# ENVIRONMENTAL POLLUTION

DEFINITION, CAUSES AND EFFECTS

NUR HAFIDZAH MUHAMADAN • Ts. SHAHIDA SHARUDDIN

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authors
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Politeknik Sultan Salahuddin Abdul Aziz Shah Jabatan Pendidikan Politeknik & Kolej Komuniti

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## Preface

Environmental is one of the courses that are available for the Bachelor of Technology in Facilities Management Program. Environmental topics covered in this book involve several types of pollution, such as air, water, and noise pollution. The book also explains the definition of each type of pollution, the causes of pollution, and the effects of such pollution. This book is expected to provide guidance and information on the topic of pollution and then hopefully help students understand pollution more effectively.

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### **DEFINITION**

### **Environment:**

The complex of physical, chemical, and biotic factors that act upon an organism or an ecological community and ultimately determine its form and survival (Britannica, 2020).

### **Pollution:**

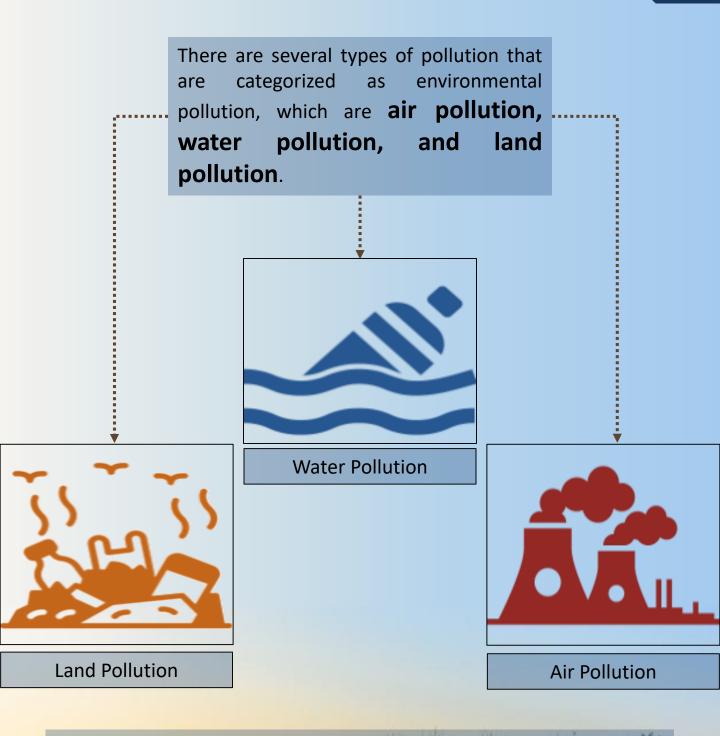
The addition of any substance (solid, liquid, or gas) or any form of energy (such as heat, sound, or radioactivity) to the environment at a rate faster than it can be dispersed, diluted, decomposed, recycled, or stored in some harmless form (Nathanson, 2022).

### **Environmental Pollution:**

US Environmental Protection Agency (EPA) defines pollution as "any substances in water, soil, or air that degrades the natural quality of the environment; offends [the senses]; causes a health hazard; or [impairs] the usefulness of natural resources."



### TYPE OF POLLUTION



These days, pollution can also be divided into many categories, such as **plastic, light, and noise pollution**. All forms of pollution harm not only people but also plants, animals, and wildlife.

### **CAUSES OF ENVIRONMENTAL POLLUTION**

### Urbanization and industrialization :

The rapid growth of industrialization and urbanization has a negative impact on the environment. With rapid urbanization and industrialization, huge quantities of waste, heavy metals, toxic sludge, and solvents enter streams and rivers, thereby polluting them (Ukaogo et al., 2020). This leads to an increase in environmental pollution, especially for developing countries.



### • Mining and exploration:

Mineral exploration has a variety of negative consequences for the environment, including air, water, and soil contamination, even though it may only cause a little pollution. Mining debris that contains harmful substances that could pollute both land and water is produced during excavation.

