their own feet. It took 12 hours for people to get respiratory problems shortly after the beginning of the smoke.



Don't worry about the graph! Focus on the increasing dashed lines and thick lines. It means as days go by in early December, the more the smoke increased, the more deaths were recorded. The health effects of the smoke were devastating, high public concerns triggered the Clean Air Acts of 1956 and 1968. Thus, since the 1960s—the decline in heavy industry, location of high-stacks power stations outside cities, and burning of cleaner fuels has led to ~90% decrease in national average smoke. Today, the United Kingdom, including London, has more than 1,600 monitoring sites in total to evaluate the condition of the pollution.



1.2. United States (US): The United States also has the same problem!

Los Angeles became the first city in the U.S. to experience bad air pollution in the 1940s. A bowl-like area made it easy for the smoke from industry and transportation to accumulate. In Pennsylvania, persistent six days of bad air occurred in 1948 due to the trapped movement of smoke supported by a layer of heat in the atmosphere, a temperature inversion. It made more than 7000 people seek medical treatment. They also got the hanging laundry dirtier than after washing because of the soot. It caused public protest to stop industry polluting the air.



CREDIT: Courtesy of
The Western Reserve Historical Society
Cleveland, Ohio

Source: Cleveland Department of Public Health

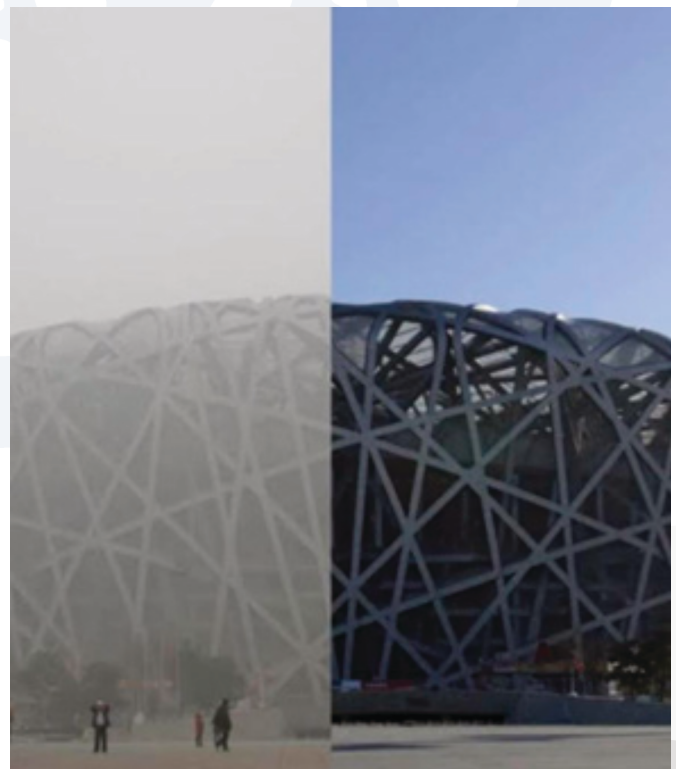
Bad air made the birds lose their feathers, the tree leaves dried, and the rains turned to acid rain. But not long after in 1963, the Clean Air Act marked a significant change in the U.S. air pollution control program. It acknowledged the problem expanded beyond the boundaries,

not merely a local or state jurisdiction issue. A national air quality standard published as a recommendation. The changes of the Clean Air Act in 1990 intensified the air quality efforts. It took 27 years, 1995–2022, for the annual U.S. emissions levels to have decreased over 90%.

1.3. Asia: Wait, Asia has a similar air pollution issue too?

In the 1970s, China started its environmental protection for industrial pollution control. However, China still suffered from deteriorated air as they pushed for “China Speed” for rapid economic and social development in the late 1990s. China succeeds in economic growth through privatization of industrial production and manufacturing boom. In 1998, they couldn’t see tall buildings a few streets from where they stand. “Pollute first, clean up later” has become the approach to environmental problems.

The 29th Beijing Olympic Games in 2008 acted as a catalyst for the capital city of China’s air pollution control. Haze kept people in the dark, highways were shut down, and flights were grounded. A motionless cloud of pollution was described as: “the haze is fog, not fumes”, but the Chinese know better over



Source: The Climate and Clean Air Coalition (CCAC)

time. U.S Embassy air quality data in China also asked to be halted as officials were concerned over the public confusion and the data were considered an insult. These sparked online public campaigns demanding more accurate official air quality reports. In 2012, the national

air quality standard was revised and tightened as growing media and public concerns grew on the health impacts. The bad air episodes have been less intense and frequency declined drastically in 2017. Now, China is still fighting for clean skies in 82 cities.

2. Regional and Local Perspectives

2.1. Southeast Asia: How about Southeast Asia's air pollution?

The Southeast Asia haze has been known to occur every three to five years in the region since 1972, primarily caused by large-scale forest and peatland fires—often linked to land clearing for agriculture. These transboundary haze events have led to severe air quality degradation, health issues, and economic disruptions across multiple countries, including Indonesia, Malaysia, and Singapore.

On the other hand, from 1998 until 2018, low labor costs and large market potential attracted industrial transfer and worsened environmental conditions. The rise in industrial activity further intensified air pollution in several Southeast Asian developing countries, particularly in Cambodia, Laos, the Philippines, and Vietnam.

Today, Southeast Asia continues to battle the haze through the ASEAN Task Force on Peatland, which is working to implement the ASEAN Peatland Management Strategy 2023–2030 in hopes of curbing fires and improving regional air quality.

1995

The Association of Southeast Asian Nations (ASEAN) made diplomatic efforts to address the bad air episodes through the Cooperation Plan on Transboundary Pollution.

1997

Southeast Asian Haze marked as the major international air pollution disaster as the biomass burning from land clearing scale in Indonesia has increased. The thick forest fires smoke from Indonesia covered several countries with haze for several months, including Malaysia, Singapore, Brunei, Thailand, and the Philippines. It led to the temporary shutdown of industry, travel, and commerce. The ASEAN 1997 Regional Haze Action Plan (RHAP) was made to address the problem.

2014

Indonesia became the last country to ratify the ASEAN Agreement on Transboundary Haze Pollution (AATHP)

2015

The Southeast Asia haze crisis came back. More than 140,000 people in Indonesia reported respiratory illnesses. The Malaysian sky was covered in gray and the marathon for 30,000 registered participants was canceled. World's Cup swimming officials in Singapore also shut down.

2.2. Indonesia: Now, how about our country?

Indonesian haze happened a long time ago and affected countries mentioned in the previous section, but the efforts are still lacking. Public understanding of air pollution is mostly related to biomass burning. The history in Indonesia is also lacking due to a lack of open air quality data and discussions. However, air pollution studies rose after the 2015 Southeast Asian haze due to its massive international coverage and impacts. A significant increase in the number of studies started after the 2020 pandemic year. It was triggered from the start of an air pollution company that enables the public to access large data networks and scientific education, as well as growing air pollution communities and organizations among the society, like Bicara Udara. Doubling the large online media coverage led to emerging public discussions.

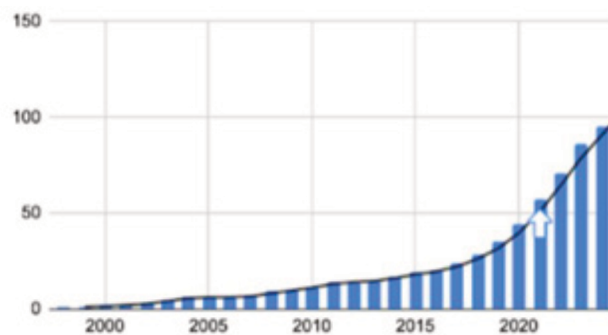


Image: Cumulative growth of peer-reviewed publications about air pollution in Indonesia, 1998–2024 data (Dinda Shabrina & Addison, 2025)

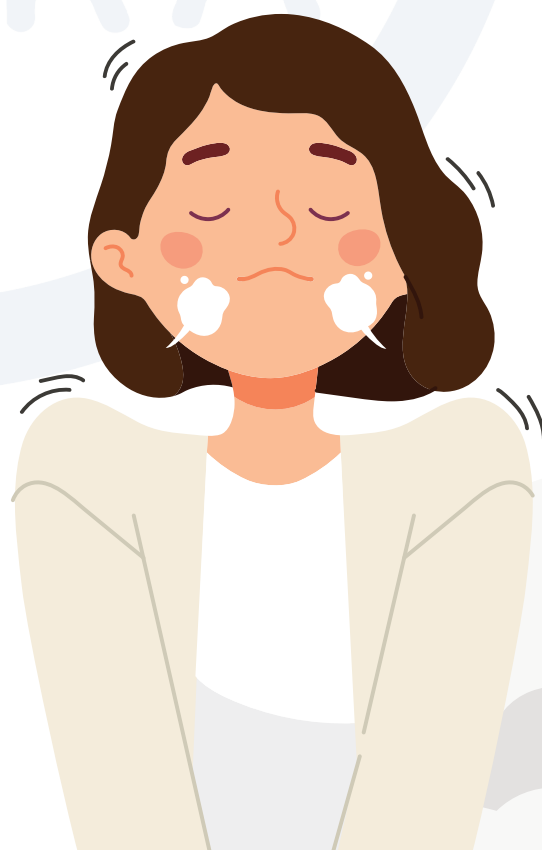
As of 2024, Indonesians seemed to understand that the air pollution issue is not merely yearly biomass burning, like 1997 and 2015 Southeast Asian Haze. Bad air episodes can happen in every city and region. Similar to China, the common line often highlights the fog in the cities as only a fog, but not until we know better, the fog is a mixture of fumes.

3. Definition and Types of Air Pollution

So you've heard about air pollution, bad air episodes, air quality, smoke, smog, fog, transboundary air, and haze. Before we go too far, what is air?

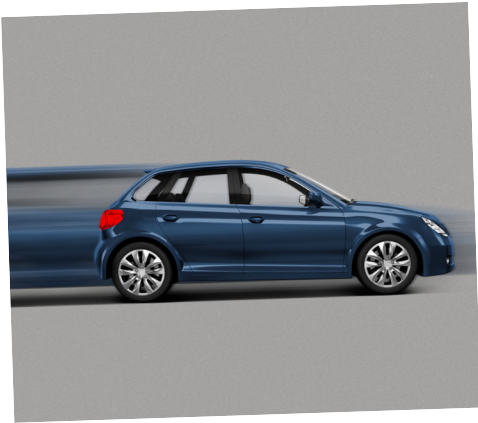
Now, try to take a long breath. What do you feel when you breathe? The air near you fills up your lungs, but have you ever known what's inside the air that you currently breathe? You may be inhaling contaminated air.

Air pollution is the contamination of air through a range of gases and solids which modify their natural characteristics. They are often invisible to the naked eye since the size is smaller than the human eye can see. However, it can be visible in a favorable situation, for instance, the smoke from trash burning or diesel fuel of transportation. So, if you don't see them, it doesn't mean they do not exist.



