

OUR ENVIRONMENT

(Part of WSEP)

What is air pollution?

Air pollution occurs when gases, dust particles, fumes (or smoke) or odour are introduced into the atmosphere in a way that makes it harmful to humans, animals and plant. This is because the air becomes dirty (contaminated or unclean).

The Earth is surrounded by a blanket of air (made up of various gases) called the atmosphere. The atmosphere helps protect the Earth and allow life to exist. Without it, we would be burned by the intense heat of the sun during the day or frozen by the very low temperatures at night.

Any additional gas, particles or odours that are introduced into the air (either by nature or human activity) to distort this natural balance and cause harm to living things can be called air pollution.

Things that pollute the air are called **pollutants**. Examples of pollutants include nitrogen oxides, carbon monoxides, hydrocarbons, sulphur oxides (usually from factories), sand or dust particles, and organic compounds that can evaporate and enter the atmosphere.



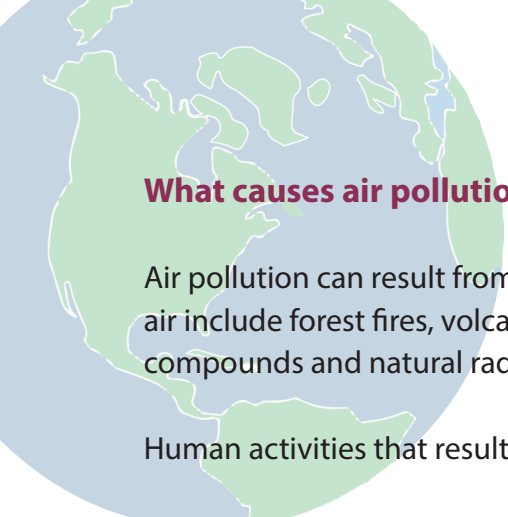
There are two types of pollutants:

Primary pollutants are those gases or particles that are pumped into the air to make it unclean. They include carbon monoxide from automobile (cars) exhausts and sulphur dioxide from the combustion of coal.

Secondary pollutants: When pollutants in the air mix up in a chemical reaction, they form an even more dangerous chemical. Photochemical smog is an example of this, and is a secondary pollutant.

When pollution occurs in the air, it can easily travel and spread, and because we breathe in air, we cannot easily avoid it.





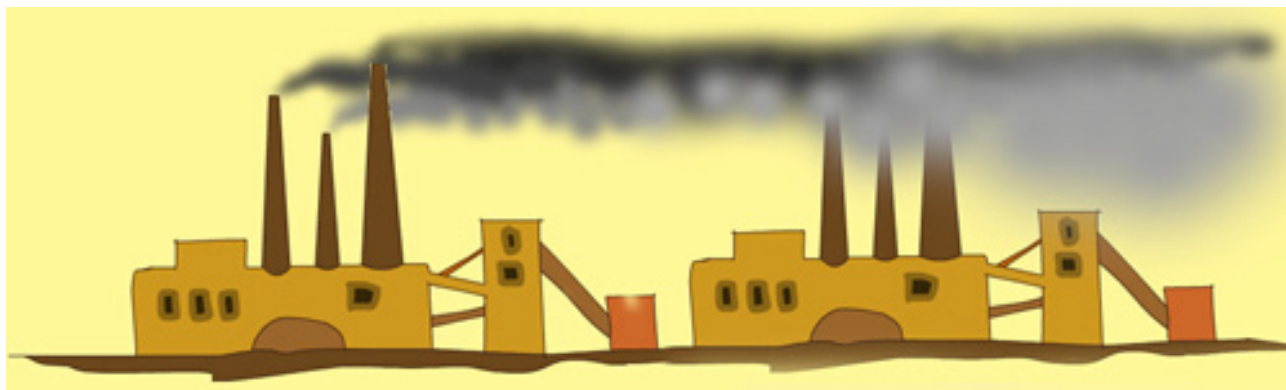
What causes air pollution?

Air pollution can result from both human and natural actions. Natural events that pollute the air include forest fires, volcanic eruptions, wind erosion, pollen dispersal, evaporation of organic compounds and natural radioactivity. Pollution from natural occurrences is not very often.

Human activities that result in air pollution include:

1. Emissions from industries and manufacturing activities

Consider a typical manufacturing plant: You will notice that there are long tubes (called chimneys) erected high into the air, with lots of smoke and fumes coming out of it. Waste incinerators, manufacturing industries and power plants emit high levels of carbon monoxide, organic compounds, and chemicals into the air. This happens almost everywhere that people live. Petroleum refineries also release lots of hydrocarbons into the air.



