



AMERICAN SOCIETY OF
SAFETY PROFESSIONALS

Nigeria Chapter

Working together for a safer, stronger future.

Pollution: Types, Prevention and Control

**7th ASSP Nigeria Chapter PDC
Productivity & Profitability Matrices in HSE
System**

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Learning Points

- Introduction
- Definitions
- Types and Causes of Pollution
- Health and Environmental Impact
- Preventive Measures
- Remedial Actions
- Pollution Short Story (Video)
- Conclusion

Introduction

- Nature is a mother that has lovingly provided human beings with all facilities that leads to a comfortable and peaceful life. The plants, trees and grains we cultivate; grow through rainfall and sunshine which are free gifts of nature.
- Instead of being grateful to nature; man pollutes the surroundings, brings destruction to himself and disrupts the ecosystem. Pollution has led to series of catastrophic situations like floods, forest fires, global warming, earthquakes etc.
- The activities of man can be curbed through review, control and reduction in the level of pollutant generation.

Definitions

- **Pollution:** refers to the introduction of contaminants into the natural environment that causes adverse changes.
- **Pollutant:** this is a substance or energy introduced into the environment that adversely affects the usefulness of a resource or has undesired effects.
- **Environment:** can be defined as the biotic (living) / abiotic (non-living) things, chemicals, other natural forces and how they interact with themselves to adapt to conditions within the surroundings.
- **Site Remediation:** refers to the process of removing polluted or contaminated soil, sediment, surface water, or groundwater, to reduce the impact on people or the environment.

Definitions

- Contaminant: refers to any potentially undesirable substance (physical, chemical or biological) that makes the environment impure.
- Biosparging: this is an in-situ remediation technology that uses indigenous microorganisms to biodegrade organic constituents in the saturated zone.

Types and Causes of Pollution

Pollution is classified into the following types namely:

- Air pollution.
- Water pollution.
- Land pollution.
- Noise pollution.
- Light pollution.

Types and Causes of Pollution

- Air Pollution.

This is the introduction of biological molecules, particulates or other harmful materials into the Earth's atmosphere. It causes harm to the environment, diseases, death of humans and other living organism.



Types and Causes of Pollution

Causes of Air Pollution

Primary Pollutants	Secondary Pollutants
<p>These are emitted directly from a source. Examples are:</p>	<p>These are formed as a result of the pollutants emitted from different sources reacting with molecules in the atmosphere. Examples are:</p>
<ul style="list-style-type: none">• Oxides of Carbon (Carbon monoxide, Carbon dioxide) – from fossil fuel burning, deforestation	<ul style="list-style-type: none">• Particulates – from diesel engines, thermal power plants etc.
<ul style="list-style-type: none">• Nitrogen Oxides (NO_x) – from burning of fossil fuels.	<ul style="list-style-type: none">• Hydrocarbons – from petrol engines
<ul style="list-style-type: none">• Sulphur Oxides (SO_x) – from the burning of Sulphur containing compounds, fossil fuels etc.	<ul style="list-style-type: none">• Nitric acid – from the reaction between NO_x and water molecules in the atmosphere.
<ul style="list-style-type: none">• Lead Compounds – from petrol engines.	<ul style="list-style-type: none">• Sulphuric acid – from the reaction between SO_x and water molecules in the atmosphere.
<ul style="list-style-type: none">• Chlorofluorocarbons (CFs) reduce the amount of ozone in the atmosphere. CFCs come from -<ul style="list-style-type: none">○ the burning of plastic foam items○ leaking refrigerator equipment○ spray cans.	

Types and Causes of Pollution

- Water Pollution.

This is the introduction of chemical, physical or biological materials to a water body (ocean, rivers, streams etc.). The materials degrade the quality of the water and affects the organisms living in it.



Types and Causes of Pollution

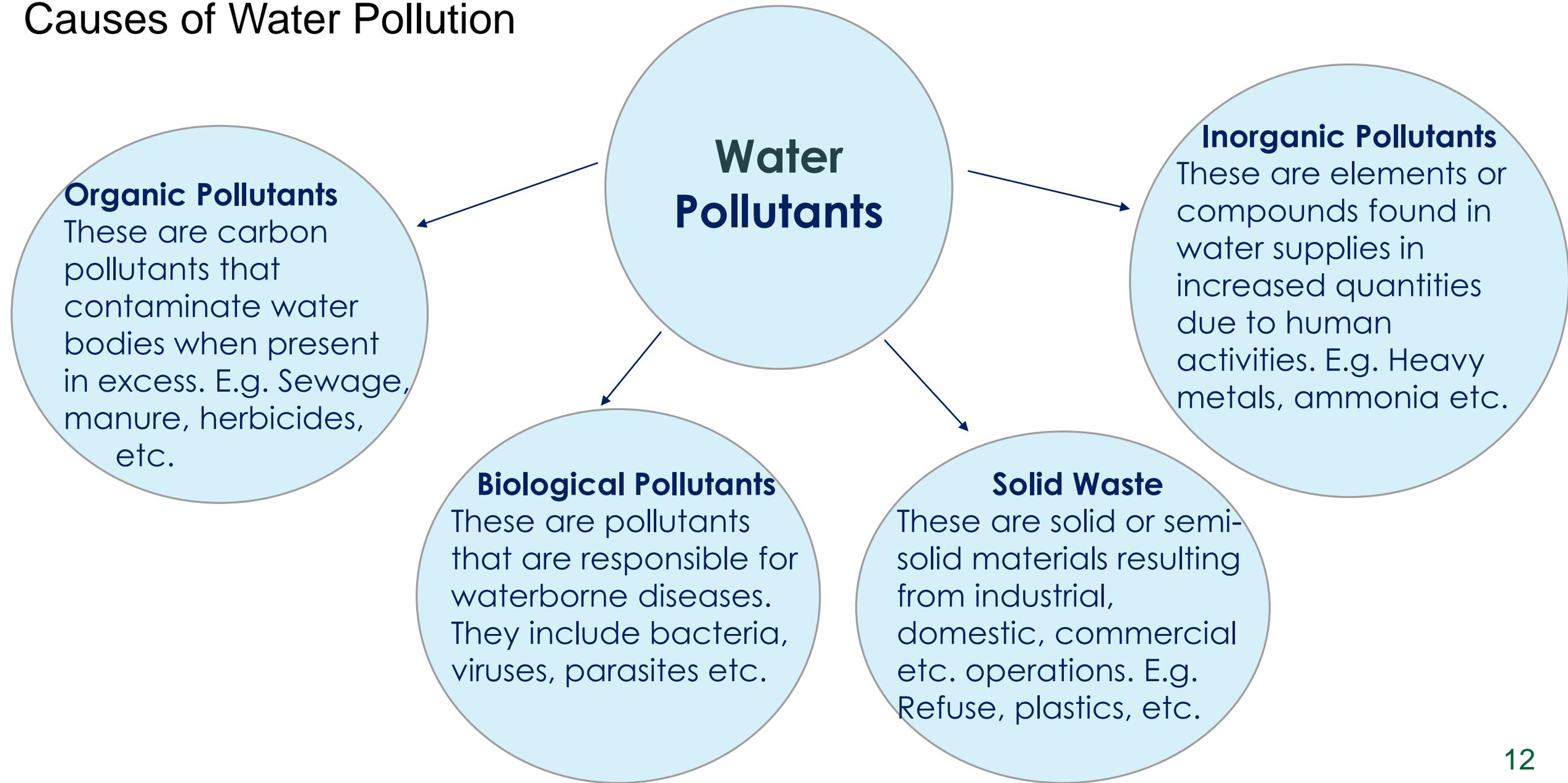
Causes of Water Pollution

The factors that contribute to water pollution can be categorized into the following;

S/N	Point Sources	Non- Point Sources
1	These are easy to identify and control. Some examples are discharges from:	These are ambiguously defined and harder to control. Some examples are:
2	Factories	The runoff of fertilizers / manure from farms into the ground water system or nearby streams.
3	Sewage Systems	Natural disasters like flash floods and hurricanes that cause the intermixing of water with harmful substances on the land.
4	Power Plants	Deposit of materials by rain in major water bodies.
5	Underground Coalmines	“Eutrophication” the process by which a body of water becomes enriched in dissolved nutrients that stimulate the growth of aquatic plant life usually resulting in the depletion of dissolved oxygen. This occurs as a result of the presence of detergents in the water body.
6	Oil Wells	

Types and Causes of Pollution

Causes of Water Pollution



Types and Causes of Pollution

- Land Pollution.