4. Sources of Air Pollution

Air pollution can be emitted from various sources such as man-made or anthropogenic compounds and natural sources. Human activities are associated with PM_{2.5} or smaller sized (fine) particulate matter, such as biomass burning, motor vehicles, power plants, or industries. However, substantial natural sources components like road dust or sea salt can be found in coarse particulate matter (PM_{10-2.5}).



How we commute



How we manufacture



How we manage our waste



How we produce the energy



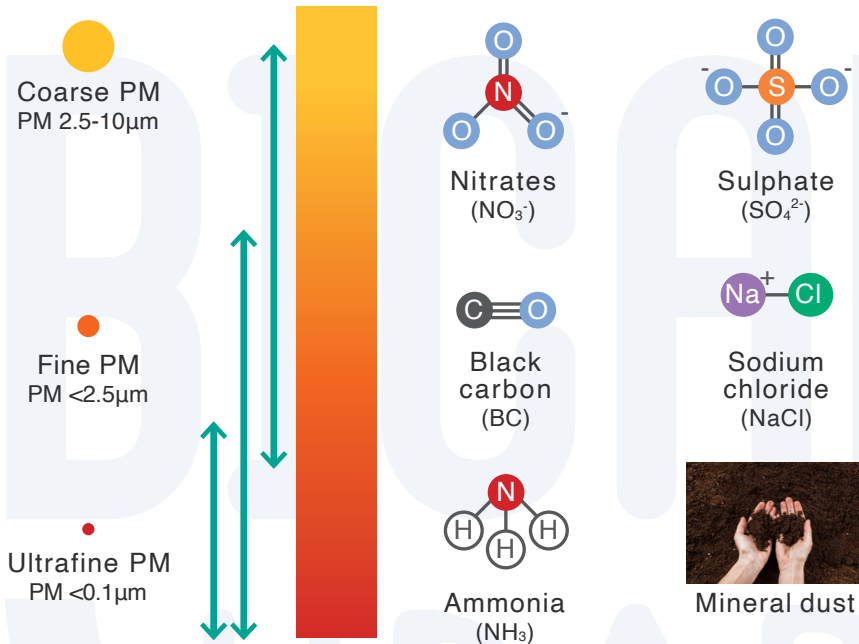
There are natural sources, too

5. Composition of Pollutants

Particulate Matter

PM is a collective term for solid and liquid particles suspended in the air.

Major compositions of PM are:



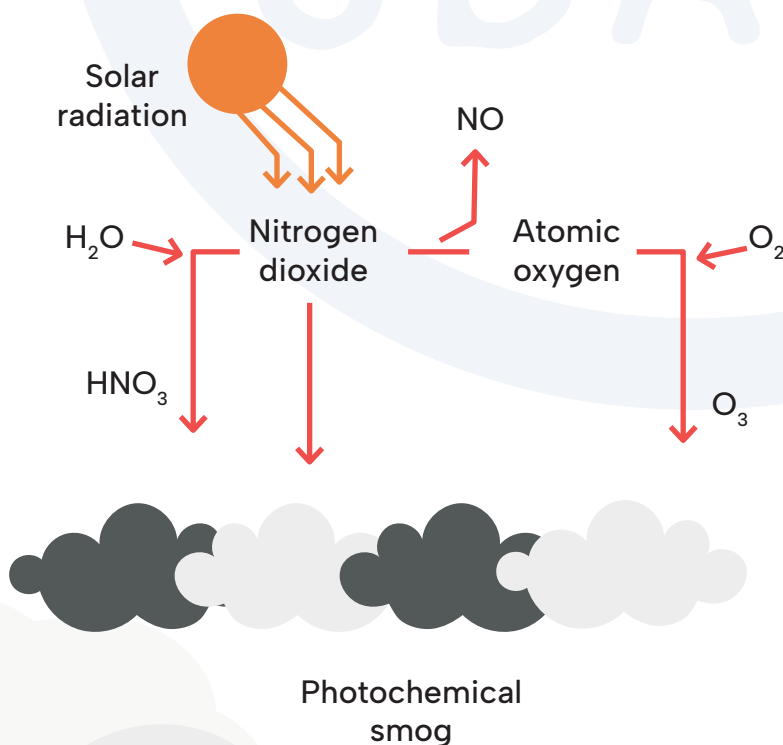
Gas

Carbon monoxide (CO)

Ground-level Ozone (O_3)

Sulfur dioxide (SO_2)

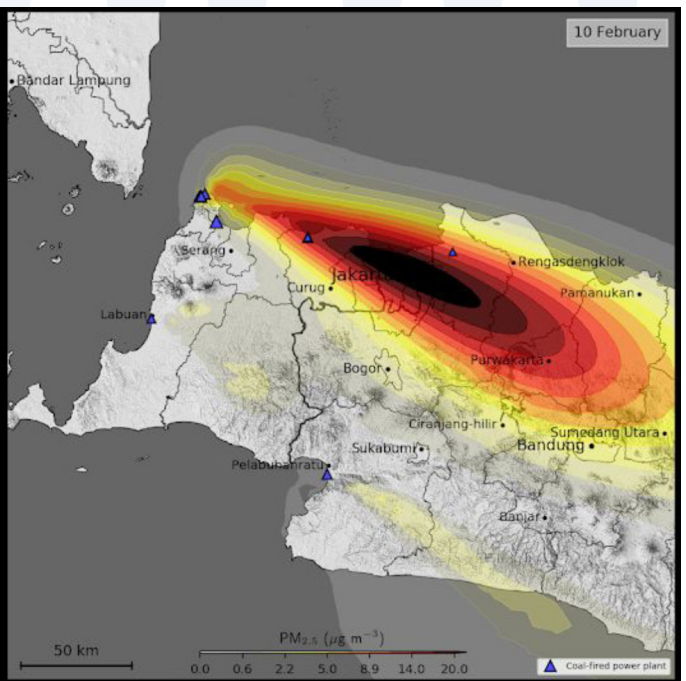
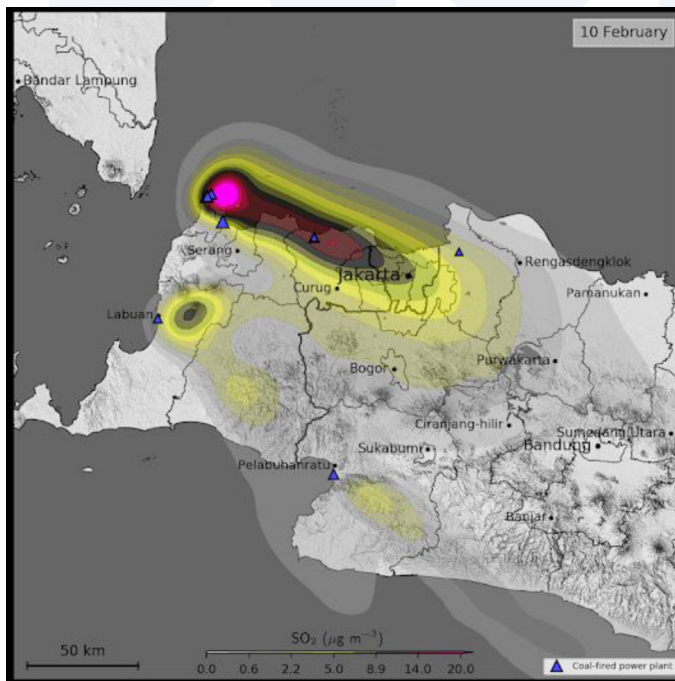
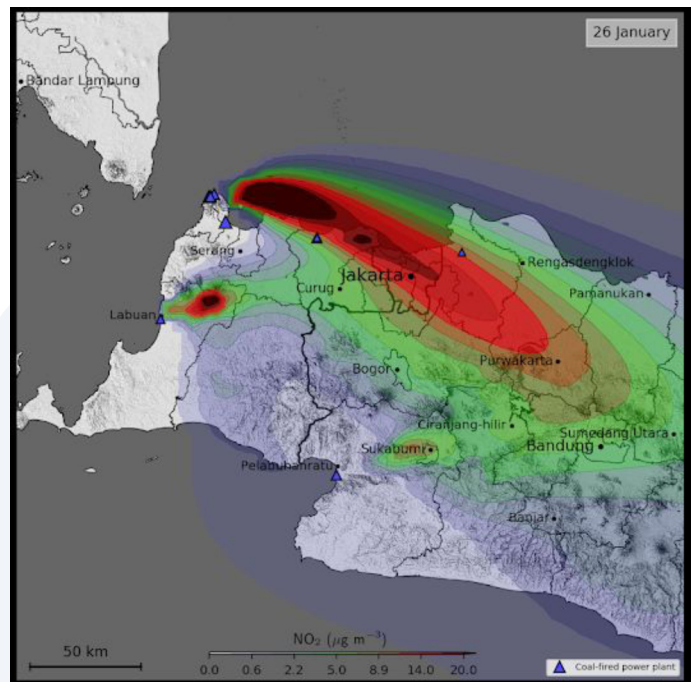
Nitrogen oxides (NO_x)



Important to know that air pollution can be called smog, haze, or smoke. It depends on what is in the air, how it is formed, and context. The "smog" term was used in the 1900s to describe a mixture of smoke and fog. We often call it smog when the sulfur-rich particles react with water droplets (sulfurous smog) or the pollution reacting with the sunlight, creating brown haze above cities (photochemical smog). Meanwhile, the reflection of sunlight off the pollution is often described as haze, and the visible suspended pollutants are called smoke.

6. Transboundary Air Pollution

Air pollution is dynamic. Pollutants can travel to other places far from the primary sources or stay nearby the sources. Originally, transboundary air pollution means the pollutants travel beyond countries' territories (used in Southeast Asian Haze), however, the term is also often used to expand beyond any small to regional borders. Meanwhile, pollutants that stay near sources are often called localized air pollution or hyperlocal pollution



NO_2 , SO_2 and $\text{PM}_{2.5}$ concentrations over Jakarta on the "worst days" of pollution

WORKSHEET

1. Choose one country that has successfully improved its air pollution conditions (United Kingdom, United States, China, or others!)
 - ◊ Explain the reasons why you chose it.
 - ◊ Address the primary influencing factor driving changes!
 - ◊ Compare policies between the chosen country and Indonesia, what can Indonesia learn?
2. Explain your understanding of the air pollution definition to one person near you in 1 minute. Write down their feedback about your communication skill and their thoughts on a potential misunderstanding of air pollution. Take time to reflect on it and suggest what can be improved.
3. Identify primary pollutants that are harmful to human health. Describe: Where can we find the pollutant? How to mitigate high pollution exposure?
4. Classify the pollution sources based on their category, indoor air pollution or outdoor air pollution. Explain how each source can contribute to worsening air pollution conditions.
 - ◊ Cooking activities
 - ◊ Trash burning
 - ◊ Mosquito fogging
 - ◊ Vehicle emissions

Reflection Session

After you fully read this unit – what is the first thought that comes across your memory? Describe the correlation or relevance to the learning you had from this section in a short paragraph.