### • Agricultural activities:

Agricultural activity is very important to all countries as a source of economic activity. Certain farming activities can cause damage, contaminate, and degrade the environment and ecosystem. A source of pollution in farming is the burning of waste materials from agricultural activities such as land clearance, applying excessive fertilizer more than the plants' requirements, and the use of certain pest control chemicals that are nonbiodegradable (Ukaogo et al., 2020).



### **TEST YOUR MIND**

As	a	stuc	lent,	yc	ur	best
cont	rib	ution	towa	rds	red	ucing
envii	on	ment	al pol	luti	on is	S

Give your idea on how to reduce pollution at home?



# AIR POLLUTION

# WHAT IS AIR POLLUTION?

### **Definition:**

According to the World Health Organization (WHO), air pollution is contamination of the indoor or outdoor environment by any chemical, physical, or biological agent that modifies the natural characteristics of the atmosphere.

Air pollution refers to the release of pollutants into the air—pollutants which are detrimental to human health and the planet as a whole (Jillian Mackenzie, 2016).

Typically, chemical compounds that have the potential to impact air quality are what lead to air pollution. Regardless of the source, shape, or circumstance, air pollution has a wide range of dispersion and impacts.

Scan QR Code to watch the Air Pollution Video



### TYPE OF AIR POLLUTION

### Visible:

•Visible air pollution is the kind that you can see, like the smog.

### Invisible:

•Invisible air pollutants cause you can't see the pollution. For example, air pollutants from sulphur dioxide, carbon monoxide, and nitrogen oxides.

There are two types of air pollution that can be distinguished: visible and invisible.

Air pollution can also be divided into primary and secondary air pollutants.

### **Primary pollutant:**

• Primary pollution is pollution that has a direct impact on the environment. For example, the emission of sulphur dioxide from factories.

### **Secondary pollutants:**

 Secondary pollutants are caused by the intermingling and reactions of primary pollutants such as smog.

### SOURCES OF AIR POLLUTION

There are many different activities that might cause air pollution, and these activities can be further broken down into natural and manmade sources.

### Natural Sources:

Natural sources from come phenomena including natural human body emissions and windborne dust that travels to regions with less plants (carbon dioxide from humans during respiration, during methane from cattle digestion, oxygen from plants during photosynthesis). Along with the release of polluted smoke from the gases, combustion of various combustible objects, volcanic eruptions, etc., is included in the list of natural causes of pollution.





### •Man-made Sources:

The main man-made sources include transportation, agriculture/waste incineration, industry, and heating systems for buildings. The predominant element is smoke. The smoke is variety released by a combustion processes, including biomass, factories, cars, furnaces, etc. Methane is produced when waste is thrown in landfills, and it has various negative effects. The interactions of some gases with chemicals can also produce toxic vapours that are risky for the health of living things.

### CAUSES OF AIR POLLUTION

### 1. The Burning of Fossil Fuels

Fossil fuel combustion is one of the main causes of air pollution. One of the main contributors to air pollution is sulphur dioxide, which is released by the burning of fossil fuels, including coal, petroleum for power plants, and other industrial combustibles.

Billions of vehicles on the road are powered by gasoline and diesel engines that burn petroleum to release energy. Petroleum is made up of hydrocarbons, and engines don't burn them cleanly. Therefore, carbon monoxide, organic compounds, and lead are emitted from vehicles, including trucks, jeeps, cars, trains, and airplanes, causing a high level of pollution.



### CAUSES OF AIR POLLUTION

### 2. Agricultural Activities

Insecticide, pesticide, and fertilizer use in agricultural operations has increased significantly. They can pollute water and release dangerous chemicals into the air. Burning crops to clean up fields also pollutes the environment by releasing toxic chemicals into the atmosphere.



### 3. Waste in Landfills

Methane gas will be produced when garbage is buried or dumped in landfill zones. Methane is a significant greenhouse gas, highly combustible, and dangerous. E-waste also entails a great deal of unsophisticated dismantling, including chemical leaching, wire burning, and other practices.



### CAUSES OF AIR POLLUTION

### 4. Mining Operations

Minerals beneath the earth are retrieved using heavy machinery during mining. Massive air pollution is produced as a result of the process' emission of dust and chemicals into the atmosphere.