This is the degradation of the earth's land surface through misuse of the soil by poor agricultural practices, mineral exploitation, industrial waste dumping, and indiscriminate disposal of urban wastes.



Types and Causes of Pollution

Causes of Land Pollution

Land Pollutants

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graph TD; LP[Land Pollutants] --> BA[Biological Agents]; LP --> AP[Agricultural Practices]; LP --> IW[Industrial Waste]; LP --> UW[Urban Waste]; LP --> RP[Radioactive Pollutants];
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Biological Agents.

Biological agents work inside the soil to introduce manures and digested sludge (coming from the human, bird and animal excreta) into the soil.

Agricultural Practices

The soil of the crops is polluted to a large extent with pesticides, fertilizers, herbicides, slurry, debris, and manure.

Industrial Waste

Steel, pesticides, textiles, drugs, glass, cement, petroleum, etc. are produced by paper mills, oil refineries, sugar factories, petroleum industries and others as such.

Urban Waste

Urban waste consists of rags and rubbish materials, plastics, dried sludge and sewage from domestic / commercial waste.

Radioactive Pollutants
Radioactive substances such as Radium, Thorium, Uranium, Nitrogen, etc. can infiltrate the soil and create toxic effects.

Types and Causes of Pollution

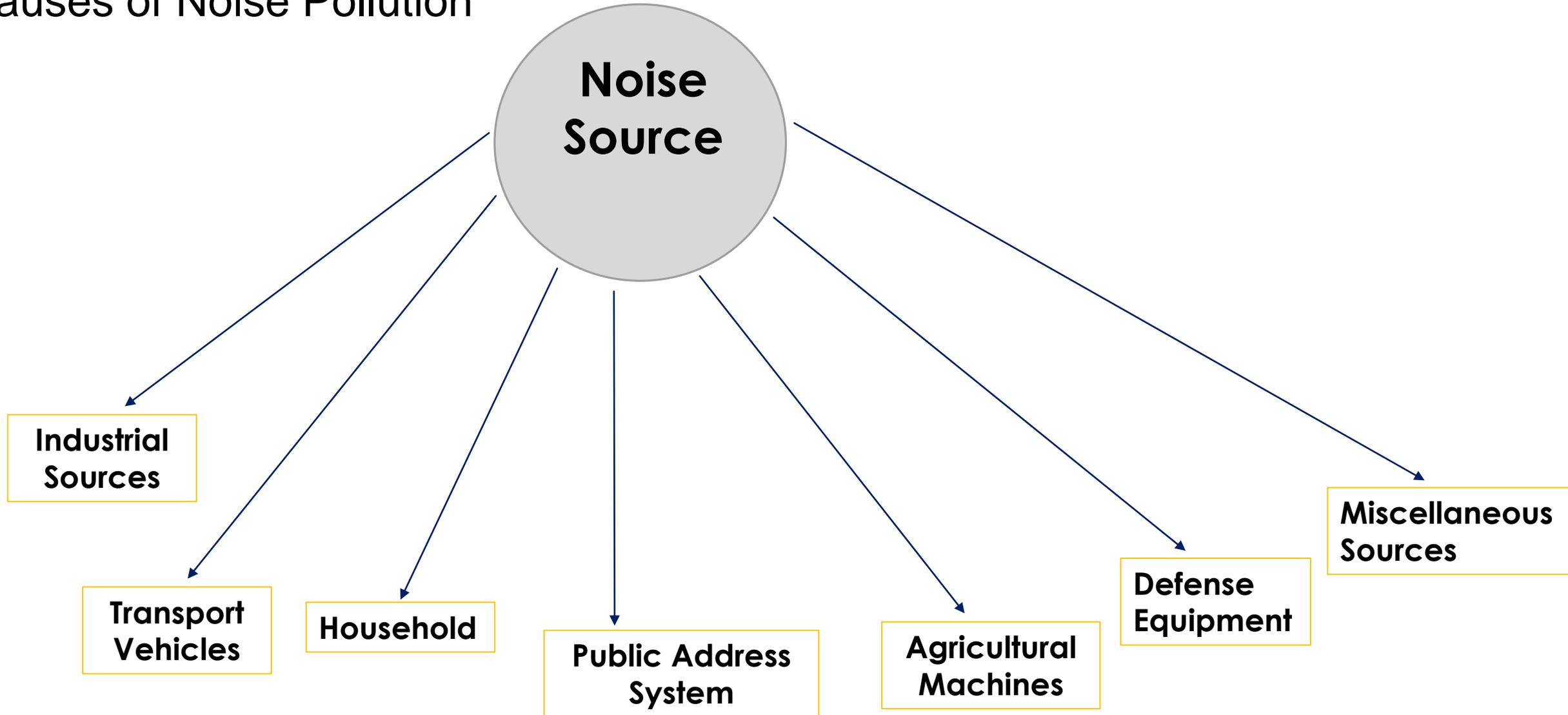
- Noise Pollution.

This is the exposure to excess amount of sound that is not pleasant to the ears. Noise may be continuous, intermittent, of high frequency or low frequency.



Types and Causes of Pollution

Causes of Noise Pollution



Types and Causes of Pollution

- Light Pollution.

This is also known as photopollution or luminous pollution.

It occurs due to prolonged and excessive use of artificial lights at night. It has a disruptive effect on natural cycles and inhibits the observation of stars and planets.



Types and Causes of Pollution

Types of Light Pollution

- Light trespass: occurs when a light fixture casts illumination beyond the property lines, unintentionally illuminating other homes, businesses or areas. It is also known as spill light.



- Glare: is a visual sensation that occurs when the light source is brighter than the light your eyes are accustomed to.

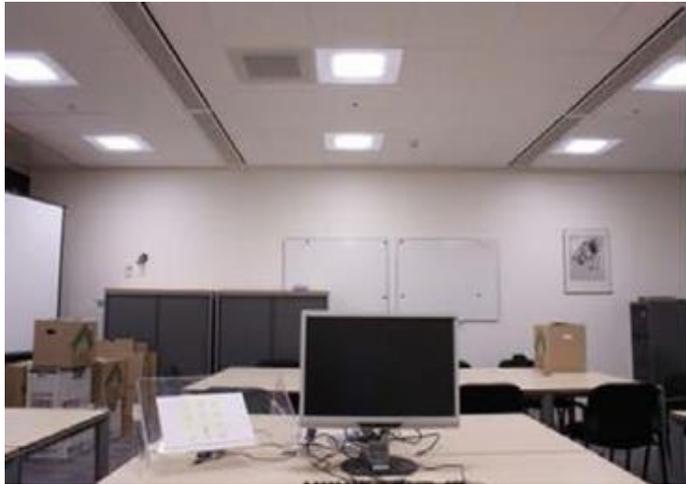
Glare takes place in the following forms:



Types and Causes of Pollution

Types of Light Pollution

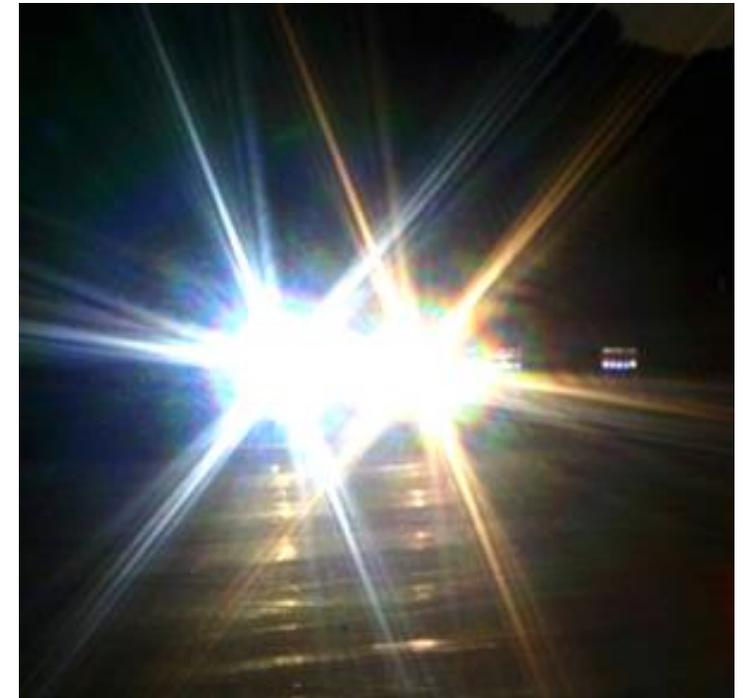
- Discomfort glare – this is also known as psychological glare and it occurs when lighting causes irritation but does not decrease visual performance. The physical discomfort is short term and the most common type of glare. This can be reduced through the installation of non-uniform lighting systems in the home.



