Environmental Medicine

By

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YOUR HEALTH = YOUR ENVIRONMENT
BLOG

1. Environmental health (Def)
2. Air Pollution A. Outdoor (source, indicators, effects, prevention, and control).
   B. Indoor (source, indicators, effects, prevention, and control)
3. Ozone depletion and UVR
4. Global warming and Green house effects
5. Acid rain
6. Land&Soil Pollution
8. Water Pollution

9. Environmental hygiene and sanitation

a. Drinking water (characteristic, quality, pollution)
b. Water borne diseases
c. Disposal of waste
   d. Refuse
   e. Sewage (disposal, and management, recycling)
   f. Industrial waste and sewage (disposal, and management, recycling)
   g. Hospital (medical, clinical) waste and sewage (disposal, and management, recycling)

10. Food Hygiene and food poisoning

Environmental health (Def)

- Is the aspect of public health concerned with all factors, circumstances, or surrounding of human being .
- Ill effects of environment pollution not only on human health but on all living organisms. The purpose of which is to maintain and improve the human eco-system.
- Environmental health—considered toxicity problems of man; regarding factors which present in environment; as Chemical, Physical, and Biological factors.

Environment

Is totality of gases and everything that surround the human being

Atmosphere

An **atmosphere** (New Latin *atmosphaera*, created in the 17th century from Greek ἀτμός [*atmos*] "vapor" and σφαῖρα [*sphaira*] "sphere") is a layer of gases surrounding a material body of sufficient mass that is held in place by the gravity of the body. An atmosphere is more likely to be retained if the gravity is high and the atmosphere's temperature is low.

It is the surrounding total sphere of gases around the human being.

Atmosphere of Earth

The atmosphere of Earth is a layer of gases surrounding the planet Earth that is retained by Earth's gravity. The atmosphere protects life on Earth by absorbing ultraviolet solar radiation, warming the surface through heat retention (greenhouse effect), and reducing temperature extremes between day and night (the diurnal temperature variation).

The common name given to the atmospheric gases used in breathing and photosynthesis is air. By volume, dry air contains 78.09% nitrogen, 20.95% oxygen, 0.93% argon, 0.039% carbon dioxide, and small amounts of other gases. Air also contains a variable amount of water vapor, on average around 1%. While air content and atmospheric pressure vary at different layers, air suitable for the survival of terrestrial plants and terrestrial animals currently is only known to be found in Earth's troposphere and artificial atmospheres.

The atmosphere has a mass of about 5×1018 kg, three quarters of which is within about 11 km (6.8 mi; 36,000 ft) of the surface. The atmosphere becomes thinner and thinner with increasing altitude, with no definite boundary between the atmosphere and outer space. The Kármán line, at 100 km (62 mi), or 1.57% of the Earth's radius, is often used as the border between the atmosphere and outer space. Atmospheric effects become noticeable during atmospheric reentry of spacecraft at an altitude of around 120 km (75 mi). Several layers can be distinguished in the atmosphere, based on characteristics such as temperature and composition.

Structure of the atmosphere

- Principal layers

1. Exosphere
2. Thermosphere
3. Ionosphere
4. Mesosphere
5. Stratosphere
6. Ozone layer
7. Troposphere

Ecology

It is the interaction between environment and human being.

Agents

Chemical, physical, biological

Host

Individual (human)

Vehicles

Air, water, soil, food,..

The interaction between human being and their environment

The cycle of ignorance, poverty and disease

Types of environment

A. Physical environment

B. Biological environment

C. Social environment

Physical environment

- This refers to the non-living part of the environment-air, water , soil, minerals; and climate factors such as such as temperature and humidity. The physical environment is extremely variable in the tropics covering arid deserts, savannahs, upland, jungle, cold dry or humid plateau, marshlands, high mountain steppes or tropical rain forest.
- Climatic factors such as temperature and humidity have direct effect on man, his comfort and his physical performance. The physical environment also exerts an indirect effect on man by determining the distribution of organisms in his biological environment: plants and animals which provide him with food, clothing and shelter ; animals which compete with him for food; and parasites and their vectors which produce and transmit disease.

Man alters the natural characteristics of his physical environment sometimes in a small scale but often on a very large scale. He may clear a small patch of bush, build a hut and dug a small canal to irrigate his vegetable garden; or he may build large cities, drain swamps, irrigate arid zones, dam rivers and create large artificial lakes.