# 5. Exhaust from Factories and Industries

Factories and industries release a lot of carbon monoxide, hydrocarbons, organic compounds, and chemicals into the air, which lowers air quality.



### 6. Natural Events

Volcanoes, forest fires, and dust storms are a few examples of natural occurrences that cause air pollution.



### EFFECTS OF AIR POLLUTION

### 1. Respiratory and Heart Problems

The respiratory system of humans is affected by air pollution. Asthma, chronic bronchitis, emphysema, heart attacks, strokes, cancer, and other illnesses that affect the heart and lungs are caused by this, among other dangers to the body.

### 2. Child Health Problems

Premature birth, autism, asthma, and spectrum disorders in young children are all caused by exposure to air pollution, as well as miscarriages in pregnant women. Children who are exposed to air pollution run the risk of impairing early brain development and contracting pneumonia, which kills over a million children under the age of five every year.

### 3. Global Warming

With increased temperatures worldwide, an increase in sea levels and melting of ice from colder regions and icebergs, displacement, and loss of habitat have already signalled an impending disaster.

### 4. Acid Rain

During the burning of fossil fuels, harmful gases like nitrogen oxides and sulphur oxides are released into the atmosphere. The water droplets combine with these air pollutants, become acidic, and then fall on the ground in the form of acid rain. Acid rain can cause great damage to humans, animals, and crops.



### EFFECTS OF AIR POLLUTION

### 5. Eutrophication

Eutrophication is a condition where a lot of nitrogen, which is contained in some pollutants, builds up on the sea surface and transforms into algae, harming fish, plants, and other animal and plant species. This particular chemical alone is what causes the green algae that grows on lakes and ponds.

### 6. Effect on Wildlife

Apart from humans, animals are also affected by air pollution. When toxic chemicals are present in the air, wildlife species move to a new place and change their habitat. If the toxic contaminates the seawater's surface, it can harm sea animals.

### 7. Depletion of the Ozone Layer

The stratosphere of the planet contains ozone, which shields people from damaging ultraviolet (UV) rays. Due to the existence of hydrochlorofluorocarbons and chlorofluorocarbons in the atmosphere, the ozone layer of the Earth is thinning.

As the ozone layer deteriorates, it will reflect dangerous rays back onto the planet, which can lead to issues with the skin and eyes. Crops can be impacted by UV radiation as well.



### **TEST YOUR MIND**

air pollution?
What should we do to reduce air pollution?



# WATER POLLUTION



### WHAT IS WATER POLLUTION?

Water pollution is the release of substances into subsurface groundwater or into lakes, streams, rivers, estuaries, and oceans to the point where the substances interfere with beneficial use of the water or with the natural functioning of ecosystems. In addition to the release of substances, such as chemicals, trash, or microorganisms, water pollution may also include the release of energy, in the form of radioactivity or heat, into bodies of water (Nathanson, 2022).

According to WWF, water pollution is Water pollution happens when toxic substances enter water bodies such as lakes, rivers, oceans, and so on, getting dissolved in them, lying suspended in the water, or depositing on the bed. This degrades the quality of water. Not only does this spell disaster for aquatic ecosystems, the pollutants also seep through and reach the groundwater, which might end up in our households as contaminated water we use in our daily activities, including drinking.



Water pollution can be defined as the contamination of water bodies. Water pollution is caused when water bodies such as rivers, lakes, oceans, groundwater, and aquifers get contaminated with industrial and agricultural effluents.

When water gets polluted, it adversely affects all lifeforms that directly or indirectly depend on this source. The effects of water contamination can be felt for years to come (BYJU'S, 2022).