Unit 2

STEM Approach

Learning Objectives

Students understand the air quality index and its significance, the health and environmental effects of air pollution, and learn technologies that support air pollution monitoring and mitigation efforts.



1. How Do We Measure Air Quality—and Know If It's Safe?

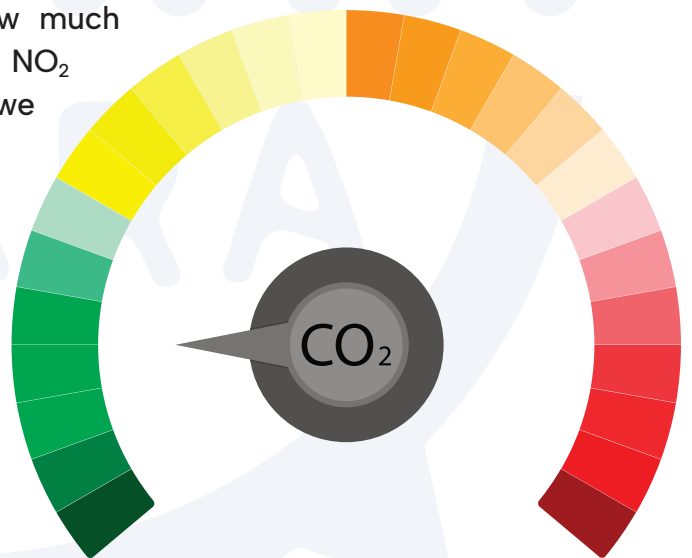
To find out whether the air is clean or polluted, we use **air quality monitoring stations**. These stations measure how much pollution—like PM_{2.5} (tiny dust particles), SO₂ and NO₂ (gases from fuel burning)—is in the air. But how do we decide if those levels are safe or harmful?

There are three main tools used to guide us:

1. WHO Air Quality Guidelines (AQG)

These are **scientific recommendations for safe levels of each pollutant**, issued by the **World Health Organization**. For example, WHO says PM_{2.5} should not go above 15 (µg/m³) in a 24-hour average. If levels go beyond that, it could start affecting our health.

Because some countries might need more time to meet these strict limits, WHO also provides **Interim Targets**—like mini-goals—to help improve air quality step by step.



Use **WHO AQG** when you want to understand the **ideal health-based limits of pollutants** like PM_{2.5}.

2. National Ambient Air Quality Standards (NAAQS)

These are **legal pollution limits** for **each pollutant** set by **each country**. For example, the U.S. allows up to 35 $\mu\text{g}/\text{m}^3$ of PM_{2.5} in a 24-hour average, while Indonesia's national standard is higher—at 55 $\mu\text{g}/\text{m}^3$. This means Indonesia allows more PM_{2.5} pollution in the

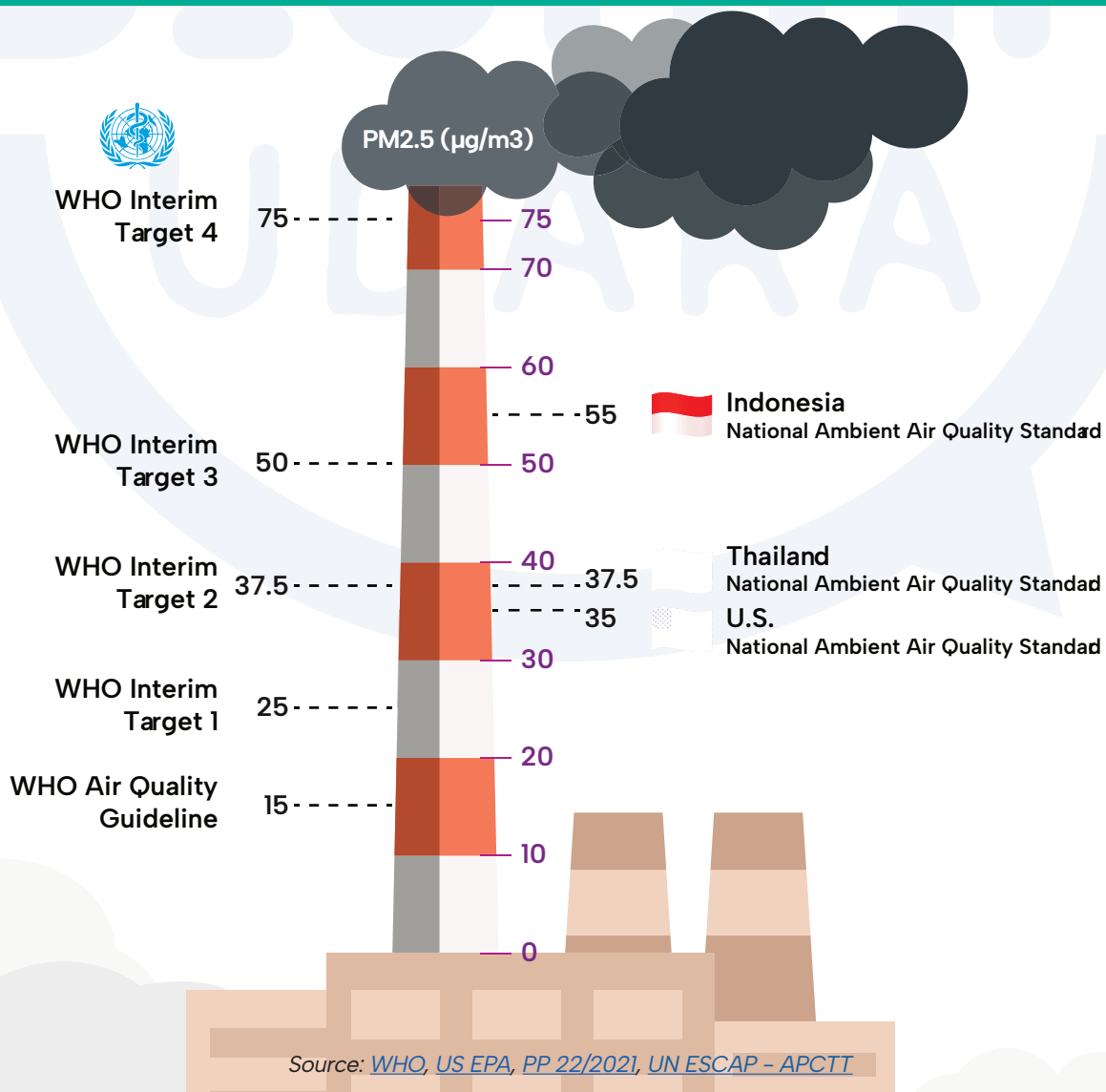
air before it's officially called "unsafe." So, a higher number means the standard is more relaxed. These numbers are important because they help decide when action should be taken to protect our health.

Use **NAAQS** to see what your **country legally allows** in the air—and whether the limits are more or less strict compared to other countries.

Let's compare **WHO's Air Quality Guideline** and the **National Ambient Air Quality Standards** in **Indonesia, the U.S., and Thailand** in the figure below:

"How Safe Is Safe?"

Comparison of PM_{2.5} levels (24-hour average) in WHO Guideline to the National Ambient Air Quality Standards of Indonesia, Thailand and the United States



3. Air Quality Index (AQI)

The AQI is a **combined score or index** based on the levels of **several pollutants**—like PM_{2.5}, SO₂, NO₂, ozone, and CO. It helps translate complex scientific data into a single number and a color that's easy to understand. The higher the AQI number, the more polluted and dangerous the air is.

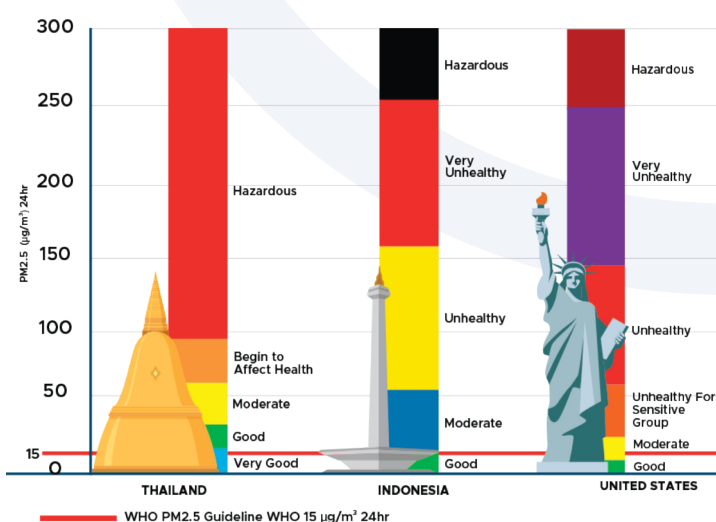
Many countries use their own AQI systems, such as the **U.S. AQI**, **Indonesia's ISPU**, and **Thailand's AQI**—each with slightly different scales and colors.

Use **AQI** when you want a **quick, easy-to-read warning** about current air conditions and what actions you should take to stay safe.

Note: Beyond AQI, it's best to also check the actual pollutant levels, like PM_{2.5}, to truly understand what you're breathing in.

To compare how countries present air quality, let's focus on one key component: PM_{2.5}. Check out our **"PM_{2.5} in AQIs Around the World"** chart to see how Indonesia, the U.S., and Thailand use different colors and categories to show the same PM_{2.5} levels.

"PM_{2.5} in AQIs Around the World"

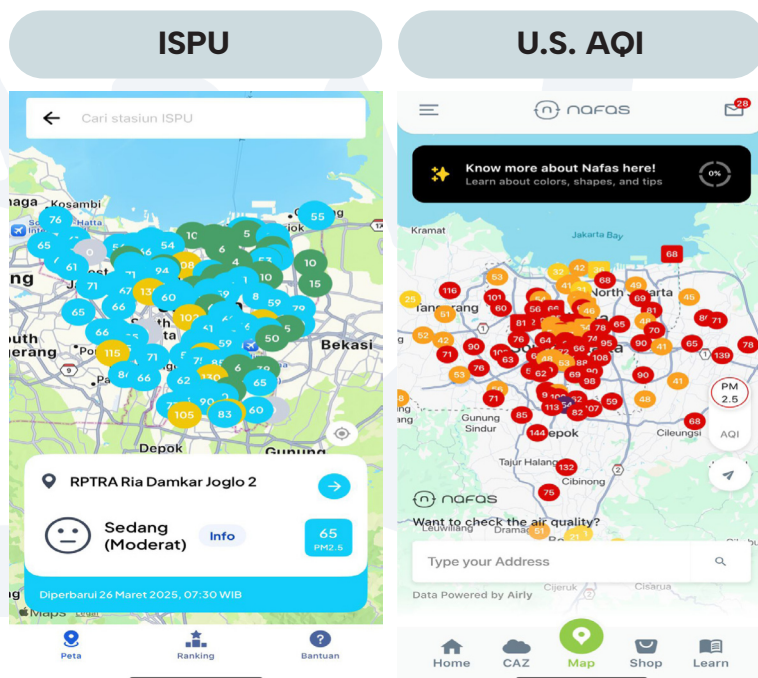


Why does this matter? Because the colors and numbers shown in air quality apps affect how seriously people take the warnings.