Types and Causes of Pollution

Types of Light Pollution

- Disability glare – also referred to as veiling glare occurs when stray light scatters in the eye, producing a veil over the retina, affecting visual performance. Veiling glare reduces contrast as well as color and spatial perception, which can lead to unsafe driving conditions.



Types and Causes of Pollution

Types of Light Pollution

- Blinding glare – also known as dazzle or absolute glare occurs when a light source impairs the field of vision, preventing the eye from seeing anything but the light source. Visual performance may remain affected for some time well after the incident.



Types and Causes of Pollution

Types of Light Pollution

- Sky glow: this occurs when light is emitted directly into the atmosphere, accidentally or purposefully. The light is scattered by dust and gas molecules, creating a dome-like orange glow that covers the night sky. The glow reduces the contrast between the stars and the galaxies in the sky, making celestial objects difficult to see even with a telescope.



Types and Causes of Pollution

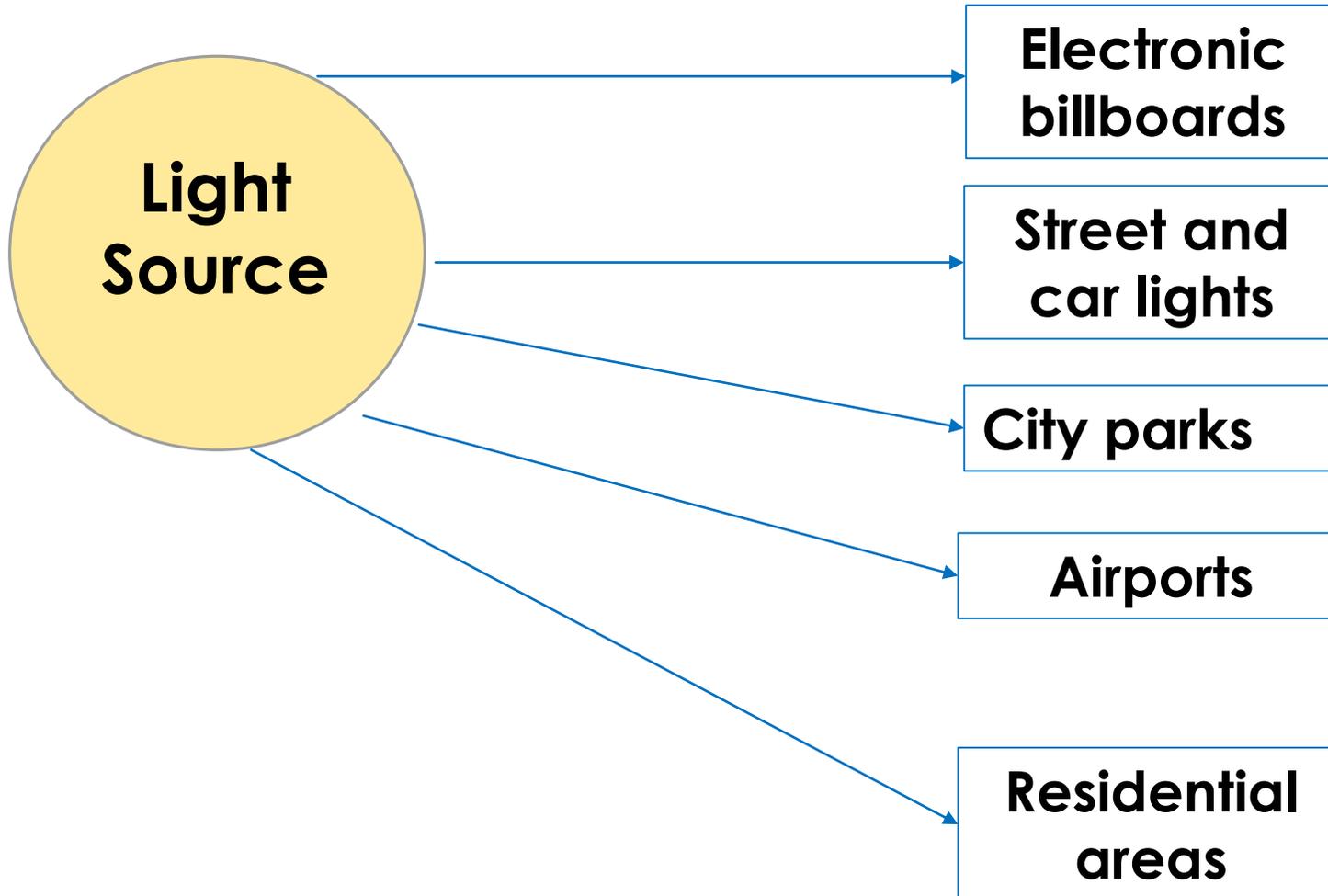
Types of Light Pollution

- Light clutter: refers to the excessive grouping of lights that can cause distraction to oncoming or surrounding objects. Light clutter is visible on roads surrounded by unshielded street lights and brightly lit advertisements or signs. Clutter contributes to other forms of light pollution, including light trespass, glare, and sky glow. It creates a hazardous environment for drivers and pilots because it competes with traffic and navigation signals.



Types and Causes of Pollution

■ Sources of Light Pollution



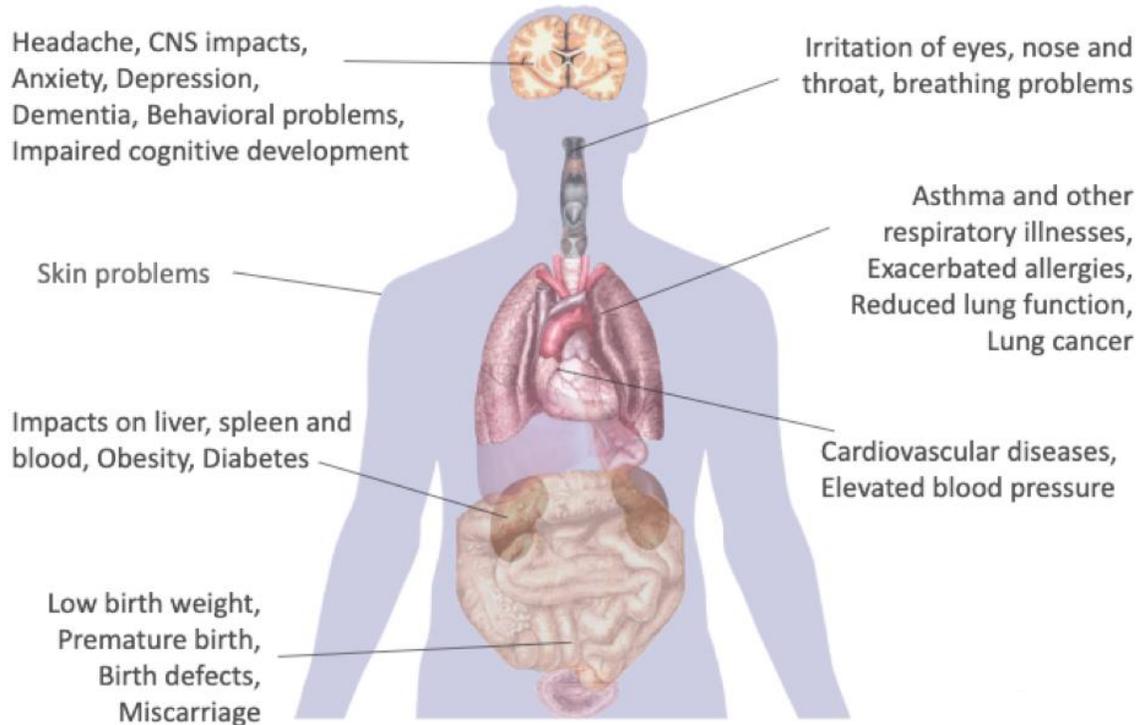
Health and Environmental Impact

Health Impact.