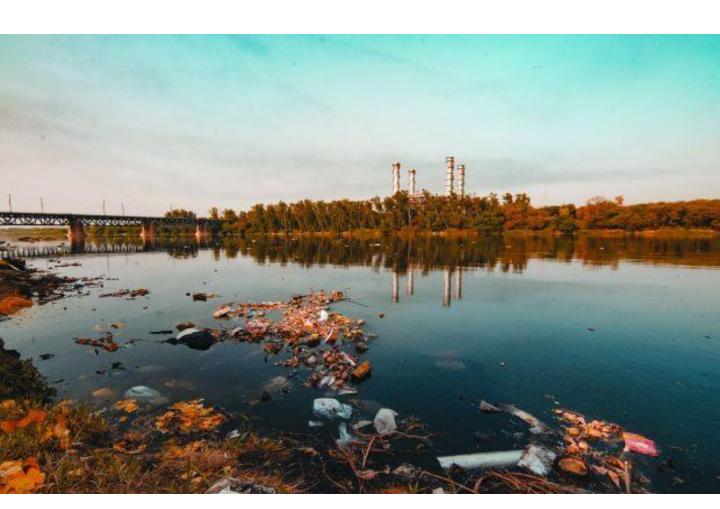
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### CAUSES OF WATER POLLUTION

When it comes to sustaining life, water is one of the most crucial components on Earth. Sadly, it is also incredibly vulnerable to pollution. This is mostly due to the fact that water is a universal solvent that can dissolve a wide variety of compounds.

While this is a wonderful quality that we take advantage of for everyday tasks such as cooking, cleaning, and taking medication, it is also the exact quality that causes water to become polluted so easily (ecok, 2019).





### CAUSES OF WATER POLLUTION

### 1. Industrial Waste

The main cause of water pollution is industrial waste. Because there aren't enough waste management mechanisms in place, many industrial sites produce waste in the form of harmful substances.

Industrial garbage from manufacturing facilities, mining operations, and agricultural sites may find its way into rivers, streams, and other waterways that flow straight into the ocean.

The toxic chemicals in the waste produced by these industries not only have the potential to make water unsafe for human consumption, but they can also cause the temperature in freshwater systems to change, making them dangerous for many water-dwelling organisms.



The process of marine dumping is exactly what it sounds like: dumping garbage into the waters of the ocean. It might seem crazy, but household garbage is still collected and dumped into oceans by many countries across the world. Most of these items can take anywhere from two to 200 years to decompose completely.

### 3. Sewage and Wastewater

Even after treatment, sewage and wastewater might include dangerous chemicals, bacteria, and pathogens. Each residence releases effluent and sewage into the sea along with fresh water. The germs and bacteria found in that waste spread disease, resulting in problems with both human and animal health.



### 4. Oil Leaks and Spills

The leaks of oil caused by accidental or drilling operations in the ocean or ships that transport oil. Oil spills can cause sea water pollution that can threaten aquatic life.

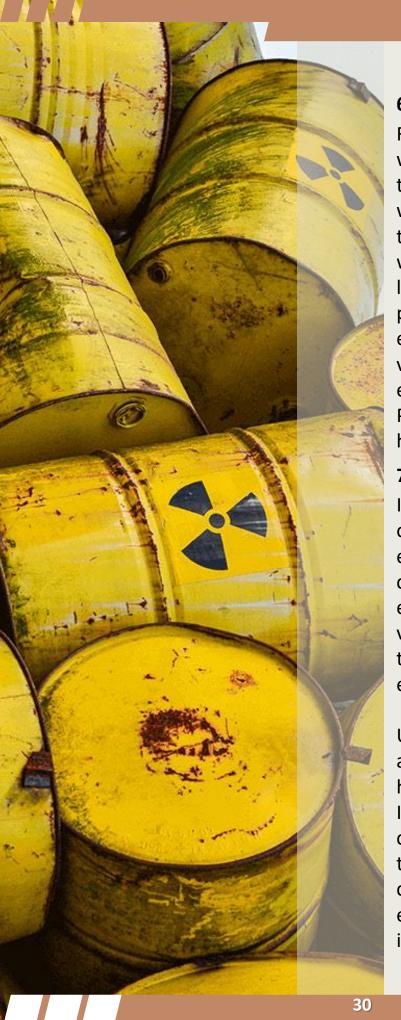


### 5. Agriculture

In the agricultural industry, farmers usually use chemicals to protect crops from being attacked by pests. When these chemical substances seep into the groundwater, they can harm animals, plants, and humans. Additionally, when it rains, the chemicals mix with rainwater, which then flows into rivers and streams that filter into the ocean, causing further water pollution.



