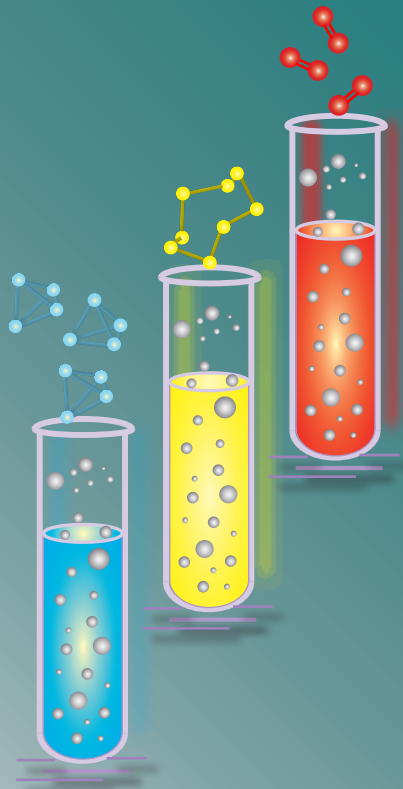


ENVIRONMENTAL PROTECTION



Think green!

- *Air pollutants*
- *Water pollutants*
- *Soil pollutants*
- *Recycling*
- *Global environmental issues*
- *Environmental protection and human activities*

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Air, water and soil pollutants

KEY TOPICS

1. WHAT ARE THE MAJOR AIR POLLUTANTS?
2. What are the most harmful water pollutants?
3. What are the soil pollutants?

KEY WORDS

- Pollution
- Pollutant
- Air pollutants
- Acid rains
- Water pollutants
- Soil pollutants



WHAT IS A POLLUTANT?

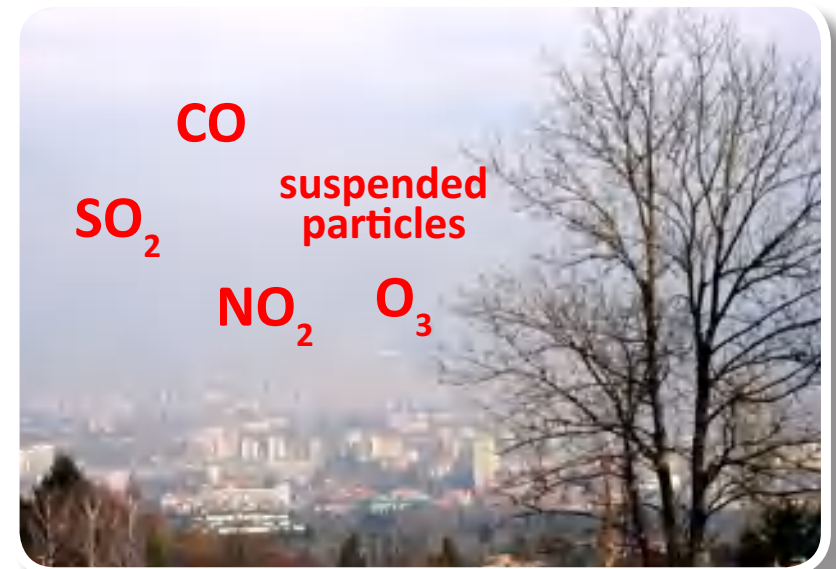
Air, waters (oceans, rivers, lakes, underground water, etc.) and soils are part of our environment. If the amount of toxic chemicals in air, waters or soils is high enough to pose a risk for humans or for ecosystems, it is considered that the environment is polluted. All substances that pollute the environment are called **pollutants**. They are present in the environment or are the result of human activities. The pollutants that contaminate the environment are known as **contaminants**. Usually, contaminants are harmful substances released in the environment by man.

AIR POLLUTION

If in the atmosphere are present harmful and/or excessive toxic substances, the air is polluted. The most important air pollutants are **nitrogen dioxide** NO_2 (also nitrogen oxide NO and both oxides are often designed as NO_x), **sulfur dioxide** SO_2 (but most often processes generating SO_2 generate SO_3 too and both oxides are often designed as SO_x), **carbon oxide** CO , **ground-level ozone** and **suspended particles**.

The smog (smoke + fog) in the cities is caused by many factors and consists of over 100 chemicals that may have various harmful health effects and can cause diseases.

Pollutants are released in air by industries, power plants, motor vehicles, combustion of fossil fuels. Some air pollutants are produced in nature – forest fires, eruption of volcanoes. However, air pollution is a global problem caused mainly by human activity.