Type of Pollution	Air Pollution	Water Pollution	Land Pollution	Noise Pollution	Light Pollution
Effects	<ul style="list-style-type: none"> • Irritation of eyes. • Asthma • Chest pain, respiratory infections • Reduced energy level. • Throat inflammation • Heart and lung diseases 	<ul style="list-style-type: none"> • Allergies • Skin rashes • Stomach ache • Nausea and vomiting 	<ul style="list-style-type: none"> • Skin rashes • Loss of access to food. • Cancer • Public health threats 	<ul style="list-style-type: none"> • Hearing loss • Stress • High blood pressure • Sleep loss • Productivity loss • Distraction • Headache 	<ul style="list-style-type: none"> • Sleeping disorders • Anxiety • Depression • Insomnia • Melatonin (hormone that regulates the sleep and wake cycle) deficiency • Mood disorders

Health and Environmental Impact

Health Impact.

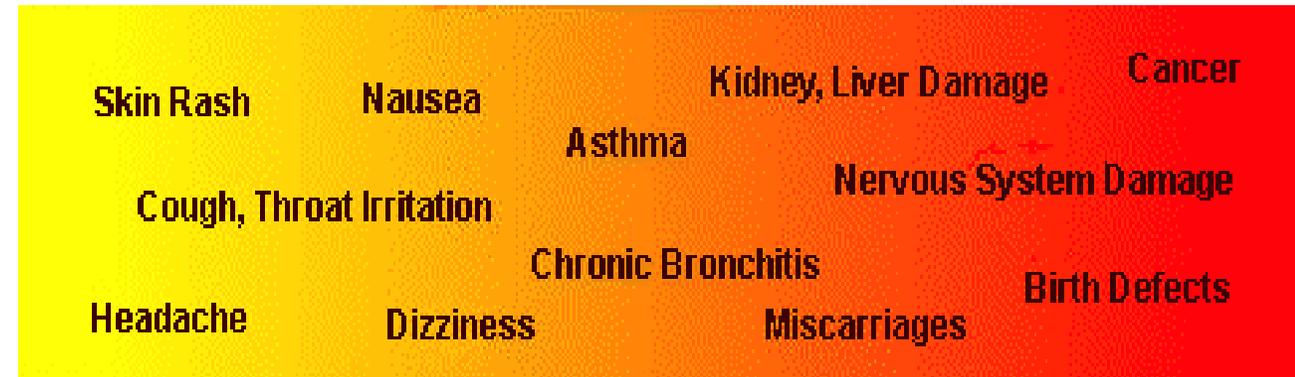


HEALTH EFFECTS OF AIR POLLUTION

Less Serious
reversible
not debilitating
not life-threatening



More Serious
irreversible
debilitating
life-threatening



HEALTH EFFECTS OF WATER POLLUTION

Health and Environmental Impact

Health Impact.



Diarrhea



Vomiting



Typhoid



Diphtheria



Hepatitis



Kidney Damage

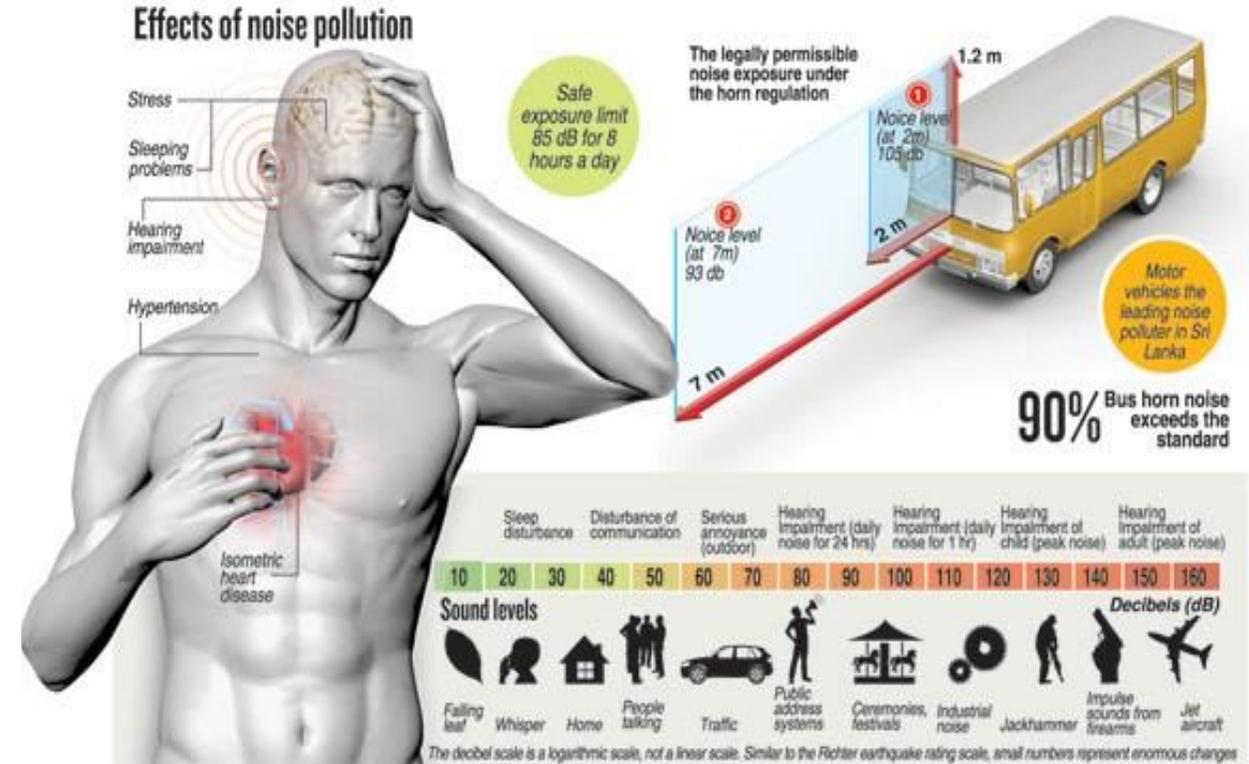


Nerve Disorders



Skin Lesions

HEALTH EFFECTS OF LAND POLLUTION



HEALTH EFFECTS OF NOISE POLLUTION

Health and Environmental Impact

■ Health Impact.

Health Effects of Light Pollution

The infographic features a central white silhouette of a person walking a dog on a leash. To the right, a white bird is shown in flight. Below the person and dog, a large white circle contains silhouettes of a turtle and a frog. Five orange text boxes are connected to these silhouettes by thin white lines, detailing the effects of light pollution on each group.

Humans

- ★ Interferes with melatonin production which regulates daily cycle of systemic activities
- ★ Glare reduces contrast sensitivity, and color perception

Birds

- ★ Artificial lights can cause migrating birds to wander off course and never reach their natural destination

Reptiles

- ★ Decrease in mating, resulting in diminished populations
- ★ Increased vulnerability to natural predators and unusual ones like cars and humans

Mammals

- ★ Difficulty foraging for food due to too much light
- ★ Exposure to predators that would otherwise be unable to see them

Amphibians

- ★ A decrease in reproduction, resulting in lower populations
- ★ Confusion of natural instincts that protect against predators