In Indonesia, the ISPU might still show less alarming colors like blue and yellow, even when the air is already unhealthy. It also skips an important category that the U.S. AQI includes—"Unhealthy for Sensitive Groups", like children, older adults, and people with asthma. A clearer example can be seen in the U.S. AQI, which uses more alarming colors—like orange and red—to help people take action and stay safe. Without alarming colors, people might not realize the air is actually putting their health at risk.

Check out the **"What You See on Air Quality Apps"** figure to compare how PM_{2.5} levels look on apps in different AQI coloring.

"What You See on Air Quality Apps"



Source: JAKI App (PM_{2.5} - ISPU coloring) and Nafas (PM_{2.5} - U.S. AQI coloring), data collected on March 26, 2025 at 08.00 - 08.05 WIB

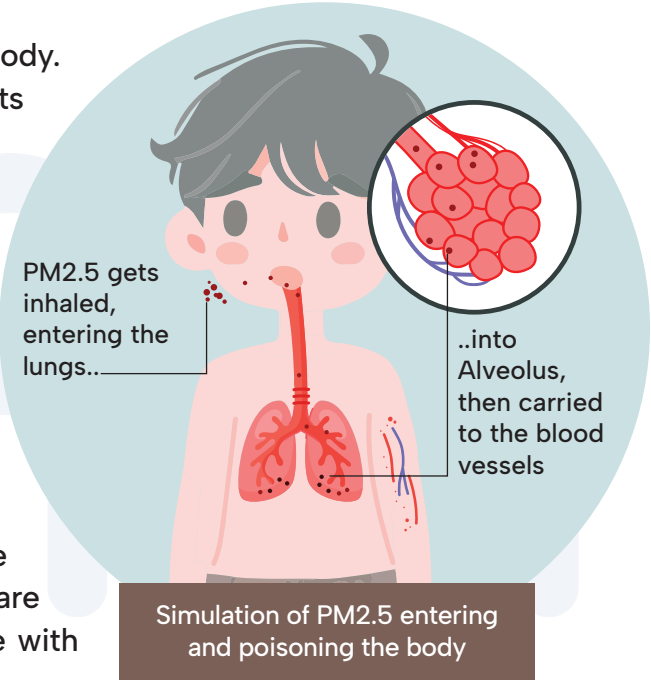
Understanding these tools—and how they differ—is the first step to protecting yourself and your community from dirty air. Clean air starts with clear information!

2. Health and Environmental Impacts

2.1. Human Health

Air pollution poses health effects to the human body. The most important pollutant is PM2.5 because of its potential negative health impacts and its fine size makes it easy to travel to the bloodstream.

When we breathe, the symptoms of the health effects vary among individuals depending on the health conditions, genetics, lifestyle, exposure time, behaviors, and composition of the particulate matter. Symptoms can appear in a short or long term, for instance, individuals with rhinitis may sneeze repeatedly shortly after inhaling a high concentration of pollutants. Sensitive groups are at risk of high pollution exposure. There are children, pregnant women, the elderly, and people with health sensitivity related to bad air quality.



Impact of Air Pollution

Short-Term

Brain
ADHD (from fetal stage to childhood)

Nose
Influenza, Rhinitis

Heart
Heart attack, Arrhythmia

Lungs
Asthma, Bronchiolitis

Skin
Atopic dermatitis (eczema), acne, premature aging

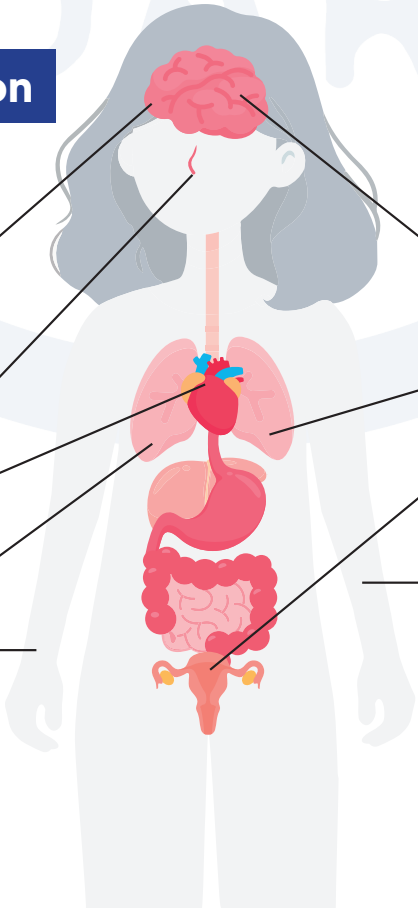
Long-Term

Brain
Alzheimer's, Parkinson's, Stroke, cognitive decline

Lungs
Pneumonia, Lung cancer, Asthma

Uterus
Premature birth

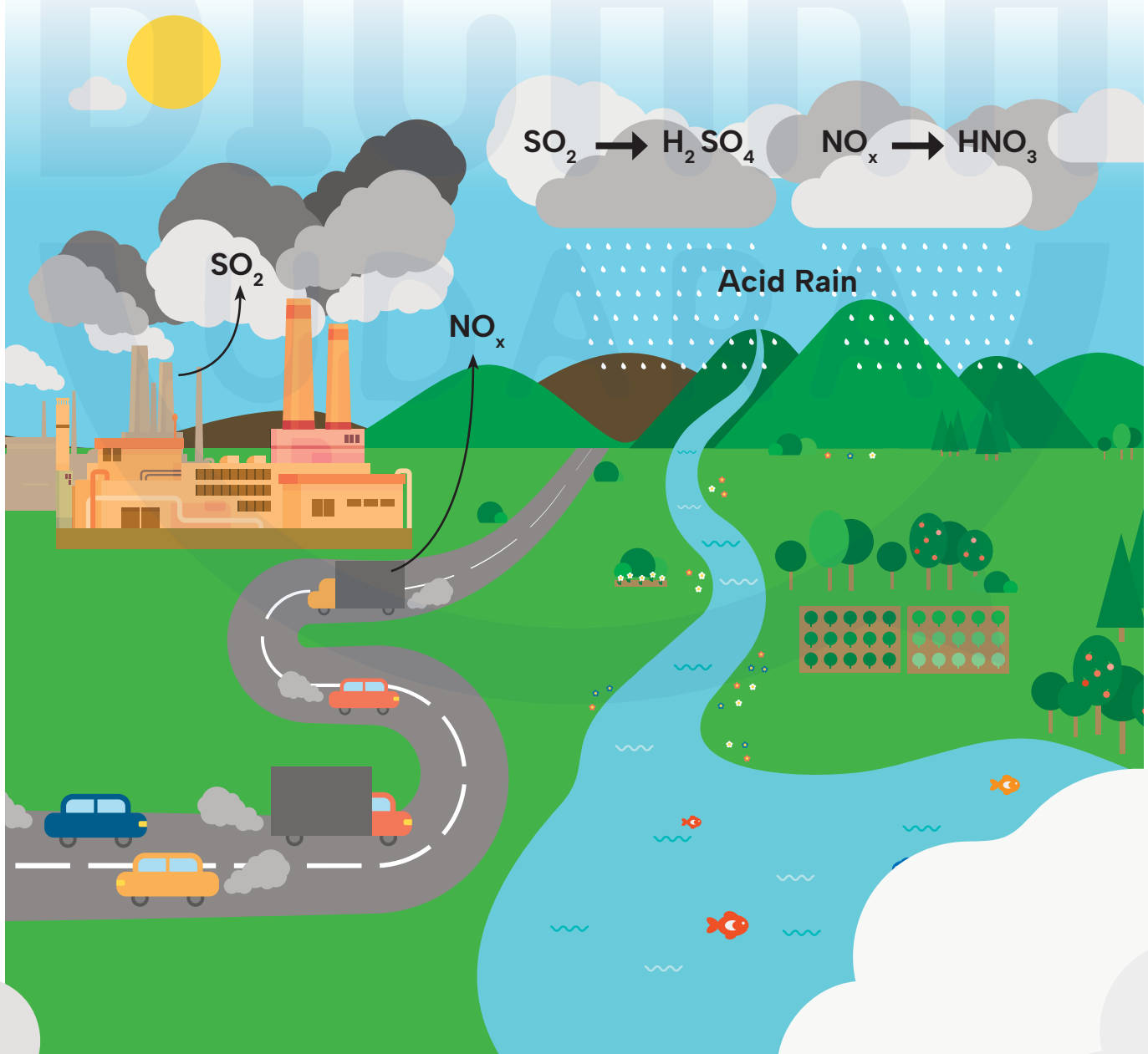
Whole Body
Blood clots



2.2. Environmental Impact

Air pollution damages the environment. It can damage our buildings, trees, water, and atmosphere. Some visible impacts that can be seen by our naked eyes are a thick haze. Another invisible and indirect impact of the air pollution is acid rain, damaged plants, acceleration of algae blooms in the water body, and climate change.

Our naked eyes, we may see the falling tree leaves as a usual phenomenon. However, air pollution may accelerate the condition of plants to be more susceptible to disease and stress. Air pollution might affect plants through acid rain (SO_2 and NO_x) or impairing photosynthesis (PM).



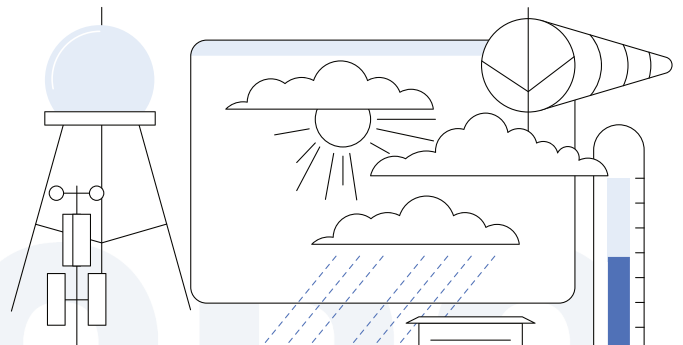
3. Technology and Engineering for Air Pollution

3.1. Air Quality Sensor

Measurement is a great way to understand the invisible pollutants in the air. Air quality sensors are divided into three categories:

i. Low cost sensors

The sensor costs a low budget. It can be applied for personal use, local traffic planning, disaster response, research, and education. It can give real-time data and be operated by anyone. However, the data quality needs to go through sensor data processing or calibration. This sensor has high spatial resolution due to its efficiency and affordable costs. It can be used to track movement of pollutants at a geographical scale for informing public health and identifying hot spots (pollution sources).

