Al-Mustaqbal University
Department of Fuel and Energy Engineering Techniques
Second stage
Subject: Pollution
Lecturer: Dr. Malik Mustafa
Second semester

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Environment

Environment defined as the sum total of water, air, and land and interrelationships among themselves and also with the human beings, other living organisms and materials. Environment includes all the physical, chemical, biological conditions that surround and affect organisms during a lifetime.

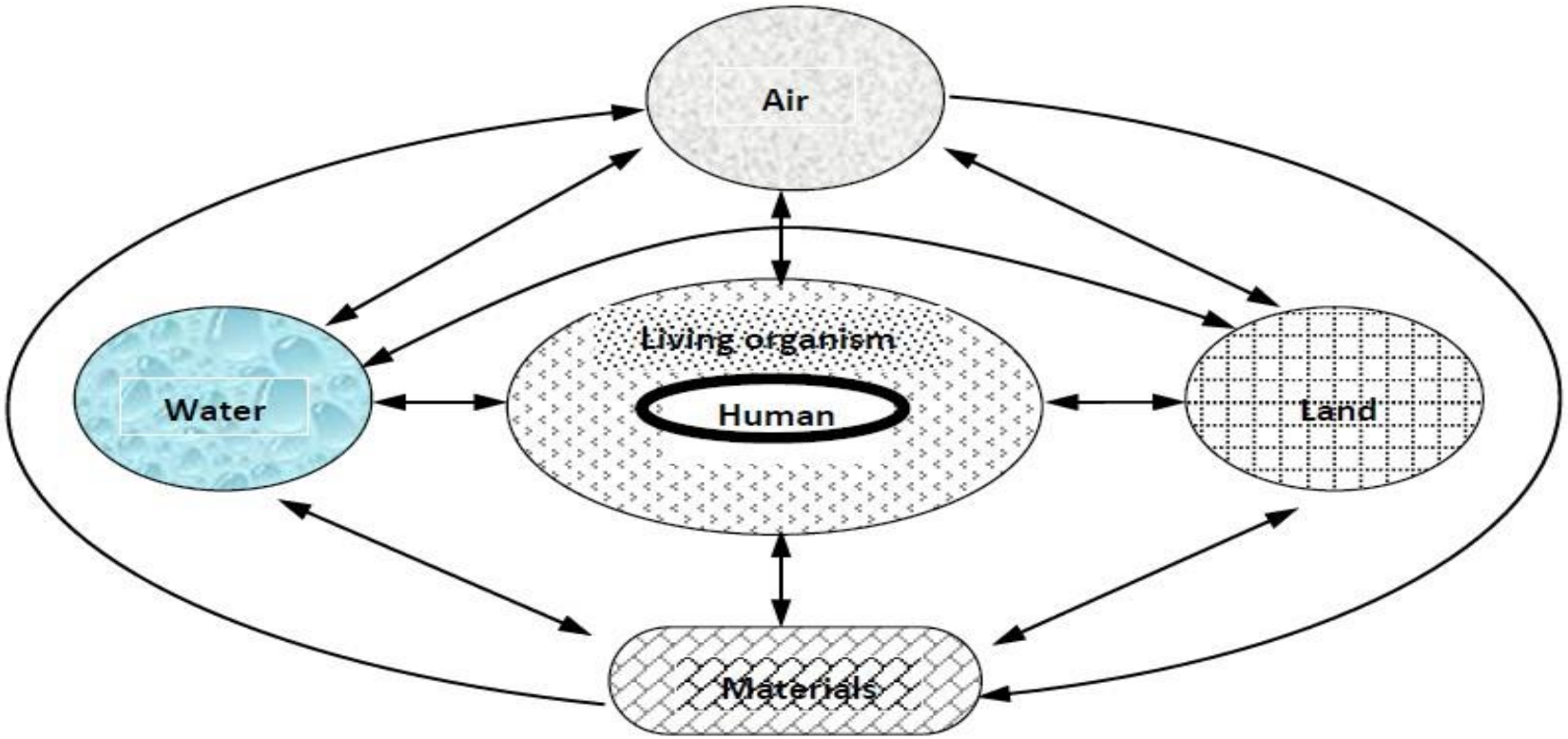

Fig.1 Concept of Environment: air, water, living organisms and materials surrounding us and their interactions together constitute environment

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Environmental Engineering

Environmental engineering is the branch of engineering that concerned with application of scientific and engineering principles to:

- Protect the environment and public health by reducing waste and pollution.
- provide healthy water, air, and land for human habitation and for other organisms,
- design of technologies and processes that control pollution releases and clean up pollution sites.

Environmental Pollution

Pollution is the introduction of contaminants substance into environment that cause damage and un-desirable change in the physical, chemical, biological characteristics of the air, water, or land which then affect the health, survival and activities of human and other living organisms.

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Pollutants

Pollutants are any substances that cause pollution if present in such concentration that causes damage to the environment and human beings. Pollutants may be chemical, biological, thermal, radioactive or even mechanical (dust, sediment, grit, etc.). These pollutants may be solid, liquid, or gaseous and may be introduced into environment naturally or by human activity.