The main source of **nitrogen and sulfur oxides** NO_x and SO_x in the air is the burning of fossil fuels. Some industrial processes, volcanoes activity also contribute to the accumulation of these gases in the atmosphere. Sulfur oxides and nitrogen oxides at high concentrations are harmful for the vegetation but they can negatively affect also an entire ecosystem returning back to the ground as **acid rains** – precipitations (snow, rain, fog, hail, dust) with acidic components such as sulfuric H_2SO_4 or nitric acid HNO_3 .



Acids rains harm forests, natural waters, man-made materials (metals, marble statues) and the **human health** (can cause respiratory problems). They acidify the soil and remove valuable minerals and nutrients from it and so retard the growth of plants and trees, acidic droplets cause browning or death to leaves and plants are less able to absorb sunlight, the coniferous forests are damaged. These rains increase water acidity in lakes and that causes the death of numerous fish species. The acid rain causes weathering, destroying of limestone and marble, monuments, statues, buildings, corrosion of metals, peeling of paints on surface, fading of textiles and aging of plastic materials.

Acid rains are a global environmental problem concerning all countries in the world. Reducing nitrogen and sulfur emission is a key factor for safeguarding the environment.

Carbon monoxide CO in air is a product of the incomplete combustion of fossil fuels. Air with a toxic concentration of CO is harmful if breathed. It reduces the amount of oxygen that haemoglobin in blood transport to organs. That can cause dizziness, confusion, unconsciousness, even death.

Ozone O₃ in the stratosphere protect Earth from the cosmic uv-radiation. But the so called **ground-level ozone** can cause health problems. It is produced in chemical reactions between nitrogen oxides and volatile organic compounds occurring under the action of sun light. Toxic levels of ozone O₃ can cause chest pain, coughing, throat irritation, airway inflammation. Ozone is especially harmful for people with asthma, bronchitis, emphysema. Ozone is also particularly harmful for growing vegetation.

The **particle pollution** is caused by tiny solid particles of different origin and size (in microns), dispersed in air. They are introduced in air by abrasion or grinding of materials – metal filings, sawdust, fine rubber particles from wear of automobile tires, dust from a dust storm or automobile wheels on a dusty roads, fumes from combustion of fossil fuels, most often in cities – from traffic fumes, etc. The fumes contain also unburned hydrocarbons - if their combustion is incomplete because of a deficiency of oxygen or for other reasons, the result is a release of the harmful CO and unburned particles, contributing to smog.

Air is contaminated also by volatile organic compounds – solvents in many household chemicals (paints, waxes, varnishes) which evaporate easily at ordinary temperature and pressure.

AIR POLLUTION IS A GLOBAL HEALTH HAZARD. The quality of air is an important factor for a healthy environment. In Bulgaria the Executive Environmental Agency (EEA, www.eea-government.bg) provides a daily bulletin for air quality.

WATER AND SOIL POLLUTION

Water pollution is caused by the release of harmful chemical and microorganisms in rivers, oceans, seas, lakes, underground waters. In addition the release of energy (radioactivity or heat) also contaminate natural water resources. Sewage, sediments, oil spills are important sources of water pollution. Major water pollutants are different **pathogens**, **heavy metals** (As, Hg, Cu, Zn, Ba), different **organic compounds**, **trash**.

The main source for water pollution is the sewage. The industrial and household waste, if not adequately treated, is a huge environmental threat. The waste waters and the solid wastes contain toxic compounds, cleansing chemicals, detergents, phosphates, paper, rubber, glass, plastic, aluminium foil and many other harmful substances. Some of them need hundreds of years to decompose.

Another serious water pollutant are the **oil spills** in seas and oceans during transportation of petroleum and its products. Oil cannot dissolve in water and forms a thick layer on its surface which stops the supply of oxygen and light that are essential for maintaining life in natural waters.



The **fertilizers** and the **pesticides** used in agriculture are another source of pollution. They improve the composition of soils and supply the necessary for the plants growth nutrients. But, if excessive amounts of fertilizers are used, they cannot be assimilated by plants and are absorbed into underground waters or washed out by rains thus contaminating the water reservoirs. Many pesticides destroy the soil microorganisms which affects the natural cycle of elements.

Soil pollution is caused mainly by man activities – excessive use of pesticides and fertilizers, industrial wastes, sewage waters. The most common and toxic pollutants of soils are lead Pb, mercury Hg, arsenic As, copper Cu, zinc Zn, nickel Ni, polyaromatic hydrocarbons (PAH), insecticides and pesticides and many others. Even low amounts of pollutants can be harmful for man and for ecosystems. See the project in your study book!