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### 6. Global Warming

Rising temperatures due to global warming are a major concern in terms of water pollution. Global causes water warming temperatures to rise, which can kill water-dwelling animals. When large die-offs occur, it further pollutes the water supply, exacerbating the issue. There are various ways you can reduce the effects of global warming. Practicing sustainable living help reduce global warming.

### 7. Radioactive Waste

It is important to properly dispose of radioactive waste from nuclear energy production facilities since it can be very dangerous to the environment. This is due to the very poisonous nature of uranium, the metal used to produce nuclear energy.

Unfortunately, mishaps still happen at these locations, releasing harmful waste into the ecosystem. In many ways, the coal and gas companies are no better. One of the main driving forces behind the creation of alternative, clean energy sources like solar and wind is this.

# THE EFFECTS OF WATER POLLUTION

The effects of water pollution according to Iberdrola, 2022 listed as:

### Destruction of biodiversity.

Water pollution depletes aquatic ecosystems and triggers unbridled proliferation of phytoplankton in lakes.

### Contamination of the food chain.

Fishing in polluted waters and the use of waste water for livestock farming and agriculture can introduce toxins into foods which are harmful to our health when eaten

### Lack of potable water.

The UN says that billions of people around the world have no access to clean water to drink or sanitation, particularly in rural areas.

### Disease.

The WHO estimates that about 2 billion people have no option but to drink water contaminated by excrement, exposing them to diseases such as cholera, hepatitis A and dysentery.

### Infant mortality.

According to the UN, diarrhoeal diseases linked to lack of hygiene cause the death of about 1,000 children a day worldwide.

### **TEST YOUR MIND**

What are the effects of water pollution on humans?
What are the effects of water pollution on animals?





### WHAT IS LAND POLLUTION?

Land pollution refers to the deterioration of the earth's land surfaces, at and below ground level. The cause is the accumulation of solid and liquid waste materials that contaminate groundwater and soil. These waste materials are often referred to as municipal solid waste (MSW), which includes both hazardous and non-hazardous waste.

(Texas Disposal Systems, 2022)



### CAUSES OF LAND POLLUTION

### 1. Litter

Pedestrians and drivers are the ones who leave trash on the side of the road, such as food wrappers and cigarette butts. However, not all of this trash is done knowingly; occasionally, it happens accidentally. Only a small portion of the waste that is thrown away equals this quantity. The disposal produces a significant volume of waste that either falls from the car or leaks out of the trash can. Whether it is done on purpose or not, all litter pollutes the environment by breaking down and releasing microparticles and toxins.



### 2. Urbanization & Construction

population growth may Urban cause rapid construction to occur accommodate the growing population. Metal, plastic, wood, and bricks were among the waste materials created by construction site. If building trash is not correctly managed, it will pollute the land. By ensuring that waste management is correctly managed, development needs to be carried out in a way that lessens its negative environmental effects.





### 3. Mining

Mining is the process of removing minerals from rock in order to make energy, sell commodities like gold and silver, and manufacture fuel for cars. using this practice However. and pollutes the harms environment. If the consumption of these natural resources is not restrained, they will diminish and run out. Active mining operations will also result in a rise in pollution. In order to limit the consumption of natural resources and soil contamination, renewable energy sources must be replaced.

## 4. Agriculture

Agriculture has a significant role in the nation's economic development. Agricultural pollution is when a significant amount of contamination produced as a byproduct of raising animals and cultivating food crops is released into the environment.



# EFFECTS OF LAND POLLUTION

#### **SOIL POLLUTION**

Soil pollution occurs when the surface of the soil is disturbed or damaged. This happens as a result of using chemical fertilizers, soil erosion triggered by running water, and other pest control measures, leading to the loss of fertile land for agriculture, forest cover, fodder patches for grazing, etc.