Many such changes have proved beneficial to man but some aspects of these changes have created new hazards.

Biological environment

- **All the living things in an area-- plants, animals and microorganisms, constitute the biological environment.**
- **They are dependent on each other and ultimately, on their physical environment. Thus, nitrogen-fixing organisms convert atmospheric nitrogen into nitrates which are essential for plant life. Plants trap energy from the sun by photosynthesis. A mammal may obtain its nourishment by feeding on plants (herbivore) or on other animals (carnivore) or both (omnivore). Under natural condition, there is a balanced relationship between the growth and the size of the population of a particular species, on the one hand, and its sources of food and prevalence of competitors and predators, on other hand.**
- **Man deliberately manipulates the biological environment.**
- **He cultivates useful plants to provide food, clothing and shelter, and he raises farm animals for their meat, milk, leather, wool and other useful products. He hunts and kills wild animals and other predators, and he destroys insects which transmit disease or which compete with him for food.**
- **In many parts of the tropics, insects, snails and other vectors of disease abound and thrive. This is partly because the natural environment favors their survival but also because, in some of these areas, relatively has been done to control these agents.**

Social environment

- **This is the part of the environment which is entirely man-made. In essence it represents the situation of man as a member of society: his family group, his village or urban community, his culture including beliefs and attitudes, the organization of society, politics and government, laws and the judicial system, the educational system, transport and communication, and social services including health care.**
- **There is much variation in the extent of technical development in the various countries in the tropics. Some of these countries are now highly developed whilst others are still in the early stages. Some of the developing countries show certain common features limited central organization of services, scattered populations living in small self-contained units, low level of economic development, limited educational facilities, and inadequate control of common agents of disease. Some of these communities are still held tightly in the vicious circle of ignorance, poverty and disease.**

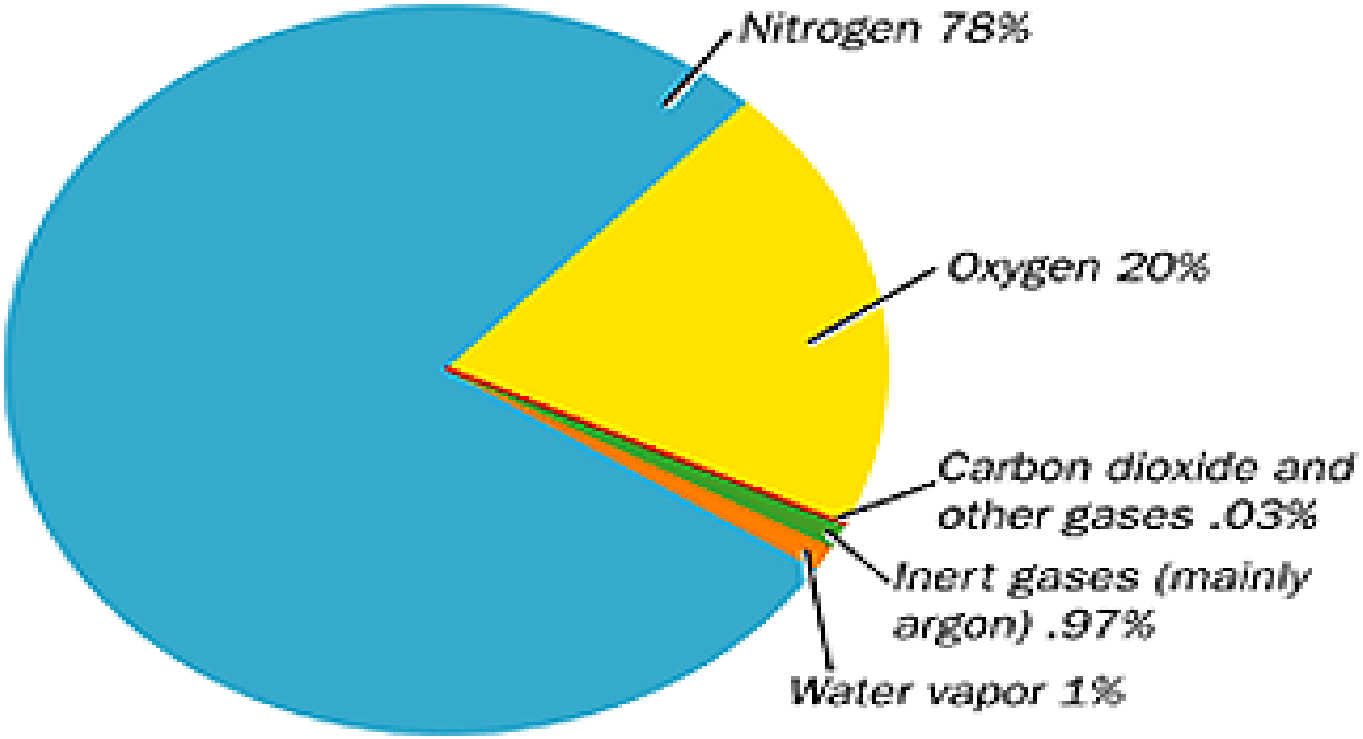
Many areas in the tropics are in transition. Rapid economic development and the growth of modern industries is causing mass migrations from rural to urban areas. Faster means of transportation, progress in education, the control and eradication of major endemic disease, and other developments are effectively breaking the chains of disease, poverty and ignorance. At the same time new problems are emerging, including those resulting from the social and psychological stresses imposed by these bewildering changes and their destructive effects on traditional family life and communal relationships.