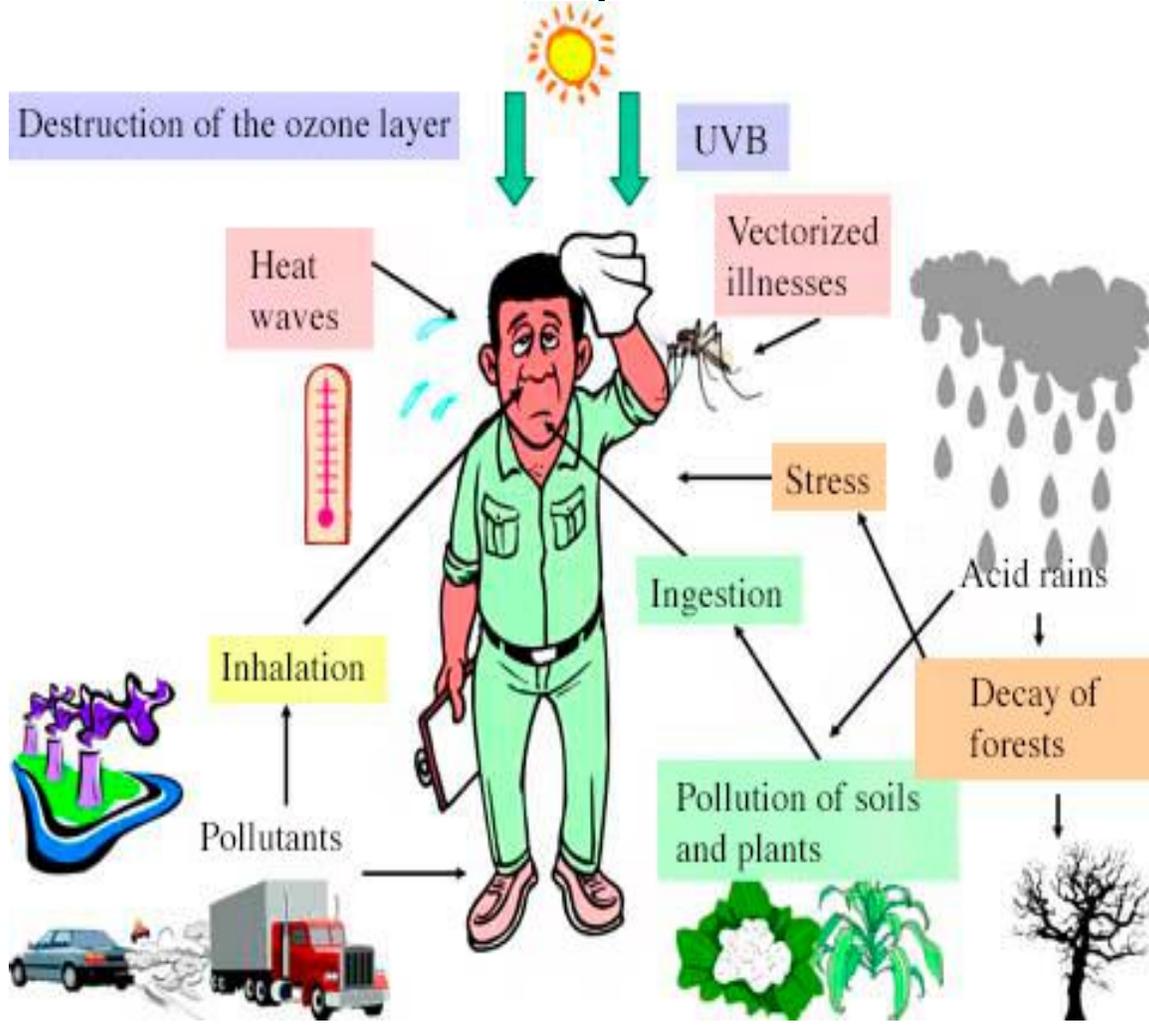
References

Chesniuk, Ron. "Missing the Dark: Health Effects of Light Pollution." *Environmental Health Perspectives* Volume 117, Number 1, January 2009

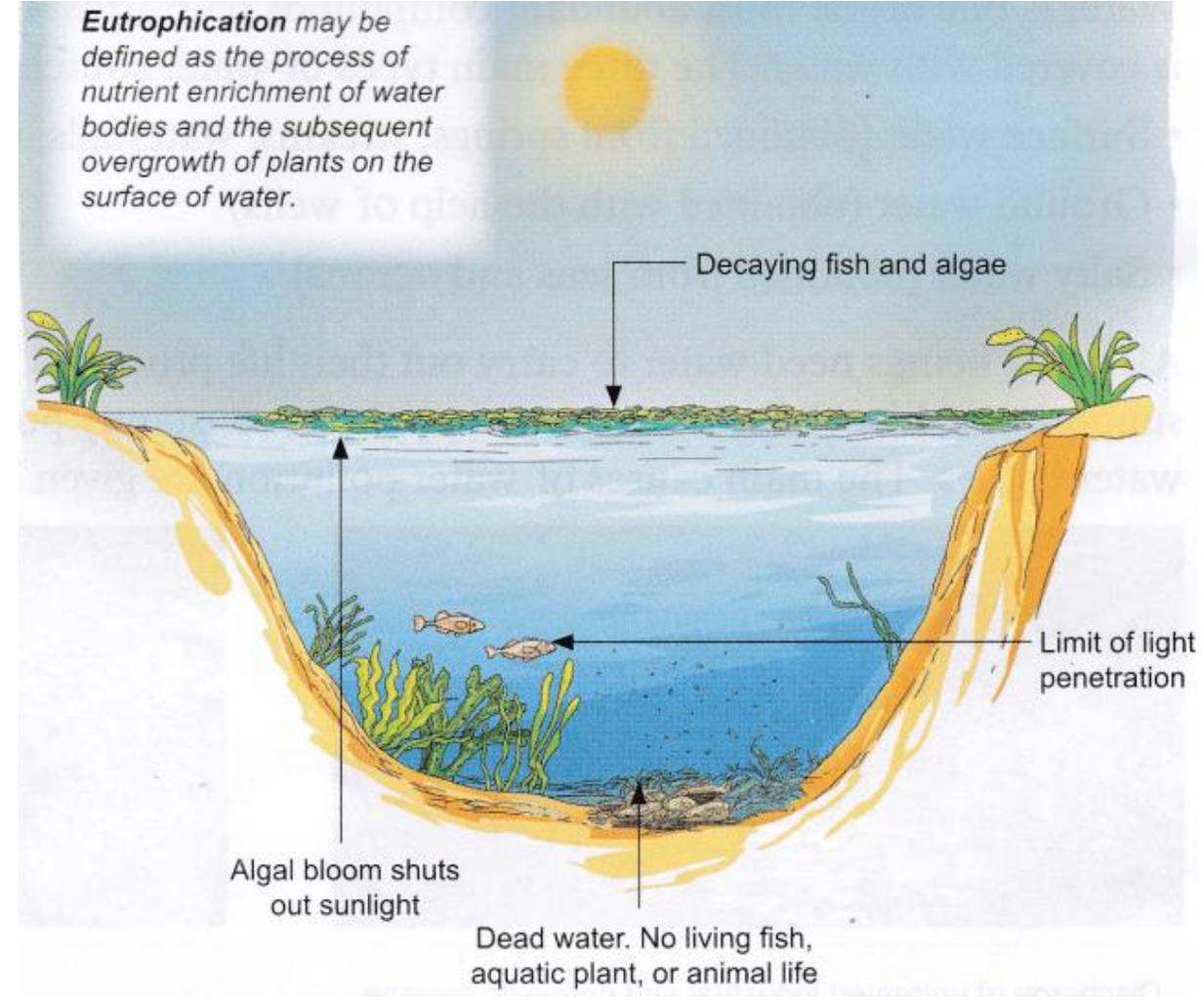
HEALTH EFFECTS OF LIGHT POLLUTION

Health and Environmental Impact

■ Environmental Impact.