#### 2. GROUNDWATER POISONING

When hazardous chemicals from industrial activities are dumped on the soil and may up in the groundwater system, wind groundwater poisoning occurs. The health of animals, plants, and people may be impacted by the process of leaching from farms, industrial facilities, and landfills.



#### 3. CHANGE IN CLIMATE PATTERNS

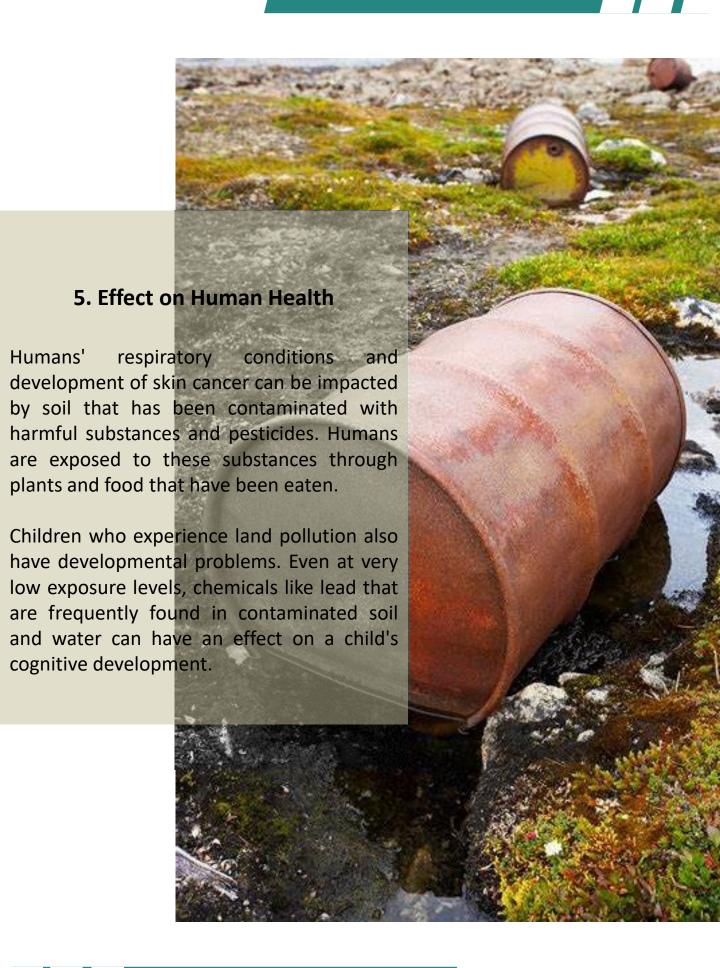
Climate change is impacted both directly and indirectly by soil degradation. Polluted soil will have an impact on the ecology. Living things including humans, animals, and plants will be impacted by this.



#### 4. ENVIRONMENTAL IMPACT

D Forests have a crucial role in controlling the micro and macroclimate, which is why they are crucial for the existence of all living creatures. As a result, climate instability such as erratic rainfall cycles is brought on by deforestation. Natural catastrophes including climate change, the greenhouse effect, erratic rainfall, and flash floods have been brought on deforestation.





## **TEST YOUR MIND**

Which is not a source of land pollution?

- A. Cutting the grass
- B. Litering
- C. Pouring gasoline on plants
- D. Emptying waste products on someones land

#### Which selection is TRUE

- A. Land pollution is caused by smog
- B. Land pollution is consist of any harmful substance to the land
- C. Land pollution always starts in January
- D. land pollution is when an harmful substance enters the body of water



# NOISE POLLUTION



# WHAT IS NOISE POLLUTION

According to Nathanson et.all, 2007 noise pollution refer to unwanted or excessive sound that can have deleterious effects on human health, wildlife, and environmental quality. Noise pollution is commonly generated inside many industrial facilities and some other workplaces, but it also comes from highway, railway, and airplane traffic and from outdoor construction activities.