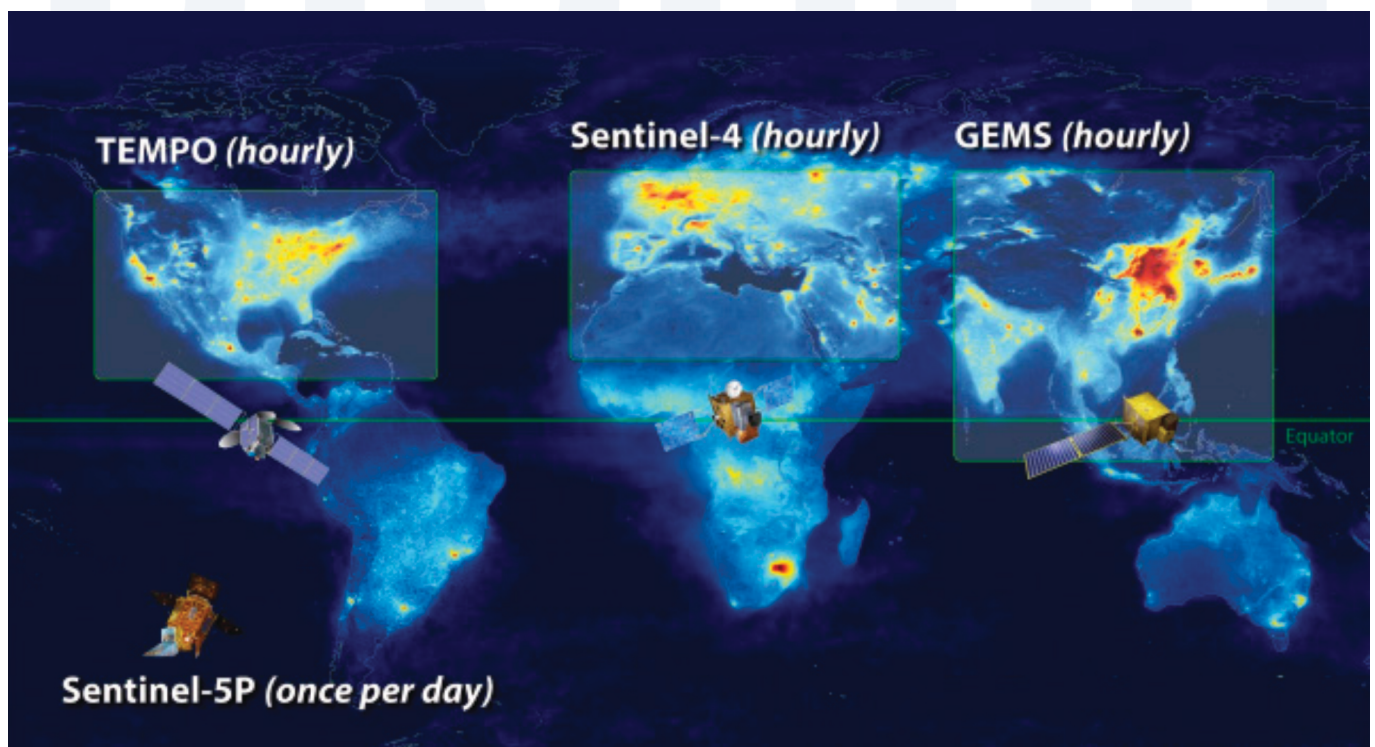


ii. Ground-based reference monitor

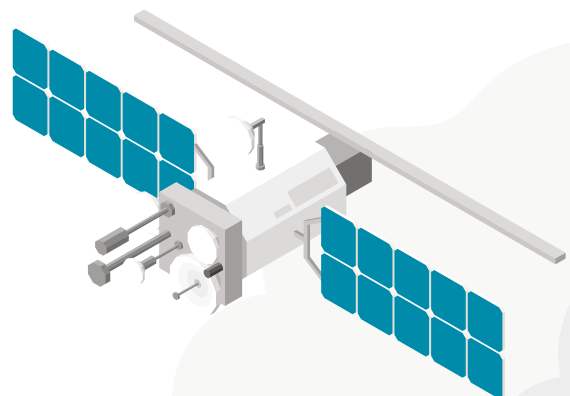


A dense network of reference monitors can be expensive, as these sensors are typically housed in climate-controlled shelters and require additional infrastructure. They are primarily used by regulatory and research entities for compliance and monitoring purposes, such as verifying whether pollution levels meet legal standards. Reference monitors provide high-quality, accurate data and are capable of recording air quality levels at sub-hourly, hourly, and daily intervals.

iii. Satellite-based instrument



It is used for air quality forecasts and scientific inquiries through measuring air pollution in large areas. People who use this often use government and research entities. They can only collect data during daylight hours and cannot measure pollution below clouds.





EXPERIMENT TIME



Level

Easy

Make Invisible Air Visible

Materials:

Any materials or objects, phone camera

Steps:

1. Explore the corner or space in your school, home, or building sites
2. Find dusty spaces (e.g. bookshelf), you can see if it needs cleaning.
3. Place your hand towards the space to see how dirty it is
4. Take a photo of your hand/finger that is probably full of black dust/less
5. Come back to the same place every week and do the same experiment for a month

Learning Goal:

Students understand that air pollution exists around us and accumulates over time in places (includes the air we breathe).



Air Quality Monitoring

Materials:**Air quality sensors****Steps:**

1. Turn on the air quality sensors
2. Explore the corner or space in your school, home, or building sites
3. Check how the changes in numbers of each parameter on the sensor, the surrounding environmental condition, and sources (e.g. rainy weather, hot weather)
4. Record the date, time, pollutants numbers, weather condition, sources, and places
5. Do it every day at the same time (afternoon/morning) in a week
6. Analyse the data you've got and observe the differences

Learning Goal:

Students understand that air pollution differs for each condition in different times, places, and weather.



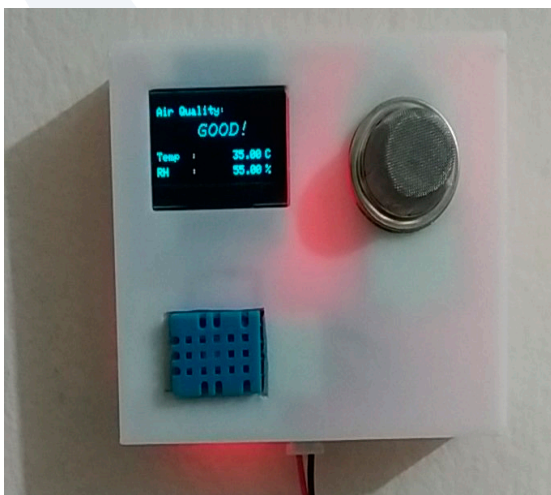
DIY Arduino Low-cost Air Quality Sensor

Materials:

1. DHT11 Temperature & Humidity Sensor (3 pins)
2. Arduino Nano R3
3. Air Quality sensor (MQ135)
4. 0.96" i2c OLED Display
5. Apps: Arduino IDE
6. Tools/Machine: 3D Printer & Soldering iron

Steps:

1. Connect the wires of the Arduino according to the [manual](#)
2. Install [some](#) libraries to run the code on the apps
3. Run the code
4. Connect the sensor to the circuit
5. Try to go outside with your sensor and check the air quality!



(Source: Abid Hossain, ProjectHub Arduino)



3. 2. Introduction to Air Purifier Technology



After learning how to measure air quality, what should you do if you find that the air around you is polluted?

You can try to escape, but air is everywhere. Air pollution extends beyond borders in the outdoor setting, but not—when it comes to indoor areas. We spend most of our time sitting inside a building, lots of walls can prevent rapid movement of air in a room.

A part of the solution to answer health problems caused by indoor air exposure is through managing your indoor air quality. Technology used to manage this problem is an air purifier. An air purifier can be effective if it is used properly; how large is your room? The larger the room, one purifier may not be effective. You need to see the size of the room and calculate your CADR (Clean Air Delivery Rate): <https://reviewsofairpurifiers.com/cadr-calculator/>

EXPERIMENT TIME

Level

Easy

Air Quality Test with Paper

Materials:

A white paper, a fan, coloured flour (as the dust), a tape

Steps:

1. Put the white paper on the back of the fan that draws air in using the tape
2. Turn on the fan and sprinkle some coloured flour from different sides
3. Turn off the fan after minutes and check how much flour is attached to the white paper

Learning Goal:

Students understand how the air purifier system works to remove dust in the air.

Air Quality Filters

Materials:

Multiple layers of fabrics (tissue paper, cotton cloth, and printer paper), a fan with consistent speed, coloured flour (as the dust), a tape

Steps:

1. Attach each fabric type on the back of the fan that draws air like before (previous level of experiment)
2. Turn on the fan and sprinkle the same amount of coloured flour as dust
3. Check how much dust is accumulated for each fabric

Learning Goal:

Students understand how the filter materials' differences in the purifier trap the particles based on their density and structure.



DIY Corsi Rosenthal Box (CR-Box)

HOW TO BUILD A CORSI-ROSENTHAL BOX

The Corsi-Rosenthal Box is an affordable DIY air-cleaning system made with simple materials found in hardware stores. The box fan pulls air through the filters on the sides and blows out clean air. It is proven to reduce indoor exposure to airborne particles, including those containing the virus that causes COVID-19. The box can also decrease the levels of other particles in the air, such as dust or wildfire smoke.

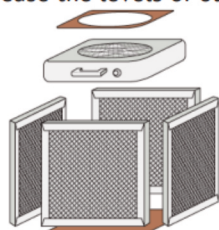
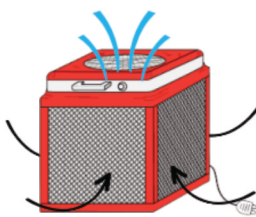
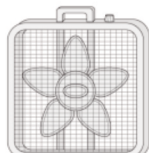
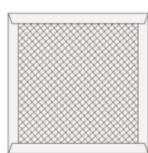


Illustration by Amanda Hu



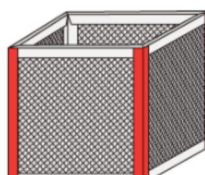
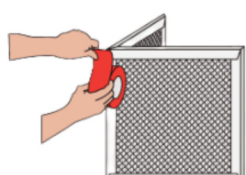
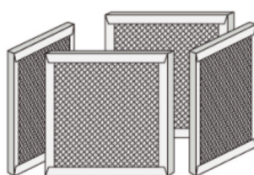
THE MATERIALS



- Filters can last up to a year
- Keep away from walls and corners

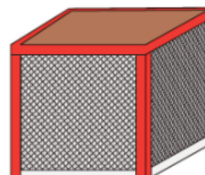
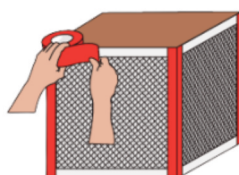
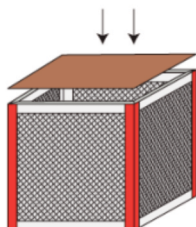
- 4 Filters: 3M MPR 1900 (20" x 20" x 1" or 20" x 25" x 1") or MERV 13 (20" x 20" x 2" or 20" x 20" x 1" or 20" x 25" x 2" or 20" x 25" x 1" [2-inch preferred])
- Lasko or Mainstays 20-inch Box Fan
- Scissors, Utility Knife, Duct Tape

