

## **Lec. 2**

**By : MSc Zahraa Raad**

### **Lecture topics:**

- The nature of pollution**
- Causes of water pollution**
- Phenomena results from water pollution**
- Water quality test**

## **Advanced civilizations**

The first advanced civilizations of Mesopotamia, and in Egypt, India, China, Persia, Greece and Rome increased the use of water to manufacture goods, which increased levels of environmental pollution, yet pollution at that time did not disrupt environmental regulations.

## **In the Middle Ages**

Population growth increased near the end of the Middle Ages and concentrated more inside the cities, creating hotbeds of pollution that contributed to the spread of infectious diseases such as bubonic plague.

## **In the modern era**

Pollution became a popular issue after the Second World War, and the use of nuclear weapons in it, which led to the emergence of many laws and treaties that call for combating pollution.

## **The nature of the pollution**

It divides the pollution given the nature or given the type of material contaminated to:

### **Chemical contamination**

Chemical pollution means pollution with manufactured chemicals, whether those that are used for special purposes such as cleaning materials and car oils or those that are produced as a

## **Air pollution**

Air pollution is a serious threat to human health around the world. According to the environmental assessment issued by the United Nations Environment Program (UNEP), about 900 million urban residents, most of them in developing countries, are exposed to unhealthy levels of carbon dioxide.

## **Sources of pollution**

Based on its source, pollution is divided into two types: natural pollution and industrial pollution.

### **Natural pollution**

It is pollution whose source is due to natural phenomena that occur from time to time, such as volcanoes, thunderbolts, and storms that may carry huge amounts of sand and dust, and destroy crops and crops. So natural pollution is its sources of natural origin, and there is no income for man in it, and then it is difficult to monitor this Pollution or its prediction and control completely, and this pollution has existed since ancient times without constituting a disturbing phenomenon to humans.

### **Industrial pollution**

Industrial pollution results from human action and activity, and finds its source in man's industrial, service, and recreational activities, etc., and in its increasing uses of modern technology manifestations and its various innovations. It goes without saying that industrial activities are fully responsible for the emergence of the pollution problem in our time, and reaching this dangerous degree that threatens life And human survival on the surface of the earth, and among the most important sources of industrial pollution: industrial

and commercial waste and what is emitted by car exhaust, and factory chimneys that leave toxic CFCs, and others.

The severity of industrial pollution depends on several factors, including:

- \* The area from which industrial pollutants are emitted or discharged.
- \* Pollution time period.
- \* The degree of concentration of pollutant.
- \* Physical, chemical and biological properties of pollutants.
- \* Decomposition and assimilation in the environmental environment in which it is placed.
- \* The degree of toxicity in relation to humans and other organisms.

### **Water Pollution**

It is any physical or chemical change in water quality, directly or indirectly, that negatively affects living organisms, or makes the water unfit for the required uses. Water pollution is the contamination of water bodies, usually as a result of human activities. Water bodies include for example lakes, rivers, oceans, and groundwater. Water pollution results when contaminants are introduced into the natural environment.

#### **Water pollution can be classified into two main categories:**

**Natural pollution:** It means pollution that changes in the natural properties of water, making it unsuitable for human use, by changing its temperature or salinity. or by increasing suspended substances in the water, whether they are of organic or inorganic source.

**The chemical pollution:** of water is one of the most important problems that pose a danger to humans. Water has a toxic effect as a result of the

presence of dangerous chemicals in it, such as lead compounds, mercury, cadmium, arsenic and pesticides. Which can be divided into a biodegradable type, and another type that can be accumulated in living organisms in water, which represents a great danger to them.

### **What Are the Causes of Water Pollution?**

Water is uniquely exposed to pollution. Known as a "extensive solvent," water is able to dissolve more substances than any other liquid on earth. It's the reason why water is so easily polluted.

#### **The causes of water pollution are:**

- 1- Sewage:** that contains types of harmful germs and bacteria as a result of the waste that is contained in it.
- 2- Factory waste:** It is one of the most polluting water sources (such as soaps and detergents, paints, cardboard, foodstuffs and petroleum refining) Also, metal products (copper, aluminum residues) and chemical products (Chromium oxide, calcium, sodium carbonate).
- 3- The use of fertilizers and pesticides in the soil:** Especially the phosphates and nitrates that leak with rain water into the groundwater or flow to the surface of the valleys and rivers.
- 4- Rainwater.** During the journey to reach the surface of the earth, the pollutants in the air are attached to it, which include: nitrogen oxide, sulfur oxide, and soil particles. Pollutants dissolve in rainwater to form a pollutant component of water and soil.
- 5- Oil from a ship or tanker accidents:** Pollution resulting from marine transport activity is from oil and its derivatives (oil tanker accidents and exploration for oil).

6- Pharmaceutical: A small percentage of these substances affect human health.

7- Radioactive materials: Nuclear weapons factories, these factories dispose their waste in water. Radioactive pollutants are considered very dangerous and need thousands of years to have their effects disappear.

### **Some phenomena resulting from water pollution:**

**Eutrophication:** This phenomenon occurs when a water becomes overly enriched with minerals and nutrients which induce excessive growth of algae. This process may causes depletion oxygen of the water.

Eutrophication is often caused by the discharge of nitrate or phosphate-containing detergents, fertilizers, or sewage into an aquatic system.

Some algal blooms resulting from eutrophication, otherwise called "harmful algal blooms", are toxic to plants and animals. Toxic compounds can make their way up the food chain, resulting in animal mortality.

**Thermal pollution:** sometimes called "thermal enrichment" is the degradation of water quality by any process that changes ambient water temperature. A common cause of thermal pollution is the use of water as a coolant by power plants and industrial manufacturers. This will elevate water and expose it to sunlight. When water used as a coolant is returned to the natural environment at a higher temperature, the sudden change in temperature decreases oxygen supply and affects ecosystem composition. Fish and other organisms adapted to the particular temperature range can be killed by an abrupt change in water temperature (either a rapid increase or decrease) known as "thermal shock".

## **Water quality tests:**

**1- Physical tests:** Common physical tests of water include temperature, solids concentrations ex total suspended solids (TSS) and turbidity.

**2- Chemical test:** Water samples may be examined using the principles of analytical chemistry. Many test methods are available for both organic and inorganic compounds. Frequently used methods include pH, biochemical oxygen demand (BOD), chemical oxygen demand (COD), nutrients (nitrate and phosphorus compounds), metals (including copper, zinc, cadmium, lead and mercury), oil and grease, total petroleum hydrocarbons (TPH), and pesticides.

**3- Biological test:** involves the use of plant, animal or microbial indicators to monitor the health of an aquatic ecosystem.