Noise pollution is generally defined as regular exposure to elevated sound levels that may lead to adverse effects in humans or other living organisms. According to the World Health Organization, sound levels of less than 70 dB are not damaging to living organisms, regardless of how long or consistent the exposure is. Exposure for more than 8 hours to constant noise beyond 85 dB may be hazardous. If you work for 8 hours daily in close proximity to a busy road or highway, you are very likely exposed to traffic noise pollution of around 85dB (Environmental Pollution Centres, 2022).

Noise pollution can be defined as any disturbing or unwanted noise that interferes or harms humans or wildlife. Although noise constantly surrounds us, noise pollution generally receives less attention than water quality and air quality issues because it cannot be seen, tasted, or smelled (Elson & Ince, 1993).

# TYPES OF NOISE POLLUTION

Noise pollution comes in two different types.

## Man-Made Noise

#### **Environmental Noise**

Man-made noise produced by humans is from human activities such as construction work, noise from the air, vehicle traffic, household noise, noise from pubs and bars, and others. This form of noise is extremely harmful to humans. It varies from 30 to a whopping 140 dB.

Noise from the environment results from various environmental activities such as volcanic eruptions, the sound of animals barking, the sound of lightning, and so on. This sound is considered dangerous when it reaches 140 dB.



## CAUSES OF NOISE POLLUTION

#### 1. Industrialization

Heavy machinery such as compressors, generators, exhaust fans, and grinding mills for industry produces loud noises and can cause noise pollution. Earplugs are required to protect the ears from injury at work due to loud noises. However, the effects of this noise can cause long-term hearing damage.

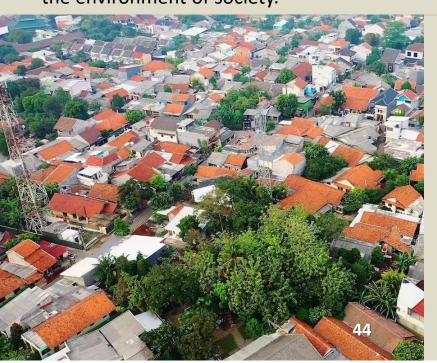




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## 2. Poor Urban Planning

In most developing countries with high population density, the lack of urban planning leads to congested houses. Houses that are built in compact conditions can cause noise pollution where large families share small space, fight over parking, frequent fights and many other problems that may disrupt the environment of society.



The residential areas that are set near industrial buildings also become the sources of noise pollution. Noise from industrial properties might hinder the well-being of basic individuals living in residential properties. This because if the noise situation causes disturbance to the sleep hours, it will affect their health.

#### 3. Social Events

Social events in residential areas contribute to noise pollution. For example, marriages, parties, pubs, discs, or places of worship will have an impact on loud noises that cause disturbance to people. In addition, playing songs on full volume and dancing till midnight can cause discomfort and disturb the residents who live nearby. Loud noise can also occur with buying and selling activities at the night market or farmer's market. Although the effect of this loud noise is not noticeable in the short term, it can affect the individual's hearing abilities in the long term.



#### 4. Transportation

Congested vehicles contribute to road noise. Airplanes flying over houses and underground trains producing heavy noise find it difficult to get accustomed to that. A loud noise can cause a person to lose the ability to hear well.





#### 5. Construction Activities

Construction activities like mining, construction of bridges, dams, buildings, stations, roads can produce a loud noise. Construction activities never end in view of the growing human population. The noise from construction activities causes hearing loss in individuals exposed to this sound, including construction workers, local communities, or people passing through the area.

## 6. Household Chores

Daily activities in a household can also create loud noises. Electrical appliances like mobiles, mixer TVs, grinders, pressure cookers, vacuum cleaners. washing machines, dryers, coolers, and air conditioners are minor contributors amount of noise that to the produced. Even though these activities contribute to the small amount of sound, it can still affect the daily routine.



## 7. Noise from Air Traffic

Apart from air pollution, aeroplanes can also contribute to noise pollution. The noise from a single aircraft produces 130 dB.

This can cause hearing problems in individuals who are exposed to loud noises. The frequency of travel by aircraft causes more noise pollution to be produced.