In these transitional societies there have been marked changes in the patterns of disease. Communicable disease which were formerly the predominant causes of disability, disease and death are now being replaced by non-communicable disease and condition. Malnutrition in the form of the deficiency of specific nutrients is being succeeded by problems resulting from over-indulgence, thus obesity is replacing marasmus as the predominant nutritional problem. Alcoholism and drug abuse are emerging as manifestations of social stresses and tensions.

Air pollution

- Outdoor (sources, indicators, health effects, prevention, and control)
- Indoor (sources, indicators, health effects, prevention, and control)

Air is a mixture from N2, O2, CO2, and other trace gases.



When increase or decrease concentration level causes different hazards for human and also other foreign bodies; this phenomenon called Air *pollution*.
Air pollution occurs when the air contains gases, dust, fumes or odour in harmful amounts. That is, amounts which could be harmful to the health or comfort of humans and animals or which could cause damage to plants and materials.
The substances that cause air pollution are called pollutants. Pollutants that are pumped into our atmosphere and directly pollute the air are called *primary pollutants*. Primary pollutant examples include carbon dioxide from car exhausts and sulfur dioxide from the combustion of coal.
Further pollution can arise if primary pollutants in the atmosphere undergo chemical reactions. The resulting compounds are called *secondary pollutants*. Photochemical smog is an example of this.
The state of air pollutants—gases, dust, solid, liquid or vapor.
The most air pollution is man made.
The concentration of pollutants depend on the strength of the source, also the weather and climate and the state of the source.
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. Household combustion devices, motor vehicles, industrial facilities and forest fires are common sources of air pollution. Pollutants of major public health concern include particulate matter, carbon dioxide, ozone, nitrogen dioxide and sulfur dioxide. Outdoor and indoor air pollution cause respiratory and other diseases, which can be fatal. (WHO).

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common sources of air pollution

- **Household combustion devices,**
- **motor vehicles,**
- **industrial facilities and**
- **forest fires.**

Pollutants of major public health concern include:-

- **particulate matter,**
- **carbon dioxide,**
- **ozone,**
- **nitrogen dioxide and;**
- **sulfur dioxide.**

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Smoke

It is liquid or solid particles from incomplete combustion of carbon origin.

Fog

It is a droplet formed by vapor condensation upon nuclei.

Smog

Is a photochemical substances mixed from fog and smoke, it the most toxicant state of air pollutant due to hydrocarbons and other sulpher oxides.

Sources of air pollution

Outdoor air pollution

A. Natural sources

Either caused by:-

1. Volcanic eruption
2. Dust storm
3. Wild fires

B. Anthropogenic sources (man made)

Come from :-

1. Burning
2. Motor vehicles
3. Industries

- Electric power produce ionizing radiation, gases. And trace elements
- Transportation ; produce ionizing radiation, gases, noise, and trace elements.
- Agriculture produce trace elements, chemical, gases and solid waste.
- Industrial product; produce as the same of agriculture.
- Refining of raw material; produce gases, solid waste and trace element.
- Biological hazards; e.g. molds or other pathogenic organisms.