Types of environmental pollution and their sources and effects

The major types of pollution are:

1) Air pollution.
2) Water pollution.
3) Soil pollution.
4) Noise pollution.
5) Radioactive pollution.
6) Thermal pollution

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1) Air pollution

Air pollution is the present of such material in air in such concentration that cause harmful effect on environments and living organism. The six main pollutants are:

Ozone, chlorofluorocarbons (CFCs), particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide and lead.

These and other air pollutants typically enter the atmosphere through industrial processes related to the generation of heat and power, incineration of solid wastes and transportation.

2) Water pollution

Water pollution refers to the presence of undesirable material, which decreases the quality of water bodies such the Earth's oceans, revers, lakes, and other water sources. The common types of water pollutants include mercury, nitrates, phosphorous, fertilizers, pesticides, and bacterial pollution. These and other types of pollutants enter the water supply through waste runoff , sewage treatment plants, feedlots, urban and agricultural runoff, septic systems and the illegle dumping of solid waste.

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3) Soil Pollution

Soil pollution is the pollution of the Earth's land surfaces. The most common types of soil pollutants are heavy metals such as cadmium, chromium, copper, zinc or mercury, pesticides or herbicides, organic chemicals, oils and tars, explosive or toxic gases, combustible or radioactive materials, biologically active compounds and asbestos. These types of pollutants can enter the soil through poor agricultural practices, industrial runoff, mining, landfill leakage, littering or the improper or illegal dumping of household or industrial waste materials.

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4) Noise pollution.

Noise pollution refers to undesirable levels of noises caused by human activity that disrupt the standard of living in the affected area. Noise pollution can come from:

- Traffic
- Airports
- Railroads
- Manufacturing plants
- Construction or demolition
- Concerts

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5) Radioactive pollution.

Radioactive pollution is the release the radioactive waste into the environment. This radioactive material emitted radiation. This radiation causing abnormal growth and possibly cancer, and this radiation remain in the atmosphere for years, slowly diminishing over time.

Sources of radioactive contamination include:

- Uranium mining
- Production of nuclear fuel
- Nuclear power reactors
- Nuclear tests
- Disposal of nuclear waste.

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6) Thermal pollution

Thermal pollution is defined as sudden increase or decrease in temperature of natural body of water such as ocean, lake, river, pond, etc. Thermal pollution may have a harmful impact on aquatic organism including plants, insect, microorganism and fish. The most important effect of thermal pollution (warm water) is a decrease in dissolved oxygen (DO).

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Ambient Air Quality Criteria

The Authority has various objectives for the ambient air quality. A summary of these objectives shown below in Table 4.1.

Table 4.1 – Ambient Air Quality Standards
(Air Pollutants Limit in the Ambient Air)

Substance	Symbol	Maximum Allowable Limits (µg / m^3)	Average Time
Sulfur Dioxide	SO_2	350	1 hour
		150	24 hour
		50	1 year
Carbon Monoxide	CO	23 (mg)	1 hour
		10 (mg)	8 hour
Nitrogen Dioxide	NO_2	290	1 hour
		110	24 hour
Ozone	O_3	160	1 hour
		120	8 hour
Total Suspended Particles	TSP	230	24 hour
		90	1 year
Particulate Matter	PM_{10}	300	1 hour
		150	24 hour

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Atmosphere of Earth and Global Problem

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Atmosphere of earth

The atmosphere comprises of a mixture of gases surrounding the planet earth. It extends up to about 500 km above the surface of the earth. The atmosphere acts as a gaseous blanket protecting the life on the earth by absorption the dangerous ultraviolet solar radiation (UV), warming the surface of the earth through the heat retention (this phenomenon is called the greenhouse effect). The greenhouse effect phenomenon which keeps the earth warms enough to sustain the life on the earth.

Composition of Earth's atmosphere

The composition of gases in the atmosphere is:

- The major gases of the atmosphere are nitrogen (N_2), Oxygen (O_2) and Water vapor (H_2O).
- The minor gases in the atmosphere are: Argon (Ar) and carbon dioxide (CO_2).
- The trace gases in the atmosphere are: Methane, Nitrous oxide, Hydrogen, ozone. Carbon monoxide, Ammonia, Neon, Helium, etc.

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Layers of Earth's atmosphere:

The atmosphere can be broadly divided into four major regions with widely varying temperature even within each region. These regions are: Troposphere, Stratosphere, Mesosphere, and thermosphere.

1. Troposphere: This layer is closest to the Earth's surface, and extends up to an altitude of 11 km. It is also the layer where majority of our weather occurs. This layer is primary composed of 78% nitrogen and 20.9% oxygen (make up air) and other gases including greenhouse gases. All atmospheric water vapor or moisture is found in this layer.

2. Stratosphere: This layer lies directly above the troposphere. It extends about 11-50 km above the Earth's surface. It contains the ozone layer. About 90% of the ozone in the Earth's atmosphere is found in this region. The ozone layer absorbs most of the ultraviolet radiation from the Sun. very little weather occurs in the stratosphere.

3. Mesosphere: This area is directly above the stratosphere, it extends about 50-85 km above the Earth's surface.

Thermosphere: This layer extends from 85-500 km above the Earth's surface.

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