THE CUBE



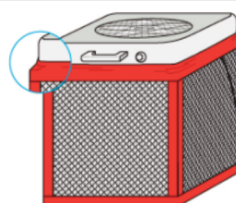
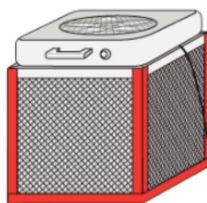
- Arrange the filters to create a symmetrical structure
- Ensure the arrows are pointing inwards
- Duct tape the four edges
- Vertical orientation of the pleats is preferred

THE BASE



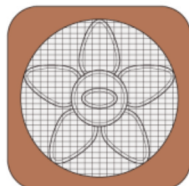
- Use one side of the fan's cardboard box
- Cut the cardboard to fit the base of the cube
- Duct tape it on all four sides

THE FAN



- Place the fan on top of the cube (air must blow upward)
- Seal all sides, including corners
- Ensure any holes on the side of the fan are sealed off with duct tape

THE SHROUD



- Cut the other cardboard sheet to fit the top of the fan
- Cut a circular hole (Diameter: 15" for Lasko and 16" for Mainstays)
- Place the shroud on the fan and tape it on all four sides
- The shroud increases efficiency and decreases the noise level

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Illustrator: Marija Mladenović Creator: Shiven Taneja

WORKSHEET

1. Case Study: Take a look at AQI Level in the past three hours in your area. What activities should people do or avoid? Why?
2. Find information on the AQI levels among nearby districts in your city where you lived (for instance, use Nafas Apps map for East Jakarta city). Analyze the trends of air pollution levels within a week or 24 hours. Explain your analysis.
3. Choose one or two of your “favorite” pollutants. Design a mini infographic showing air pollution impacts to health and the environment.
4. Are the air quality sensors reliable? What factors can make it reliable or not? Explain how to enhance the reliability of the sensors, including the data.

Reflection Session

List one or a few lessons learned after learning the units that you think are important for your parents or teachers to know. Try to communicate with them and list down the challenges you have faced.



Unit 3

CleanAir Action:

Advocating Policies for Public Health

Learning Objectives

Students will analyze the social and economic impacts of air pollution on vulnerable populations, explore the role of activism in advocating for cleaner air, and evaluate how governance and policy interventions influence air quality management in Indonesia.



1. Impact of Air Pollution on Vulnerable Groups

Air pollution disproportionately affects vulnerable groups, including children, the elderly, low-income communities, and individuals with pre-existing health conditions. In Indonesia, urban areas like Jakarta experience severe air pollution episodes, which have been linked to increased cases of respiratory diseases such as asthma and chronic obstructive pulmonary disease (COPD) (World Bank, 2021).



Children are particularly at risk because their respiratory systems are still developing. Studies have shown that prolonged exposure to high levels of PM2.5 and nitrogen oxides can stunt lung growth and lead to long-term health issues (UNICEF, 2023). Similarly, elderly populations face a higher risk of cardiovascular diseases due to air pollution exposure (WHO, 2022).

Low-income communities often reside near industrial zones or high-traffic areas, exposing them to higher levels of pollution. Limited access to healthcare exacerbates the impact, leading to higher mortality and morbidity rates. In Jakarta, areas such as North Jakarta and East Jakarta are particularly affected due to their proximity to industrial zones and major transportation routes. A study revealed

that air pollution in Jakarta is responsible for over 10,000 premature deaths and more than 5,000 hospitalizations annually, with low-income populations bearing a disproportionate burden. Additionally, residents in surrounding areas like Bekasi, South Tangerang, and Bogor experience an average reduction in life expectancy of approximately 5 years due to air pollution. In Indonesia, a study found that urban poor populations in Jakarta suffer from disproportionately high rates of air pollution-related illnesses (Bappenas, 2022). These findings highlight the urgent need for targeted interventions to improve air quality and health outcomes in these vulnerable communities.



2. Socio-economic Perspective: The Cost of Air Pollution

The **Doughnut Economics Theory**, introduced by Kate Raworth, argues that economic development should balance social needs and environmental sustainability (Raworth, 2017). From a social science perspective, air pollution is not just an environmental issue but a reflection of how economic policies prioritize short-term growth over long-term well-being (Antara News, 2024). In Indonesia, economic progress has often been used as an excuse to deprioritize sustainable solutions for air pollution. Policymakers frequently justify industrial expansion, urbanization, and deforestation as necessary steps for economic growth, while the long-term health and environmental costs are overlooked (Kompas, 2023).

One significant financial burden resulting from air pollution is its impact on the national healthcare budget. The Indonesian National Health Insurance Program (BPJS Kesehatan) allocates a substantial portion of its funding to treat respiratory diseases caused or worsened by poor air quality (Tanah Air, 2023). The increasing cases of asthma, lung infections, and

cardiovascular diseases linked to air pollution put immense strain on Indonesia's healthcare system. A 2021 report by BPJS Kesehatan highlighted that respiratory illnesses are among the top expenditures, demonstrating the economic cost of failing to address air pollution effectively. Specifically, in 2022, the health costs for diseases related to air pollution covered under the National Health Insurance program amounted to Rp 10 trillion (approximately USD 656.5 million) (Tanah Air, 2023).

With all these health and economic consequences, the question remains: *Is sacrificing environmental sustainability truly worth it for economic growth?*

While industrialization and urbanization contribute to GDP growth and job creation, they also degrade public health, lower productivity, and reduce overall quality of life (Kompas, 2023). Sustainable economic policies that prioritize clean energy, public transportation, and stricter emissions regulations could mitigate these issues without stalling economic progress (Antara News, 2024).

3. Activism and Advocacy Led by Environmental Movements

Addressing air pollution in Indonesia requires more than just short-term policies—it demands systemic change across multiple sectors, including governance, public awareness, healthcare, and economic planning. Various environmental advocacy groups and civil society organizations are working toward long-term solutions by engaging in research, policy discussions, and public education.

One of the key efforts in this space includes advocacy for better air quality policies, data transparency, and public participation in decision-making. Community-driven movements and research-based initiatives

seek to highlight the real cost of air pollution and push for effective governance responses.

One of the organisations working to drive systemic change is Bicara Udara, which focuses on research, public awareness, and policy advocacy. Through initiatives such as community education, research partnerships, and direct engagement with policymakers, Bicara Udara aims to increase political will and push for stronger regulations. These efforts emphasize evidence-based policy advocacy, accountability from industries and governments, and citizen participation in environmental governance.

To learn more about Bicara Udara's work and how to get involved, scan the QR code below to visit their website.



Another significant milestone in environmental activism was the 2019 citizen lawsuit against the Indonesian government, where Jakarta residents sued authorities for failing to provide clean air. The court ruled in favor of the citizens, mandating stricter air quality regulations (Jakarta Globe, 2021).

These advocacy efforts have pressured the government to take action, such as improving public transportation, implementing emission testing for vehicles, and monitoring industrial emissions. However, enforcement remains weak, and continued activism is necessary to ensure policy implementation.

4. The Role of Welfare States and Government

The role of the Indonesian government in addressing air pollution is multifaceted, involving policy development, regulation enforcement, and public health interventions. However, Indonesia lacks a comprehensive Clean Air Act, which limits its ability to effectively tackle air pollution across different sectors.

The government has introduced some measures, such as:

- ◇ Odd-even traffic policies to reduce vehicular emissions in Jakarta. (Governor Regulation Number 88 of 2019, which amends Governor Regulation Number 155 of 2018 concerning Traffic Restrictions with an Odd-Even System)
- ◇ Emission testing regulations for motor vehicles. (Governor Regulation Number 66 of 2020 regarding Motor Vehicle Exhaust Emission Tests)
- ◇ Incentives for clean energy adoption and electric vehicles. (Minister of Finance Regulation Number 38 of 2023 and Governor Regulation Number 90 of 2021)
- ◇ Public transportation improvements, such as MRT and LRT expansions.

Despite these efforts, Indonesia's air quality standards still fall short of WHO guidelines. The Government Regulation (PP) No. 22 of 2021, which replaced PP No. 41 of 1999, allows for a PM_{2.5} pollution limit of 55 µg/m³ for 24 hours, far above WHO's recommended limit of 5 µg/m³ (WHO, 2021).

5. Governance and Policy Interventions (National and International)

5.1. National Regulations

Indonesia's main environmental laws related to air pollution include:

- ◇ Environmental Protection and Management Law (No. 32/2009): A general framework for environmental protection but lacks specific air quality management measures.
- ◇ Government Regulation No. 22/2021: Sets emission standards but does not align with WHO air quality guidelines.
- ◇ Regional regulations: Some local governments, such as Jakarta, have implemented stricter monitoring and enforcement mechanisms.

Timeline: Indonesia's Air Pollution Regulation

1997

Southeast Asian Haze Crisis: Severe forest fires in Indonesia led to widespread haze, affecting air quality across Southeast Asia. This crisis highlighted the need for regional cooperation in addressing transboundary air pollution.

1999

Government Regulation No. 41/1999: Indonesia introduced this regulation concerning air pollution control, setting national ambient air quality standards and emission limits for various pollutants.

2009

Environmental Protection and Management Law (Law No. 32/2009): This comprehensive law provided a framework for environmental protection, including provisions for air quality management and pollution control.

2015

Severe Forest Fires and Haze: Indonesia experienced one of its most destructive fire seasons, emitting approximately 80 million metric tons of CO₂ in a single day, underscoring the urgency for stricter air quality regulations.

2016

Ratification of the Paris Agreement: Indonesia committed to reducing greenhouse gas emissions and enhancing climate resilience, indirectly supporting efforts to improve air quality.

2019

Citizen Lawsuit Against the Government: Thirty-two Jakarta residents sued the Indonesian government for failing to provide clean air. The court ruled in favor of the citizens, mandating stricter air quality regulations.

2021

- Implementation of Low-Emission Zones (LEZ): Jakarta introduced its first LEZ in Kota Tua to reduce air pollution and protect historical sites.
- Government Regulation No. 22/2021: This regulation replaced the 1999 regulation, setting new emission standards, though still not fully aligning with WHO air quality guidelines.

5.2. International, Bilateral, and Multilateral Agreements

Indonesia has adopted several international agreements to combat air pollution:

- ◊ United Nations Framework Convention on Climate Change (UNFCCC) (ratified in 1994): Provides a framework for reducing greenhouse gas emissions.
- ◊ ASEAN Agreement on Transboundary Haze Pollution (AATHP) (ratified in 2014): Addresses regional haze caused by forest fires but has seen limited enforcement.
- ◊ Paris Agreement (signed in 2016): Indonesia has pledged to reduce its emissions through Nationally Determined Contributions (NDCs), but air pollution policies remain fragmented.

6. Future Policy Directions and Challenges in Air Quality Management

These milestones reflect Indonesia's ongoing efforts to tackle air pollution and improve air quality, involving regulatory measures, international commitments, and initiatives to transition towards cleaner energy sources.