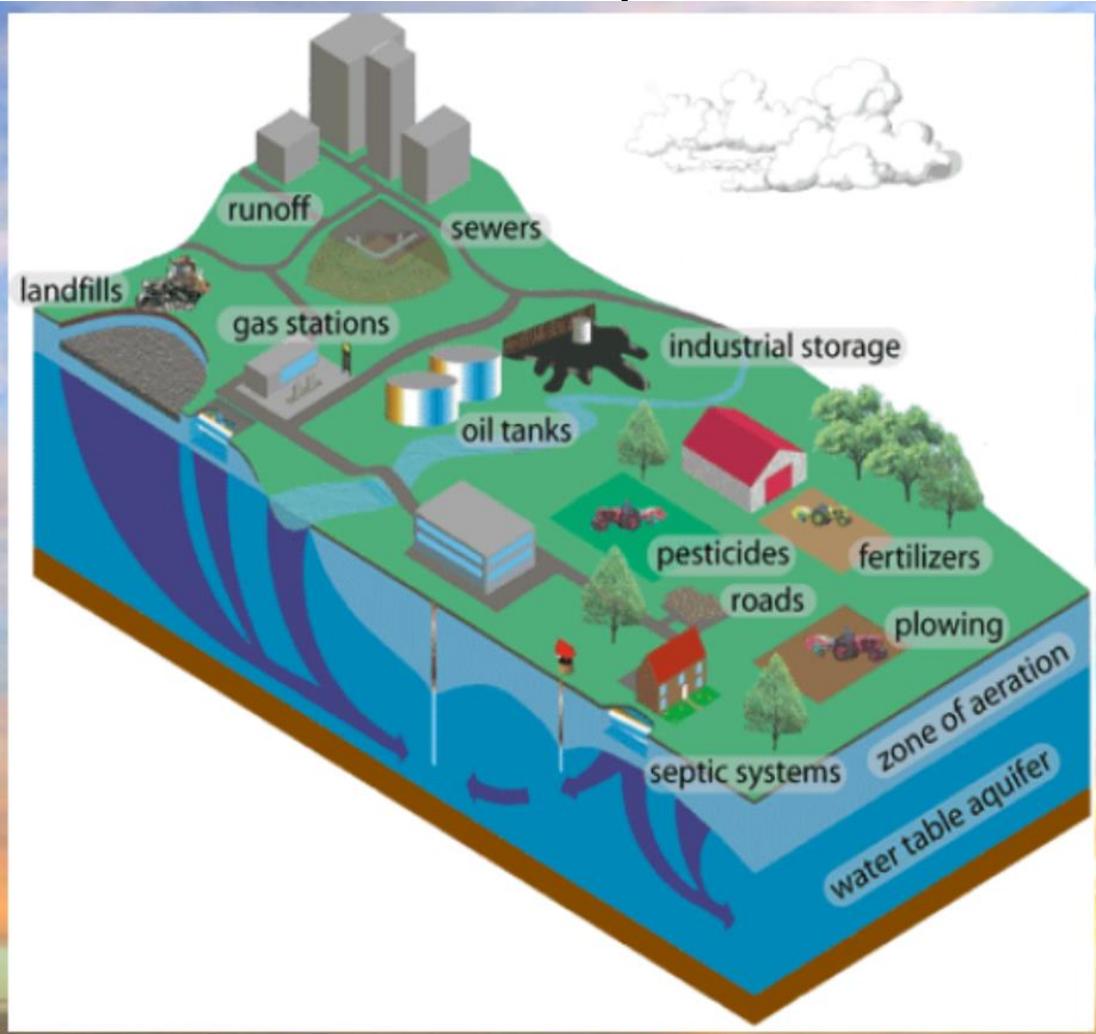
EFFECTS OF AIR POLLUTION



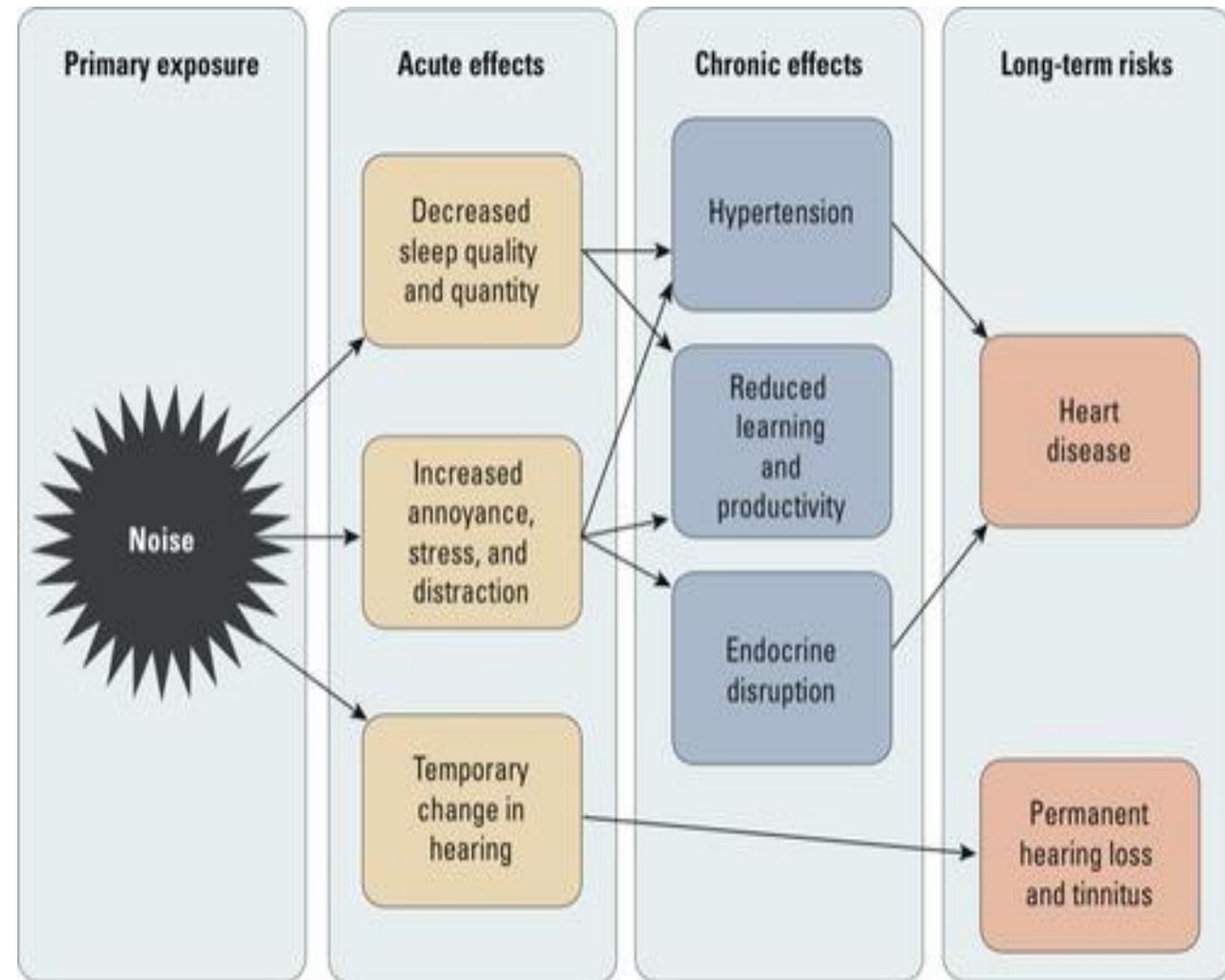
EFFECTS OF WATER POLLUTION

Health and Environmental Impact

■ Environmental Impact.