35 Global environmental issues

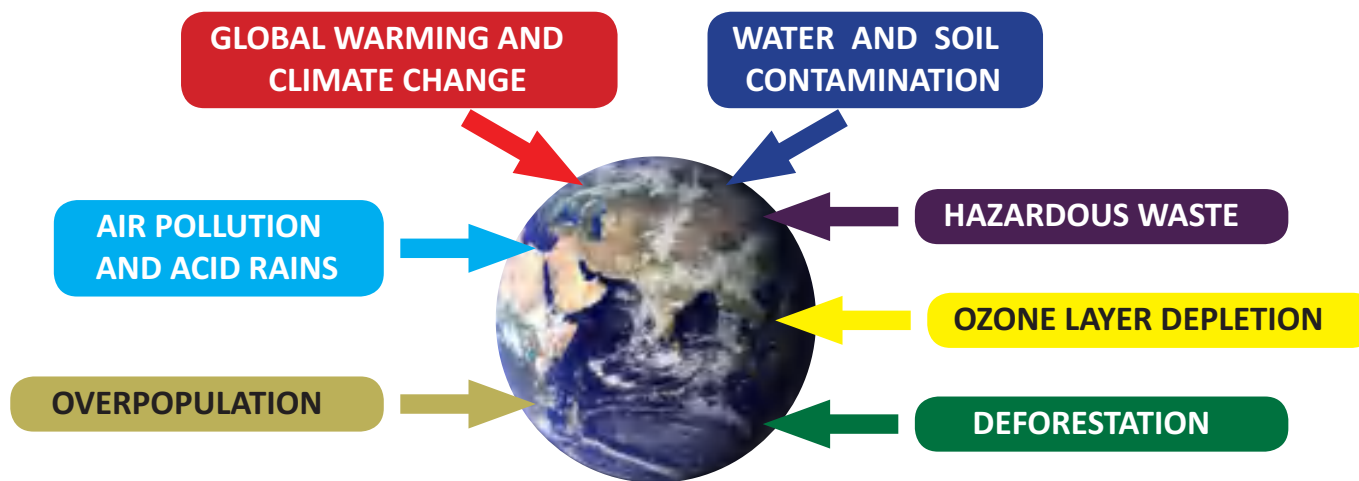


KEY TOPICS

1. WHAT ARE THE GLOBAL ENVIRONMENTAL ISSUES?
2. What are their effects on human health and ecosystems?

Since humans first lived on Earth they have made many impacts on the world as we know it. But after the industrialization period and in more recent times most of them are negative ones, causing harm to the Earth and its inhabitants. Our environment is constantly changing and we must become aware of the problems that threaten it. Natural disasters, climate changes - these are only some of the environmental problems our planet is facing.

CHEMISTRY IS PART OF OUR EVERYDAY LIFE. It is impossible to live even one day without using products of the modern chemical industry – clothes, cars, homes, packages, highways, vehicles, pharmaceuticals, books, computers, phones, airplanes, trains, space-rockets, shoes, cosmetics Modern chemistry makes our life more comfortable and gives us stunning opportunities. We enjoy that comfort but we often miss its enormous harmful impact on the environment – air contamination, water and soil pollution, global warming and climate change, ozone layer depletion, hazardous waste, deforestation, overpopulation.



Now it is up to you! Find out information about some of the major environmental issues caused by man. Prepare a presentation and share your opinion with your classmates.

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Environmental protection and human activities



*„The world is a fine place
and worth fighting for.“*

Ernest Hemingway

KEY TOPICS

1. WHY IS SAFEGUARDING ENVIRONMENT A KEY FACTOR FOR OUR QUALITY OF LIFE?
2. WHAT IS YOUR ROLE IN SAFEGUARDING ENVIRONMENT?

If we consider Earth as our only home, then we must acknowledge the vast number of global environmental problems caused by human activities. People should be concerned about all ecological problems every day.

WHAT MUST BE DONE?

- Equipment of the industrial sources of pollution with well maintained treatment facilities.
- Sedimentation, filtration and chemical purification of waste and sewage waters.
- Development of modern biochemical technologies transforming organic wastes into degradable by microorganisms substances.
- Development and production of pesticides with specific action which are less harmful for the living organisms and may be easily degraded in the soil.
- Recycling of wastes – the separate collection of the solid wastes as glass, plastics, metals, paper and their subsequent recycling is the major method to reuse them and save valuable raw materials

The sustainable development includes properly managing, developing, protecting, restoring, enhancing and conserving the environment for the future generations.



PROJECTS

1. OZONE HOLE

What are the facts? Why is ozone-layer depletion harmful for man and ecosystems?

2. DEFORESTATION

What causes deforestation? What is the impact of deforestation on ecosystems? What must be done to save the forest on our planet?

3. DRINKING-WATER

What water is safe to drink? What are the sources of drinking water? What are the benefits of drinking enough water every day?

4. YOUR ROLE IN SAFEGUARDING THE ENVIRONMENT

Think about your personal role in safeguarding the environment. Is there anything that you can do to help waste collecting and recycling?