Formation of the Committee for Respiratory Disease and Air Pollution Control: In response to rising air pollution levels in Jakarta and surrounding areas, the Ministry of Health established this committee to monitor and address health impacts related to air pollution (Antara News, 2024).

Ministerial Instruction No. 2/2023: The Minister of Home Affairs issued this instruction to tackle air pollution in Greater Jakarta, including measures like implementing hybrid work systems, limiting motorized vehicle usage, enhancing public transportation, enforcing emission tests, and promoting green solutions (Setkab, 2024).

B40 Biodiesel Implementation Plan: Indonesia announced its commitment to introduce a 40% palm oil-based biodiesel blend (B40) starting January 1, 2024, aiming to reduce carbon dioxide emissions by about 40 million metric tons (Antara News, 2024).

2023

2024

Plan to Implement B50 Biodiesel Blending: President-elect Prabowo Subianto expressed intentions to implement a 50% palm oil-based biodiesel blending mandate (B50) by early 2025 to reduce fuel imports and lower emissions from fossil fuels. However, industry stakeholders cautioned that adequate testing and capacity expansion are necessary before implementation. (Reuters, 2024).

Reduction of Subsidized Fuel Sales: The Indonesian government planned to improve air quality by upgrading the quality of subsidized fuels and restricting their sales to fewer vehicles. Measures included reducing sulfur content in fuels and limiting availability to certain vehicle categories. (Reuters, 2024).

2025

Ambitious Coal Phase-Out Plan: Indonesia aims to retire coal power plants within 15 years and achieve net-zero emissions by 2050 under President Prabowo Subianto's ambitious plan. However, experts warn that this requires substantial policy changes and massive investment in renewable energy infrastructure. (Financial Times, 2024).

Conclusion

Air pollution in Indonesia is a complex challenge that affects public health, economic stability, and social justice. Vulnerable groups, such as children, the elderly, and low-income communities, bear the heaviest burden, highlighting the need for targeted interventions. The economic cost of air pollution, as seen through rising healthcare expenses and reduced life expectancy, raises important questions about the balance between economic growth and environmental sustainability.

Activism and advocacy play a crucial role in pushing for cleaner air, as seen in the efforts of organizations like Bicara Udara and the historic citizen lawsuit against the government. While Indonesia has introduced policies to mitigate air pollution, enforcement remains weak, and stricter regulations are necessary to align with international air quality standards.

Ultimately, achieving clean air requires collective action—from policymakers enforcing stricter emissions limits, industries adopting greener practices, and citizens demanding accountability. As we move forward, students must consider their role in shaping a future where economic growth and environmental health go hand in hand.



EXERCISES

Engaging Critical Thinking & Discussion Activities

1. Debate: “Economic Growth vs. Environmental Protection”

From a governance standpoint, this raises critical questions: Who is responsible for the economic burden of air pollution? Should industries and polluters contribute to healthcare costs, or should the government enforce stricter regulations to reduce pollution at its source? These questions highlight the intersection of economics, governance, and social justice in addressing air pollution.

Divide the class into two teams:

- ◇ Team A: Supports the idea that economic growth is more important than environmental regulations.
- ◇ Team B: Argues that environmental protection should come first, even if it slows economic growth.

Each team must research and present arguments, using examples from Indonesia’s policies and global air quality challenges. After the debate, reflect on whether a balance between the two is possible.

2. The “What If” Scenario: Future of Air Pollution in Indonesia

Imagine it’s the year 2050:

- ◇ What if Indonesia successfully phased out coal and transitioned to 100% clean energy? How would life be different?
- ◇ What if no action was taken, and pollution levels worsened? What would happen to public health, the economy, and everyday life?

3. Be the Change: Create Your Own Clean Air Initiative

For this final project, students will develop a community-based campaign or event to raise awareness about air pollution and encourage action. This can be a campaign, event activation, or initiative that involves collaboration with local communities, schools, or organizations.

Project Guidelines

1. Choose a Theme

- ◇ Think about a specific aspect of air pollution you want to focus on (e.g., health impacts, transportation, urban greenery, industrial emissions).

3. Find a Community Partner (Optional but Encouraged)

- ◇ Consider partnering with schools, running or cycling clubs, environmental organizations, or even local businesses to expand the impact.

5. Present Your Idea

- ◇ Each group will pitch their campaign/event in a 5-minute presentation.
- ◇ Create a visual aid (poster, digital mock-up, or video).

2. Design Your Initiative

- ◇ Develop a campaign (e.g., social media movement, poster series, educational workshops) or an event (e.g., community clean-up, car-free day, tree-planting, art exhibition).
- ◇ Make sure it engages the public and provides solutions or preventive measures.

4. Create a Promotional Strategy

- ◇ How will you spread the word? Will you use social media, posters, or word-of-mouth?
- ◇ Think of a catchy slogan or hashtag!

Example Ideas for Inspiration

- ⌘ **“Run for Clean Air”** – A campaign designed to educate runners on the risks of exercising in polluted environments and the importance of checking air quality before outdoor activities. This initiative includes a collaborative running event with local running communities, coupled with a Clean Air Talk Show to discuss air pollution’s impact on health and ways to mitigate exposure.



- ⌘ **“Carbon Emission and Our Habits”** – An awareness campaign highlighting the connection between everyday lifestyle choices and carbon emissions. Through educational materials and interactive discussions, the initiative encourages individuals to adopt more sustainable habits to reduce their environmental footprint.
- ⌘ **“Polusi Melanda, Dampaknya Gak Bercanda”** – A podcast series that explores the severity of air pollution, its health implications, and potential solutions. Featuring experts, activists, and community leaders, the podcast aims to inform and engage listeners in meaningful conversations on air quality and environmental responsibility.

This project will challenge students to think creatively while making a real impact in their communities. The best projects can even be implemented beyond the classroom!

Unit 4

Entrepreneurial and Innovative Solutions

Learning Objectives

Learning Objectives: Students have a grasp on the green technologies, what sustainable business models look like, the future green jobs, and practical entrepreneurial skills, tips, to drive environmental change.



1. Green Technologies and Startups for Clean Air

1.1. Green Technology

The technology that we use now may not be green or eco-friendly. When it has the potential to improve environmental performances, like producing less pollution, using recycled waste, or handling waste in an acceptable manner, often called green technology.

Adopting green technology in developing countries, like Indonesia, can expand its businesses to foreign markets that require strict product specifications and environmental requirements. The production efficiency can be improved too since it reduces the input costs. In the future, green technology can be an investment to be better equipped and enhance a company's reputation in environmental and market challenges.

Several sectors involved in green technology, such as agriculture (organic), energy (renewable energy and efficiency technology), waste and water management (recycling, sewage and solid waste, and water purification), building (sustainable material and performance technology), and transport (rail and electric vehicles).



Source: [Bloomberg](#)

1.2. Startups for Clean Air

Another sector's example of green technology is the air quality. In the world, there are several air quality startups run in developing and developed cities, such as [Aclima](#), [Airly](#), [Safetraces](#), and [Clarity](#). In Indonesia, we have [Nafas Indonesia](#). On average, these startups run on the intersection of open-data air quality through deploying air quality monitoring networks, indoor air quality services, and air quality instrumental providers.

2. Business Models for Environmental Sustainability

The way business is done is described as business models. The meaning goes beyond product and service offerings, it is a design on proposal, creation, delivery, and capture of business value. It often means “the way you do business”.

There are a variety of business models, some of them are:

- a. Circular economy. This model focuses on reducing waste and maximizing resources by reuse, recycle, and upcycle products. Selling refurbished electronics and recycled clothing are some examples.

An Indonesian company like [Waste4Change](#), a leading waste management platform for companies, individuals, and government agencies. The company founded by M. Bijaksana Junerosano, who graduated from the Environmental Engineering Institute Technology of Bandung. It shows that the career path can be the same field in the future.



- b. Clean energy. This model offers clean energy as solutions, such as wind and solar companies, have services and installation consultation. One example in Indonesia's job industry is the [SUN Energy](#) founded by Philip Lee. As a Bachelor of Accountancy graduate from Nanyang Technological University in Singapore, Lee's journey demonstrates that careers don't necessarily always be linear.



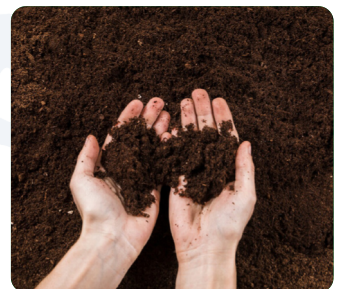
- c. Sharing economy. The model provides resources sharing for reducing the new items. For instance, car-sharing and rental services. A well-known 'ojol' or online bike-sharing GoJek, founded by Nadiem Makarim, is an example of a sharing economy. Nadiem's background in International Relations (Brown University, United States) doesn't relate to the industry, however, his daily commute problems turned into business opportunities.



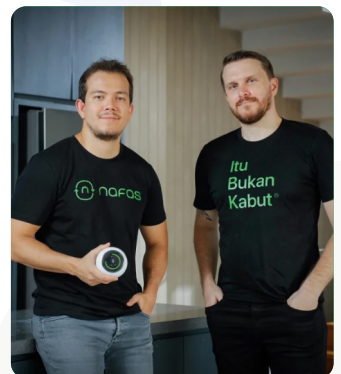
- d. Zero-waste business model holds waste eliminations in operations, efficiency resources, and maximizes recycling. An example is a company that produces compostable products, like [Surplus](#) Indonesia, a food wastage marketplace offering unsold or reduced prices from food providers. As a Bachelor of Science in Biology at the Institute Technology of Bandung, M. Agung Saputra's career as the founder is still in-line with his education background.



- e. Carbon offset models offer solutions to offset an individual's or a company's carbon footprint. For example, [Carbon Ethics](#), a startup in Indonesia that offers planting trees (mangroves) to offset emissions. One of the founders is Bimo Soewadji, who holds a Petroleum Engineering background at the Institute Technology of Bandung, which is opposite to his current career in industry.



- f. Product as a service model aims to extend the product life cycle by encouraging leasing rather than ownership. For instance, subscription-based air purifiers like Clean Air Zone by [Nafas Indonesia](#). The company was founded by Nathan Roestandy, Bachelor of Arts in Economics and History at the University of British Columbia, and Piotr Jakubowski with a Marketing degree from Drake University. Both of their backgrounds do not straightforwardly contribute to the air pollution industry, but their education degree do help to manage the businesses.



3. Students as Agents of Change: Developing Entrepreneurial Ideas

The future starts with you, the young generations. The senior high school stage may seem too early for job-seeking. During this period, you can start to explore where your interest is! It's okay if you are unsure and debating to spread your wings yet, since interest may change over time. However, one thing for you to remember is to do these things every day:

Observe:

look around you, what bothers you?

It can be positive like: "I often observe the clouds" or negative: "I don't like fast fashion"

Reflect:

spare time to think, how does it make you feel?

The following step: "I want to know more about clouds" or "I want to make people reuse clothes"

Ask:

questioning yourself, how can you achieve?