2. Burning Fossil Fuels

After the industrial age, transportation has become a key part of our lives. Cars and heavy duty trucks, trains, shipping vessels and airplanes all burn lots of fossil fuels to work. Emissions from automobile engines contain both primary and secondary pollutants. This is a major cause of pollution, and one that is very difficult to manage. This is because humans rely heavily on vehicles and engines for transporting people, goods and services.

Fumes from car exhaust contain dangerous gases such as carbon monoxide, oxides of nitrogen, hydrocarbons and particulates. On their own, they cause great harm to people who breathe them. Additionally, they react with environmental gases to create further toxic gases.



3. Household and Farming Chemicals

Crop dusting, fumigating homes, household cleaning products or painting supplies, over the counter insect/pest killers and fertilizer dust, emit harmful chemicals into the air and cause pollution. In many case, when we use these chemicals at home or offices with no or little ventilation, we may fall ill if we breathe them.

What are the common air pollutants around?

Carbon Monoxide (CO)

- o - Fuel combustion from vehicles and engines. Reduces the amount of oxygen reaching the body's
- o organs and tissues; aggravates heart disease, resulting in chest pain and other symptoms.

Ground-level Ozone (O₃)

- o Secondary pollutant formed by chemical reaction of volatile organic compounds (VOCs) and oxides of nitrogen (NO_x) in the presence of sunlight.
- o Decreases lung function and causes respiratory symptoms, such as coughing and shortness of breath, and also makes asthma and other lung diseases get worse.

Lead (Pb)

- o Smelters (metal refineries) and other metal industries; combustion of leaded gasoline in piston engine aircraft; waste incinerators (waste burners), and battery manufacturing.
- o Damages the developing nervous system, resulting in IQ loss and impacts on learning, memory, and behaviour in children. Cardiovascular and renal effects in adults and early effects related to anaemia.

Nitrogen Dioxide (NO₂)

- o Fuel combustion (electric utilities, big industrial boilers, vehicles) and wood burning.
- o Worsens lung diseases leading to respiratory symptoms, increased susceptibility to respiratory infection.

Particulate Matter (PM)

- o This is formed through chemical reactions, fuel combustion (e.g., burning coal, wood, diesel), industrial processes, farming (ploughing, field burning), and unpaved roads or during road constructions.
- o Short-term exposures can worsen heart or lung diseases and cause respiratory problems. Long-term exposures can cause heart or lung disease and sometimes premature deaths.

Sulfur Dioxide (SO₂)

- o SO₂ comes from fuel combustion (especially high-sulfur coal); electric utilities and industrial processes as well as natural occurrences like volcanoes.
- o Aggravates asthma and makes breathing difficult. It also contributes to particle formation with associated health effects.



What are the effects of air pollution?

Acidification:

Chemical reactions involving air pollutants can create acidic compounds which can cause harm to vegetation and buildings. Sometimes, when an air pollutant, such as sulfuric acid combines with the water droplets that make up clouds, the water droplets become acidic, forming acid rain. When acid rain falls over an area, it can kill trees and harm animals, fish, and other wildlife.

Acid rain destroys the leaves of plants.

When acid rain infiltrates into soils, it changes the chemistry of the soil making it unfit for many living things that rely on soil as a habitat or for nutrition. Acid rain also changes the chemistry of the lakes and streams that the rainwater flows into, harming fish and other aquatic life.

Eutrophication:

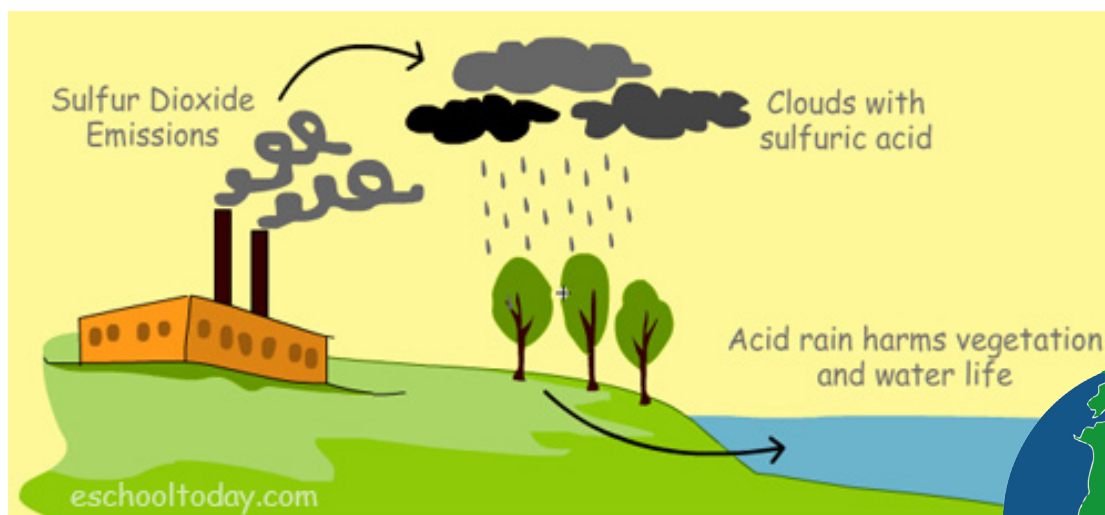
Rain can carry and deposit the Nitrogen in some pollutants on rivers and soils. This will adversely affect the nutrients in the soil and water bodies. This can result in algae growth in lakes and water bodies, and make conditions for other living organism harmful.