Air pollutants

- **Indicators of pollution (6 common pollutants)**

1. **Carbon Dioxide (CO2)**
2. **Lead (Pb)**
3. **Nitrogen Dioxide (NO2)**
4. **Sulfur Dioxide (SO2)**
5. **Particulate Matter (PM)**
6. **Ground-level Ozone (O3) (Bad Ozone)**

Effect of air pollution

1. **On plants**

   Interfere with phohotosynthesis .

2. **On animals**

   Effects locally and systemic adverse effect

3. **On climate**

   Effects on atmospheric particles and increase CO2 and increase temperature

4. **On materials**

   Corrosive for building and material

5. **On human**

   Local and systemic adverse effects

Prevention and control of air pollution

1. Identify the **type of** pollutant.
2. Estimation and evaluation of **concentration** of pollutant**.**
3. Type of hazards and its prevention e.g. Masks, Air conditioner, which filter the air and absorb sulfuric dioxide. some air filters use **electronic precipitators.**
4. Recycling the less toxic substances in industries.
5. Legislation and recommendation.

Major Air Pollutants

- Air pollution is a real public health and environmental problem that can lead to—among other things—global warming, acid rain, and the deterioration of the ozone layer.
- This chart names some common pollutants, their sources, and their effect on the environment.

Pollutant	Sources	Effects
Ozone. A gas that can be found in two places. Near the ground (the troposphere), it is a major part of smog. The harmful ozone(Bad Ozone) in the lower atmosphere should not be confused with the protective layer of ozone(Good Ozone) in the upper atmosphere (stratosphere), which screens out harmful ultraviolet rays.	Ozone is not created directly, but is formed when nitrogen oxides and volatile organic compounds mix in sunlight. That is why ozone is mostly found in the summer. Nitrogen oxides come from burning gasoline, coal, or other fossil fuels. There are many types of volatile organic compounds, and they come from sources ranging from factories to trees.	Ozone near the ground can cause a number of health problems. Ozone can lead to more frequent asthma attacks in people who have asthma and can cause sore throats, coughs, and breathing difficulty. It may even lead to premature death. Ozone can also hurt plants and crops.

Source: Jonathan Levy, Harvard School of Public Health. Based on information provided by the Environmental Protection Agency.

Carbon Dioxide. A gas that comes from the burning of fossil fuels, mostly in cars. It cannot be seen or smelled.	Carbon Dioxide is released when engines burn fossil fuels. Emissions are higher when engines are not tuned properly, and when fuel is not completely burned. Cars emit a lot of the carbon monoxide found outdoors. Furnaces and heaters in the home can emit high concentrations of carbon monoxide, too, if they are not properly maintained.	Carbon Dioxide makes it hard for body parts to get the oxygen they need to run correctly. Exposure to carbon monoxide makes people feel dizzy and tired and gives them headaches. In high concentrations it is fatal. Elderly people with heart disease are hospitalized more often when they are exposed to higher amounts of carbon monoxide.

Nitrogen dioxide. A reddish-brown gas that comes from the burning of fossil fuels. It has a strong smell at high levels.	Nitrogen dioxide mostly comes from power plants and cars. Nitrogen dioxide is formed in two ways—when nitrogen in the fuel is burned, or when nitrogen in the air reacts with oxygen at very high temperatures. Nitrogen dioxide can also react in the atmosphere to form ozone, acid rain, and particles.	High levels of nitrogen dioxide exposure can give people coughs and can make them feel short of breath. People who are exposed to nitrogen dioxide for a long time have a higher chance of getting respiratory infections. Nitrogen dioxide reacts in the atmosphere to form acid rain, which can harm plants and animals.
Particulate matter. Solid or liquid matter that is suspended in the air. To remain in the air, particles usually must be less than 0.1-mm wide and can be as small as 0.00005 mm.	Particulate matter can be divided into two types—coarse particles and fine particles. Coarse particles are formed from sources like road dust, sea spray, and construction. Fine particles are formed when fuel is burned in automobiles and power plants.	Particulate matter that is small enough can enter the lungs and cause health problems. Some of these problems include more frequent asthma attacks, respiratory problems, and premature death.
Sulfur dioxide. A corrosive gas that cannot be seen or smelled at low levels but can have a “rotten egg” smell at high levels.	Sulfur dioxide mostly comes from the burning of coal or oil in power plants. It also comes from factories that make chemicals, paper, or fuel. Like nitrogen dioxide, sulfur dioxide reacts in the atmosphere to form acid rain and particles.	Sulfur dioxide exposure can affect people who have asthma or emphysema by making it more difficult for them to breathe. It can also irritate people's eyes, noses, and throats. Sulfur dioxide can harm trees and crops, damage buildings, and make it harder for people to see long distances.
Lead. A blue-gray metal that is very toxic and is found in a number of forms and locations.	Outside, lead comes from cars in areas where unleaded gasoline is not used. Lead can also come from power plants and other industrial sources. Inside, lead paint is an important source of lead, especially in houses where paint is peeling. Lead in old pipes can also be a source of lead in drinking water.	High amounts of lead can be dangerous for small children and can lead to lower IQs and kidney problems. For adults, exposure to lead can increase the chance of having heart attacks or strokes.