## EFFECTS OF NOISE POLLUTION

## 1. Hearing Problem

Any sound that is too loud will damage the eardrum and cause hearing problems. If you work in an exposed area, preventive measures should be considered. Continuous exposure to loud noises will cause damage to eardrums and loss of hearing, causing tinnitus or deafness.



## 2. Psychological Issues

Other than hearing problems, loud noises can also cause emotional and psychological for stress people. Continuous noise disturbance result in loss of control and failure to think properly, leading to a decline in performance. Excessive noise that disturbs rest and sleep can also increase nerve and muscle tension, anxiety, irritability, and depression, which increases the potential for cardiovascular diseases and high blood pressure.



## 3. Physical Problems

Loud noise can also cause health problems for people. For example, exposure to extremely loud noise can cause high blood pressure, respiratory agitation, racing pulse, gastritis, colitis, and even heart attacks may occur.



## 4. Cognitive Issues & Behavioural Changes

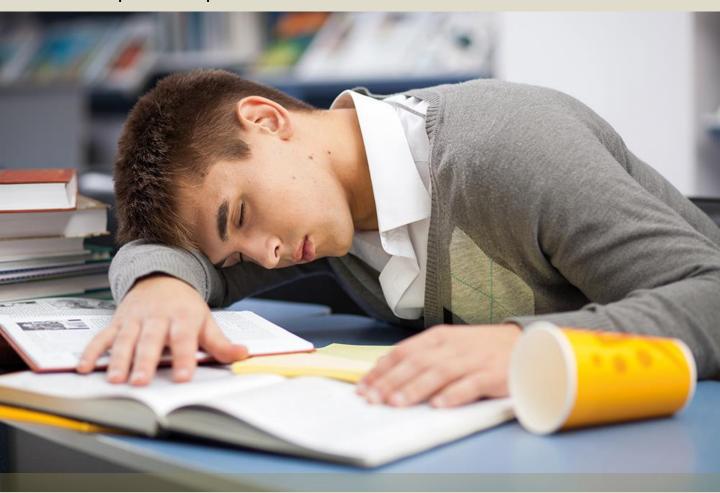
A decrease in work performance can occur as a result of losing concentration due to exposure to continuous noise. Too much noise when it goes to the brain leads to lower response rates as well as making the mind dull. For students, noise can affect their poor memory, making it hard to study. Children living near to noisy areas such as railway stations or airports have problems in learning, according to the studies. Some of the studies found that people who live near airports or busy roads usually have a higher incidence of headaches, take more sleeping pills and sedatives, are more prone to minor accidents, and are more likely to seek psychiatric treatment.



#### 5. Sleeping Disorders

A good sleep pattern will make the body healthier in carrying out daily affairs. However, excessive noise levels are likely to disrupt sleep patterns and lead to irritation and uncomfortable situations.

Irregular or restless sleep patterns cause various problems related to fatigue. This will affect performance in the office as well as at home. Changing a healthy lifestyle can reduce the risk of diseases caused by lack of sleep or adequate rest.



#### 6. Cardiovascular Issues

Problems that may occur as a result of noise are high blood pressure, cardiovascular disease, and heart problems related to stress are increasing. In order to prevent this situation from continuing, the understanding of noise pollution needs to be considered so that this situation can be controlled from becoming worse.



#### 7. Trouble Communicating

Loud noise can affect communication between people. Misunderstandings may occur as a result of voices that are not clearly heard and it is difficult to understand others. Constant loud noises can also cause you severe headaches and disturb your emotional balance.

#### 8. Effect on Wildlife

Noise pollution can also affect wildlife other than humans. Animals have a better sense of hearing because their survival depends on it. A study published in Biology Letters found that sounds created by humans affect a wide variety of animals. The negative effects of excessive noise start at home. Pets react more aggressively where there is constant noise. This is because they become more easily confused and face many behavioral problems. In nature, animals may suffer from hearing loss, which makes them easy prey and leads to dwindling populations. It also becomes inefficient in hunting and will disturb the balance of the ecosystem.



# **TEST YOUR MIND**

What types of noise pollution do you hate the most? And why?
Do you think noise pollution should be taken as a serious issue?



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