Ground-level ozone:

Chemical reactions involving air pollutants create a poisonous gas ozone (O_3). Gas Ozone can affect people's health and can damage vegetation types and some animal life too.

Particulate matter:

Air pollutants can be in the form of particulate matter which can be very harmful to our health. The level of effect usually depends on the length of time of exposure, as well the kind and concentration of chemicals and particles exposed to. **Short-term effects** include irritation to the eyes, nose and throat, and upper respiratory infections such as bronchitis and pneumonia. Others include headaches, nausea, and allergic reactions. Short-term air pollution can aggravate the medical conditions of individuals with asthma and emphysema. **Long-term health effects** can include chronic respiratory disease, lung cancer, heart disease, and even damage to the brain, nerves, liver, or kidneys. Continual exposure to air pollution affects the lungs of growing children and may aggravate or complicate medical conditions in the elderly.





Air pollution prevention, monitoring and solution.

Solution efforts on pollution is always a big problem. This is why prevention interventions are always a better way of controlling air pollution. These prevention methods can either come from government (laws) or by individual actions. In many big cities, monitoring equipment has been installed at many points in the city. Authorities read them regularly to check the quality of air. Let's see more below:

Government (or community) level prevention

- o Governments throughout the world have already taken action against air pollution by introducing green energy. Some governments are investing in wind energy and solar energy, as well as other renewable energy, to minimize burning of fossil fuels, which cause heavy air pollution.
- o Governments are also forcing companies to be more responsible with their manufacturing activities, so that even though they still cause pollution, they are a lot controlled.
- o Companies are also building more energy efficient cars, which pollute less than before.
- o Solar Energy and Wind Power are being used.

Individual Level Prevention

- o Encourage your family to use the bus or bike when commuting. If we all do this, there will be less cars on road and less fumes.



- o Use energy (light, water, boiler, kettle and fire woods) wisely. This is because lots of fossil fuels are burned to generate electricity, and so if we can cut down the use, we will also cut down the amount of pollution we create.
- o Recycle and re-use things. This will minimize the dependence of producing new things. Remember manufacturing industries create a lot of pollution, so if we can re-use things like shopping plastic bags, clothing, paper and bottles, it can help.



Indoor Air Pollution

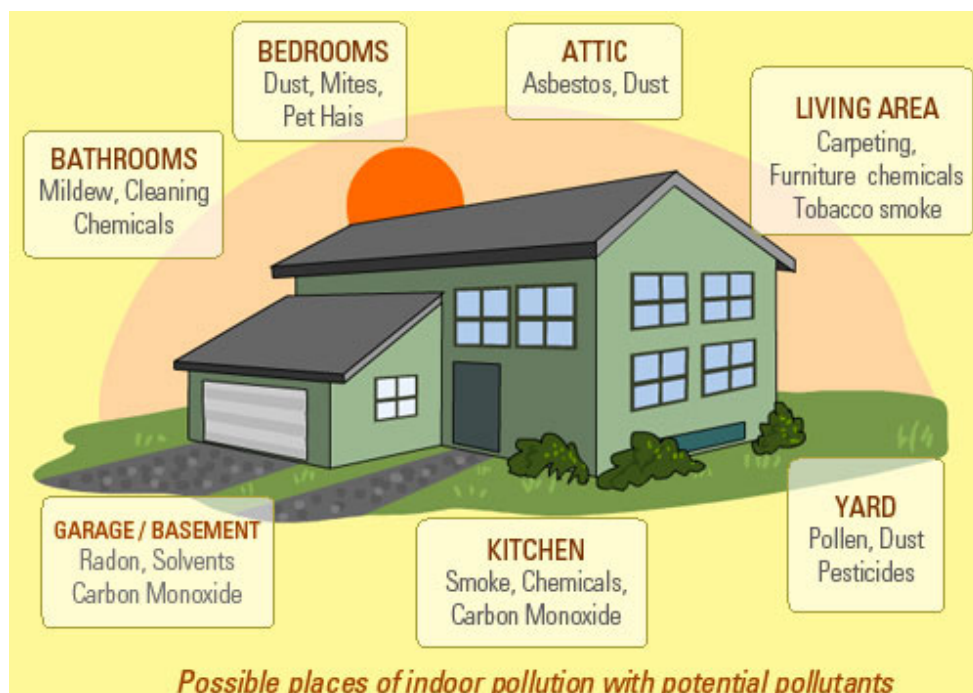
'Indoor air' is air within a building such as your home, classroom, office, shopping center, hospital or gym. We say 'Indoor Air Pollution' if indoor air is contaminated by smoke, chemicals, smells or particles.