Source: Jonathan Levy, Harvard School of Public Health. Based on information provided by the Environmental Protection Agency.

Toxic air pollutants. A large number of chemicals that are known or suspected to cause cancer. Some important pollutants in this category include arsenic, asbestos, benzene, and dioxin.	Each toxic air pollutant comes from a slightly different source, but many are created in chemical plants or are emitted when fossil fuels are burned. Some toxic air pollutants, like asbestos and formaldehyde, can be found in building materials and can lead to indoor air problems. Many toxic air pollutants can also enter the food and water supplies.	Toxic air pollutants can cause cancer. Some toxic air pollutants can also cause birth defects. Other effects depend on the pollutant, but can include skin and eye irritation and breathing problems.
Stratospheric ozone depleters. Chemicals that can destroy the ozone in the stratosphere. These chemicals include chlorofluorocarbons (CFCs), halons, and other compounds that include chlorine or bromine.	CFCs are used in air conditioners and refrigerators, since they work well as coolants. They can also be found in aerosol cans and fire extinguishers. Other stratospheric ozone depleters are used as solvents in industry.	If the ozone in the stratosphere is destroyed, people are exposed to more radiation from the sun (ultraviolet radiation). This can lead to skin cancer and eye problems. Higher ultraviolet radiation can also harm plants and animals.
Greenhouse gases. Gases that stay in the air for a long time and warm up the planet by trapping sunlight. This is called the "greenhouse effect" because the gases act like the glass in a greenhouse. Some of the important greenhouse gases are carbon dioxide, methane, and nitrous oxide.	Carbon dioxide is the most important greenhouse gas. It comes from the burning of fossil fuels in cars, power plants, houses, and industry. Methane is released during the processing of fossil fuels, and also comes from natural sources like cows and rice paddies. Nitrous oxide comes from industrial sources and decaying plants.	The greenhouse effect can lead to changes in the climate of the planet. Some of these changes might include more temperature extremes, higher sea levels, changes in forest composition, and damage to land near the coast. Human health might be affected by diseases that are related to temperature or by damage to land and water.

Tetraethyl and tetramethyl lead uses in gasoline (additive) also due to incomplete combustion of fuels and wood fire mostly effect the respiratory system

Indoor air pollution

- **1/2 million of children die from indoor air pollution especially from acute respiratory infection mostly due to solid fuel used; wood, coal in cooking and heating.**
- **Air pollution and malnutrition in developing poor countries and unsafe water, poor health care, infrastructure these together cause over one million of all death.**

There 6 major sources of indoor air pollution

1. Combustion byproduct fuels can produce and release of CO, CO2, SO2, NO2, formaldehyde, and hydrocarbons.
2. Micro-organism and allergens, pets.
3. Solvent; formaldehyde and other organic compound; acetone, benzene, organic.
4. Asbestos fibers.
5. Tobacco smoke.
6. Radon and its airborne decay products.

Control of indoor air pollution

1. The best way to control is to prevent it in the first place (source of emission) by substitution, change of the process.
2. Dilute in atmosphere in work places; air cooler in lead smelting.
3. Prevent formation of end products.
4. Reduce the quantity by :-
    1. Improve the combustion.
    2. Exhaust and emission control
5. Change the process of equipments ; close system or cover the volatile fluids or use electric motor instead of gasoline engine.
6. Air cleaning technology ; filter, electrostatic precipitate absorber.

Thank you