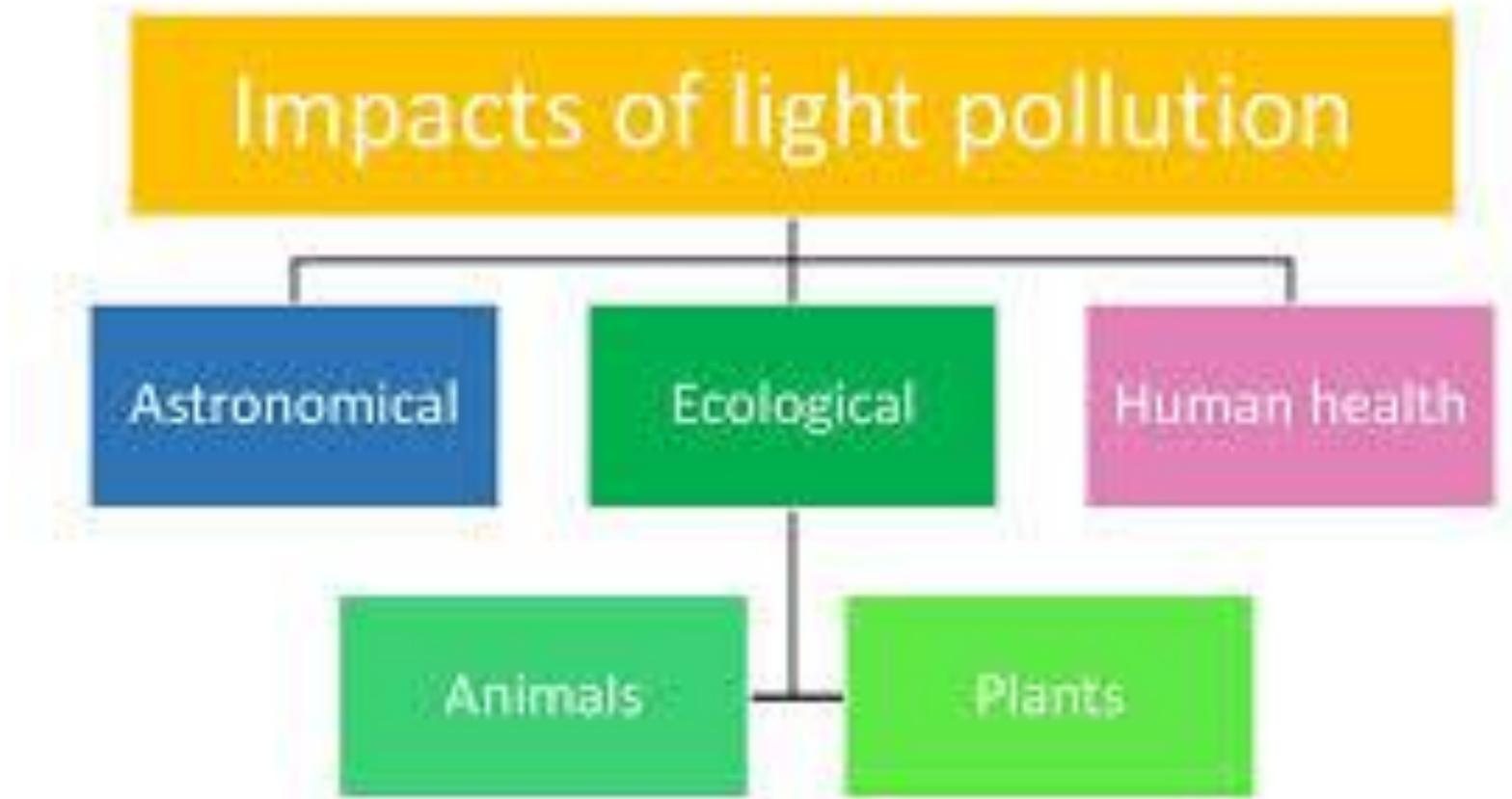
EFFECTS OF LAND POLLUTION



EFFECTS OF NOISE POLLUTION

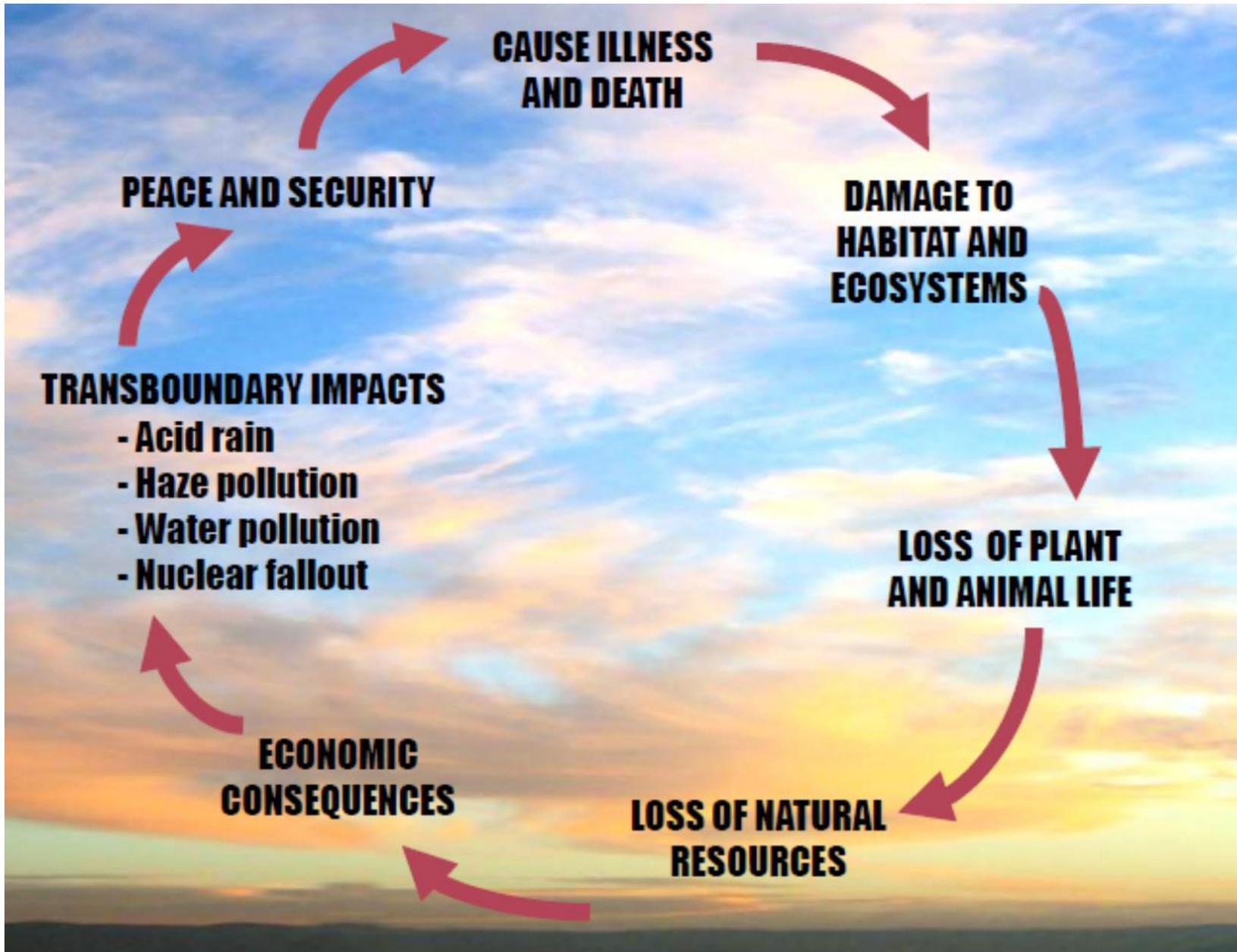
Health and Environmental Impact

- Environmental Impact.



EFFECTS OF LIGHT POLLUTION

Health and Environmental Impact



Preventive Measures

- Pollution prevention (P2) is the use of materials, processes or practices that reduce or eliminate the creation of pollutants or wastes at the source.
- Reducing the amount of pollution produced means less waste to control, treat, or dispose of. Less pollution means less hazards posed to public health and the environment.



Preventive Measures

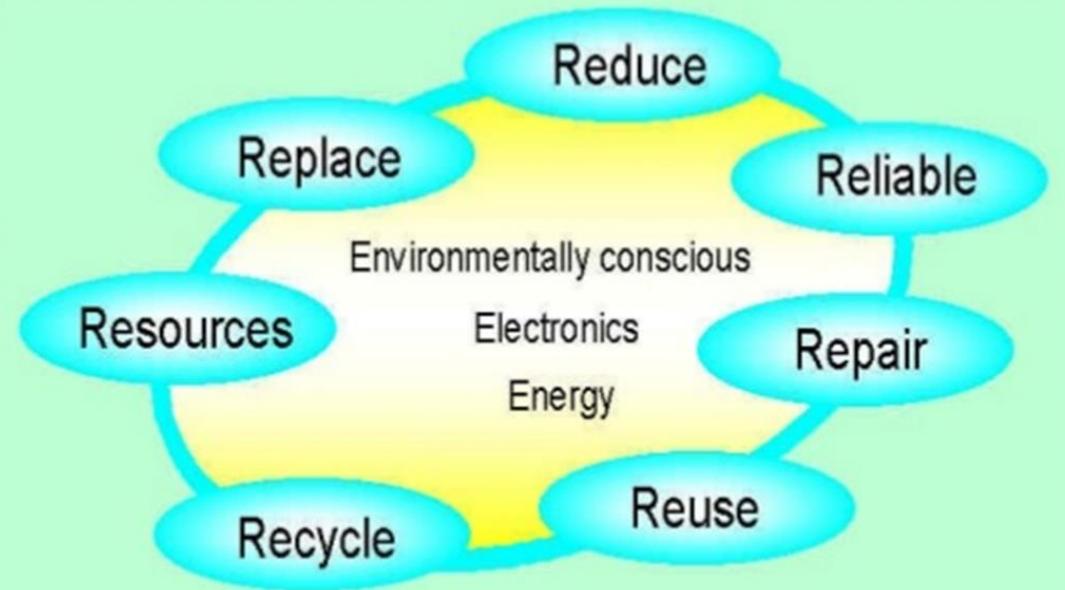
Type of Pollution	Air Pollution	Land Pollution	Water Pollution	Noise Pollution	Light Pollution
Preventive Measures	<ul style="list-style-type: none"> • Use of unleaded petrol and alternative sources of energy. • Plant more trees to absorb excess carbon dioxide. • Redesign equipment to reduce emissions. • Use public transportation or walk whenever possible. 	<ul style="list-style-type: none"> • Reduce the use of chemicals, fertilizers and pesticides. • Restore forests by planting more trees to protect the land from floods and soil erosion. • Reduce, reuse and recycle waste materials to save natural resource. • Don't dump motor oil on the ground. 	<ul style="list-style-type: none"> • Do not dump refuse in water bodies and rivers. • Clean and maintain septic systems properly to avoid exposure to groundwater. • Dispose of chemicals properly. Avoid disposal into drains. • Never pour cooking oils and fats down the sink. 	<ul style="list-style-type: none"> • Construction of noise proof rooms for noisy machinery in industries. • Noise producing industries such as airports, bus and train stations should be sighted far from residential areas. • Plant more trees along roads and in residential areas as they are good noise absorbents. 	<ul style="list-style-type: none"> • Reduce the use of decorative lighting. • Use covered bulbs that light facing downwards. • Use energy efficient light fixtures or bulbs to conserve energy. • Use of glare-free lighting for vehicles driven at night.