Unlike outdoor air pollution, the effect of indoor air pollution is health related and less of an environmental issue. In colder regions, building and heating methods make use of airtight spaces, less ventilation and energy efficient heating. Sometimes synthetic building materials, smells from household care and furnishing chemicals can all be trapped indoors. As less fresh air gets indoors, the concentration of pollutants such as pollen, tobacco smoke, mold, pesticides, radon, asbestos and carbon monoxide trapped inside the building increases and people breathe that in.

Did you know:

- o Around 3 billion people cook and heat their homes using open fires and leaky stoves, and burning biomass (wood, animal dung and crop waste) and coal.
- o Nearly 2 million people die prematurely from illness attributable to indoor air pollution from household solid fuel use.
- o Nearly 50% of pneumonia deaths among children under five are due to particulate matter inhaled from indoor air pollution.
- o More than 1 million people a year die from chronic obstructive respiratory disease (COPD) that develops due to exposure to such indoor air pollution.
- o Both women and men exposed to heavy indoor smoke are 2-3 times more likely to develop COPD

Source: WHO: <http://www.who.int/mediacentre/factsheets/fs292/en/>





Common indoor air pollutants include:

Tobacco smoke:

This is smoke burning cigarettes or exhaled smoke by people smoking.

Biological Pollutants:

These include allergens such as pollen from plants, hair from pets, fungi and some bacteria.

Radon:

This is a gas that is naturally emitted from the ground. Radon can be trapped in basements of building and homes. The gas is known to cause cancer after exposure over a period.

Carbon Monoxide:

This is a poisonous gas with no colour or smell. Carbon monoxide is produced when fuels such as gas, oil, coal or wood do not burn fully.

Basic Air Pollution Facts

Below are some random facts and information on environmental pollution.

- o Air pollutants (dangerous things that make the air unclean) come in the form of gases or particles.
- o It is estimated that you breathe 20,000 litres of air each day. This means the more polluted the air is, the more we breathe dangerous chemicals into our lungs.
- o Air can be polluted both indoors and outdoors. Tobacco and other kinds of smoking are examples of indoor air pollution.
- o Sick Building Syndrome is a health condition related to pesticides, insecticides and chemicals we use at home and offices.
- o In the great “Smog Disaster” in London in 1952, four thousand people died in a few days due to the high concentrations of pollution.

Suggestions

This topic can be covered during an outdoor activity, like a hike so that you can point out certain things for the cubs. Even better, you can encourage them to observe the harmful effects of air pollution all around them.



ACTIVITY FACT SHEET



Activity: Outdoor activity



Objective: The impact of pollution on our environment



Time: 2 - 4 hours



Outline: Take the cubs for a small hike to a particular site where the impact of pollution can be more easily observed. Help them become aware of the main causes of pollution, their impact and what we can do to avoid or minimize their effect. Give them the opportunity to discuss the impacts and come up with possible solutions. It is important to point out that the impact of pollution on our environment will affect our everyday and future life and every single effort is important.

As a Pack, plant some trees or flowers to help with the positive impact on our environment.



Equipment: Map of route, First Aid box, Water, Snack



Place: Route of choice



Group Size: Pack









3rd Parties: N/A



ACTIVITY FACT SHEET



During the Activity:

-  – The environment and how we take care of it effects today's society and that of the future. Allow the cubs to discuss how pollution affects everyday life.
-  – Walking during the hike.
-  – Understanding the scientific aspect of how different types of pollution come to be.
-  – The Cubs can come up with ideas about how we can minimize the effect of pollution and how to stop polluting ourselves.
-  – Give the cubs the space to express their feelings on how pollution is effecting our environment e.g. said, disappointed, hopeful, enthusiastic, etc.
-  – Taking care and respecting the environment helps us to appreciate nature. It is our responsibility to use the environment sustainably, keeping in mind future generations.

SILVER ARROW

After the Activity:

Following this session, cubs are encouraged to make a difference by doing their best to pollute less, maybe even to encourage their own families to do so as well.