What do you want to do?

It can be like "I will learn about the sky" or "I want to open a cheap local second-hand clothes and household store for charity"

The ORA method (**Dinda Shabrina, 2024**) can be useful if you practice often, which can lead to ideas, especially entrepreneurship ideas. Ideas may vary over time as the use of digital technology is changing, so we need to be adaptive. Some entrepreneur ideas that you can do are:

- a. Offer composting services to the community and sell the compost as products.
- b. Open eco-friendly products workshops.
- c. Organize walking, biking, or historical tours in the city highlighting the environment.
- d. Partnering with local e-waste centers and finding the business gaps.
- e. Nature photography services.
- f. Sell your budgeting or financial planning template/tools.

Now, give it a try!

4. Green and Sustainability Jobs in the Future

Based on the World Economic Forum, The Future of Jobs Report 2025 (figure below), the AI and information processing technologies, robots and autonomous systems, energy generation, storage and distribution may drive business transformation. It highlights the changes into fully digital and green-related areas. If you are looking into a career path, specialization in these areas may benefit you in the future: big data specialists, financial technology engineers, and AI-Machine Learning specialists.

Having awareness and basic skills on how to read a data set, interpret the data, how to code, and design in these areas may prepare you in the future. It is also a plus if you have already explored what platforms or tools the industry uses for each role. However, these are only recommendations; you can still explore your interest in the emerging digital era.

The most important part is to have top core (soft) skills that you need to have in order to complement the future jobs: analytical thinking, resilience, flexibility, leadership, influence, and creative thinking. So, you can start to map how you can gain these soft skills from the high school stage. For instance, trying to develop a small habit in reading data visualization charts to boost your analytical thinking, or turn your social interaction into group projects or clubs to influence something positively for society, beneficial for the environment, and can boost your leadership skill in teamwork!

FIGURE 2.2

Fastest-growing and fastest-declining jobs, 2025-2030

Top jobs by fastest net growth and net decline, projected by surveyed employers

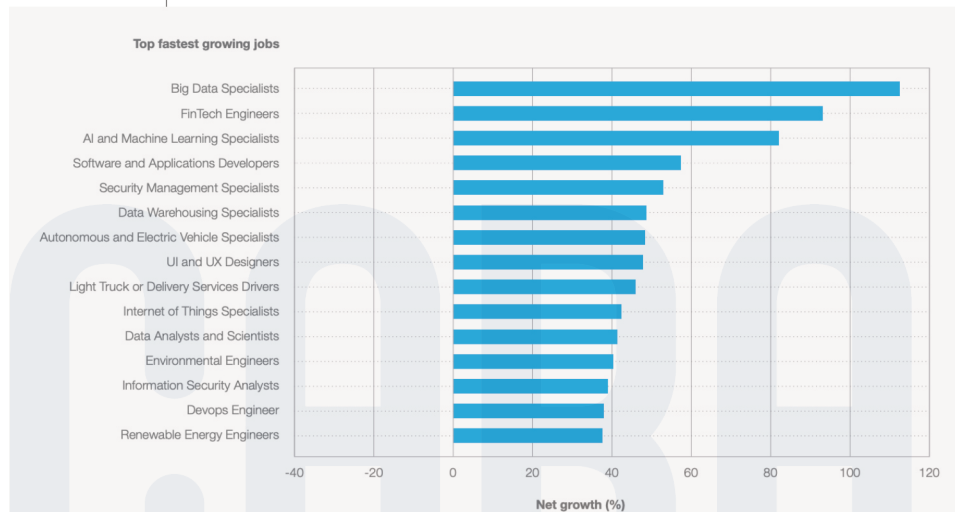
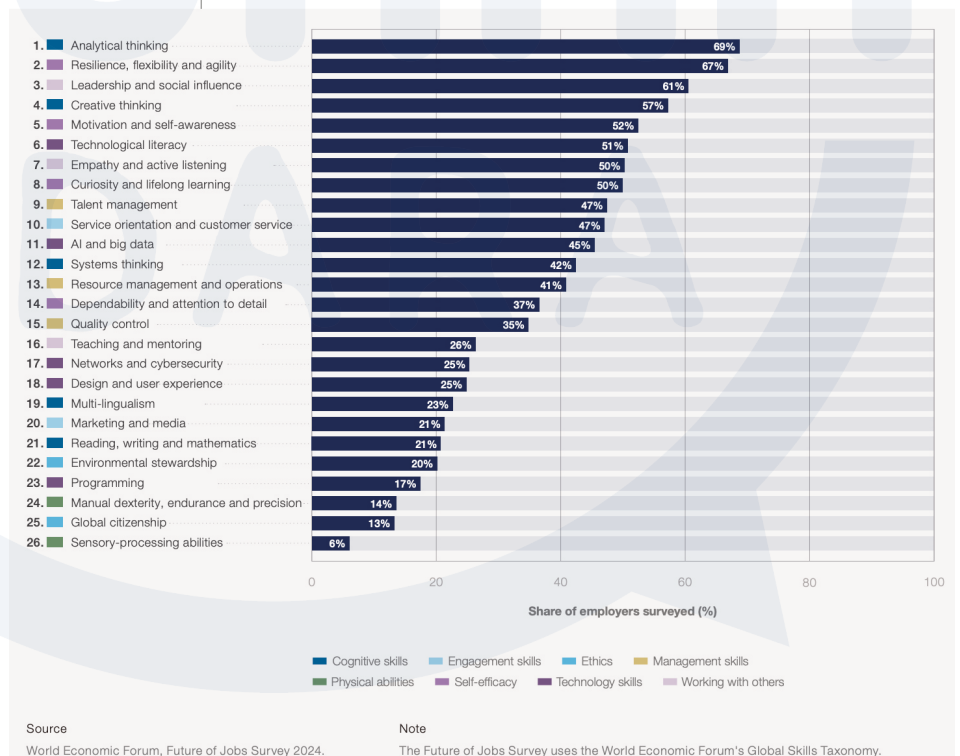


FIGURE 3.3

Core skills in 2025

Share of employers who consider the stated skills to be core skills for their workforce.



SUPPLEMENTARY CHAPTER

Biru Voices as Advocates for Clean Air

Bicara Udara believes that every individual has the power to voice the right to clean air.

In 2022, Bicara Udara launched **Biru Voices**, a platform for university students aspiring to become future leaders in sustainability and environmental sectors.

By 2024, this movement was renamed **Biru Voices Ambassadors**, gaining support from moms & parents, visionary groups, community leaders, and content creators over the age of 25, works to amplify our advocacy and drive the political will necessary to implement real solutions for cleaner air.

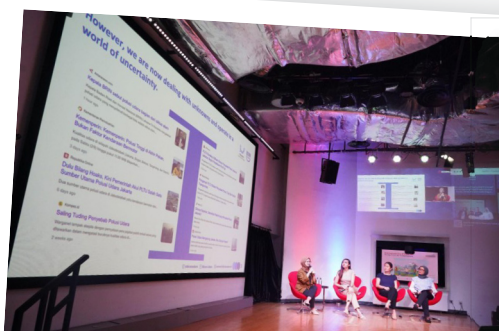


Contribution & Participation

"Young Clean Air Campaigners"

Biru Voices are equipped to lead community dialogues and initiatives addressing air pollution, aligning with the global call for cleaner air highlighted by the UN's designation of **September 7** as the **International Day of Clean Air for Blue Skies**.

@america, Pacific Place
7 September 2023



Want to see what Biru Voices Ambassadors have been up to and learn how you can collaborate?

Scan the QR code below!



bicaraudara.id/biruvoices

Glossary:

Key Terms in Air Pollution and Environmental Action



1. **Air Pollution** – The contamination of air through a range of gases and solids which modify their natural characteristics.
2. **PM2.5 / PM10** – Tiny particles in the air (Particulate Matter) that are 2.5 or 10 micrometers in diameter; can enter the lungs and cause health problems.
3. **Greenhouse Gases (GHGs)** – Gases like carbon dioxide (CO₂) and methane (CH₄) that trap heat in the atmosphere and contribute to global warming.
4. **Emissions** – Pollutants released into the air from vehicles, factories, burning waste, and other sources.
5. **Smog** – A type of air pollution that looks like fog, often caused by vehicle emissions and industrial activities.
6. **Haze** – Reduced visibility caused by particles in the air, often from forest or peatland fires.
7. **AQI (Air Quality Index)** – An index used to report the air quality levels. It informs on how clean or unhealthy the air that you breathe is and may affect your health.
8. **Sources of Air Pollution** – Air pollution can be emitted from various sources such as man-made or anthropogenic compounds and natural sources.
9. **Primary Pollutants** – Pollutants directly released into the atmosphere, such as carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO₂), and particulate matter (PM).
10. **Secondary Pollutants** – Pollutants formed through chemical reactions in the atmosphere, such as ground-level ozone.
11. **Ozone (O₃)** – A gas that protects us in the upper atmosphere but can be harmful when found near the ground.
12. **Carbon Monoxide (CO)** – A dangerous gas with no color or smell, produced from incomplete burning of fuel.
13. **Nitrogen Oxides (NO_x)** – Gases from fuel combustion that contribute to smog and acid rain.
14. **Sulfur Dioxide (SO₂)** – A gas mainly from burning coal and oil, contributing to acid rain and respiratory problems.
15. **Fossil Fuels** – Energy sources like coal, oil, and gas that release pollution when burned.
16. **Peatland Fires** – Underground fires in carbon-rich soil, common in Southeast Asia, that release thick smoke and pollutants.

- 17. Health Impacts** – Air pollution poses health effects to the human body. The most important pollutant is PM2.5 because of its potential negative health impacts and its fine size makes it easy to travel to the bloodstream.
- 18. Mitigation** – Efforts to reduce the seriousness of a problem, like actions to lower pollution levels.
- 19. Air Quality Monitoring** – The process of measuring pollutants in the air using tools like sensors or reference stations.
- 20. Clean Air Policy / Regulation** – Rules and laws created to reduce air pollution and protect public health and the environment.
- 21. Transboundary Pollution** – The pollutants travel beyond countries' territories (used in Southeast Asian Haze), however, the term is also often used to expand beyond any small to regional borders.
- 22. Sustainable Transportation** – Eco-friendly ways to travel that produce little or no pollution, such as biking, walking, or using electric or public transport.
- 23. Environmental Justice** – The principle that everyone deserves equal protection from environmental harm, regardless of background.
- 24. Citizen Science** – When everyday people participate in scientific research, like collecting air quality data in their neighborhoods.
- 25. Campaign** – A planned series of actions or events aimed at raising awareness or bringing about change on a specific issue, such as air pollution.
- 26. Advocacy** – The act of speaking out or taking action to support a cause, influence decision-makers, or push for policy change.
- 27. Environmental Awareness** – Understanding the importance of protecting the environment and recognizing the impact of human activities on nature.
- 28. Regulations / Policies** – Official rules or guidelines created by governments to manage or solve environmental issues like air pollution.

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