Remedial Actions

This involves control measures that reduce the movement of emissions and effluents into the air, soil or water. Through this, these waste products won't degrade the environment. The practices to abide by include

- Waste minimization,
- Recycling and re-use
- Compliance and enforcement
- Introduction of clean technologies

The 7 R's of *Green Technology*:



Remedial Actions

Air Pollution	Land Pollution	Water Pollution	Noise Pollution	Light Pollution
<ul style="list-style-type: none">• Vehicular pollution can be checked by regular servicing and maintenance.• Prevent burning of solid waste.• Factories should use of scrubbers, bag house filters, cyclone separators etc.• Site industries after proper EIA studies.	<ul style="list-style-type: none">• Minimize the use of plastics.• Periodic change of crops to increase the soil fertility.• Containment of hazardous waste and waste water treatment using land treatment techniques.• Control of land grazing.• Remediation of polluted soils.	<ul style="list-style-type: none">• Industrial effluents should be treated to reduce toxicity before disposal.• Waste water should be treated (primary and secondary treatment) to reduce the BOD₅ and COD levels to approved permissible limits of discharge.• Non-biodegradable waste materials (such as plastics) should not be dumped into water bodies.	<ul style="list-style-type: none">• Identify the noise source and modify the equipment to make it quieter.• Increase the distance between employees and the noise hazard.• Use hearing protection in designated areas that require it.• Limit exposure limit.	<ul style="list-style-type: none">• Create environmental zones for lighting by keeping outdoor lighting on the ground and not up in the sky.• Light your home or business area without annoying your neighbors to prevent light trespass.• Design lighting systems to keep the light within your property to avoid interference with nature.

Remedial Actions

Ogoni Case Study

- In Nigeria, the major incident of pollution that has lingered for decades is that of Ogoni land in the Niger Delta region of the country. The SPDC started operations in the region in 1958 and suspended operations in the early 1990s due to disruptions from local public unrest.
- The oilfields and installations have largely remained dormant since then but still serves as a transit route for pipelines transporting both SPDC and third-party oil production from other areas.
- Oil Spills continue to affect the area due to lack of maintenance and vandalism to oil infrastructure and facilities.

Remedial Actions

Ogoni Case Study

- The oil spills have led to major environmental contamination that has left the region devastated.

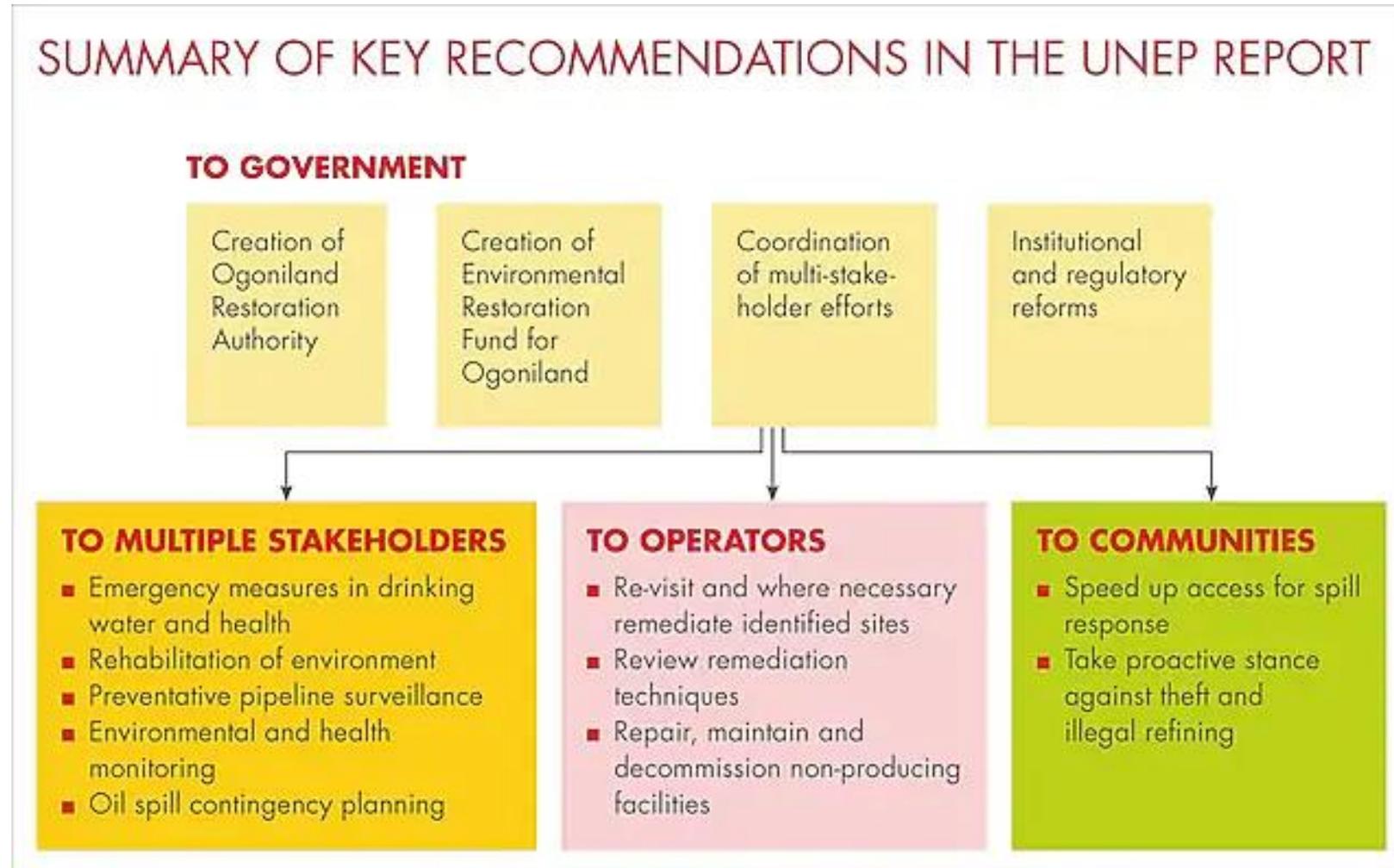


- In 2017 the United Nations Environment Program (UNEP) evaluated the extent of damage to the environment and came up with the resolution that the environmental restoration of Ogoni land could prove to be the world's most wide-ranging and long term oil clean-up.

Remedial Actions

Ogoni Case Study

- The UNEP report made some recommendations to the interested parties.



Remedial Actions

Ogoni Case Study

- The cleanup exercise of Ogoni commenced in 2017 by the Hydrocarbon Pollution and Remediation Project (HYPREP) under the Ministry of Environment.



Remedial Actions



A SAFE ENVIRONMENT

Pollution Short Story (Video)

Conclusion



**THANK
YOU**