



LESSON 3

THE POLLUTION PROBLEM

Introduction

*The first thing the travellers from Planet Uno noticed when they arrived in Earth was it seemed very different from the images they had seen. Now, the inhabitants of Earth had machines that rolled, others that flew and a lot of buildings around. The color of the sea was dark and the air was not clean. There was pollution. (**Chapter III – Back to Earth / The Mission to Planet Earth in Sofia**).*

What is pollution?

Pollution is the action of harmful substances that contaminate water, soil or air. Harmful substances can come from waste, the greenhouse gases, the chemicals etc..

Pollution harms the functioning of our ecosystems and may destroy several species of animals and plants. The biggest problem is that pollution can harm the health of human beings because we depend on clean air, fertile soil and clean water to live.

Air Pollution.

The air is essential to human life. We can spend some time without food or water, but if stay without air for a few minutes, we do not survive. Breathing is the first action of the human being. Ensuring a good quality of air is essential to our health.

The air is a resource that is everywhere and seems endless. Air pollution or atmospheric pollution is the result of several causes. Some causes are beyond our control such as the desert sand storms and smoke from forest fires and volcanic eruptions.

Other causes of air pollution come from our daily activities. To maintain the pristine quality of the air, you need to pay attention to our activities.



It is important to know that an activity that is polluting our city can also affect another country very far from where we are. Recently pesticides were found in Antarctica and they had never been used there!

Air pollution is an issue that concerns everyone and brings harm to our health:

Respiratory system - reduces the ability to breathe the oxygen that enters our body

Immunologic system - defending our body from infection by viruses and bacteria.

Symptoms of respiratory diseases are various: irritation of nose, eyes and throat, decreased ability to exercise, respiratory infection. People suffering from asthma are made worse by air pollution.

It is important to understand the six major air pollutants, according to the World Health Organization (WHO) and where they come from - their sources:

1 - **Carbon dioxide CO²** is the main greenhouse gas produced by human activities like burning of forests and fossil fuels like coal, oil and natural gas.

2-**Nitrogen Dioxide (NO)** or nitrogen dioxide is produced by the burning of fossil fuels like coal and oil. It causes smog, acid rain and contributes to the problem of eutrophication. It also causes respiratory diseases.

3 - **Suspended Particulate Matter SPM (Suspended Particulate Matter)** are solid particles in the form of smoke, dust, steam. Inhaling the finer particles can cause lung damage and respiratory problems.

4 – **Lead** is in oil, diesel, batteries, paints hair etc.. Affects the nervous and digestive system and can cause cancer.

5- **Anidrio sulfur dioxide or sulfur dioxide (SO²)** is a gas produced by burning coal, mainly in power plants and is highly toxic. Paper industries and melting of metals produces SO². It contributes to smog and acid rain. Sulphur dioxide can cause problems to the lung.

6 - **Ozone (O³)** is a poisonous gas that forms a shield to protect from ultraviolet rays in the stratosphere. When you are near the surface of the Earth's ozone, it is a highly toxic pollutant. Vehicles and industries are major sources of ozone. Ozone stings the eyes and diminishes resistance to colds and pneumonia.

Other pollutants:

Carbon monoxide is a colorless and odorless gas, produced by incomplete burning of carbon-based fuels.

Chlorofluorocarbons (CFC) gases are released mainly by air conditioning systems and cooling and affect the ozone layer that protects us from UV rays.

Methane (CH₄) is a gas that causes global warming and ozone loss. The largest source of methane pollution is agriculture. Animal agriculture also produces methane gas. Methane The UN body IPCC is concerned with the production of methane and estimates that 60% of methane in the atmosphere is due to human activities.

Mercury (Hg) is a chemical element that falls from the atmosphere and is deposited in the soil. Industrial processes, coal burning and also medical waste contribute to the accumulation of mercury. The industries that pollute the most are: power plants, refineries, cement, petrochemical, steel and mining industries.

The amount of mercury has increased three times since the start of progress, with the Industrial Revolution 200 years ago. Mercury is bad for our health and cause diseases.

The Pollution of Water

We can not live without air and we can not live without clean water to meet our consumption needs. When toxic substances enter the water of lakes, rivers, streams, oceans and other bodies of water, they dissolve, become suspended in water or are deposited at the bottom. The water is polluted and loses quality and affects aquatic ecosystems. The pollutants can also infiltrate and contaminate soil.

Water pollution has many causes. What brings the greatest pollution is the sewage in the cities and industries that discharge waste into rivers.

Many places in the world still have no sewage treatment plants. The pollutants that are in water enter the water system, rivers and other water bodies. The water that goes into our homes is often contaminated and carries germs that cause all sorts of diseases.

The domestic sewage uses water that is discarded by households. This water contains a variety of dirt or impurities that are dissolved or floating in water. A great number of these impurities are composed of organic materials and other toxic substances. The materials are organic foods and vegetables and drugs come from products that use chemicals such as laundry soap, detergents etc..

The sewage also contains microbes that cause diseases. Where to dispose of domestic sewage is a technical problem of the utmost importance.

People throw their trash in streams, lakes, rivers and seas, and turn the environment into a trash can for their plastic bottles, soda cans, plastics and other products they consume.



Other types of water pollutants are non-biodegradable compounds or slow degradation created primarily by recent technologies, toxic to humans. The water that flows from agricultural irrigation becomes contaminated by chemicals used as fertilizers and pesticides and will pollute the places through which it passes until it reaches the rivers which will also be polluted.

Excessive nutrients such as fertilizers and metals used in industrial activities and agriculture pollute the water leaving it unfit for human consumption.

The pollution of the sea and oceans

The sea which gives us so many things is not the same anymore. Human beings were able to change its nature and its beauty. The sea suffers from pollution and global warming caused by air pollution.

Global warming melts the land ice and causes sea level rising. Large amounts of melt water run into the sea and causes changes in ecosystems, damaging some species. Coral reefs are the most affected by the temperature rise of the sea. The algae that form the coral reefs do not survive and take a whitish appearance and die.

Marine pollution is the result of products that are thrown in the seas and oceans, mostly by us, humans: domestic waste (sewage and debris polluting in used water), waste industries (hydrocarbons, metals, synthetic chemicals and other substances) and residues from agriculture (fertilizers, pesticides).

Most of the pollution comes from the continents and is carried by rivers and winds. It accumulates in coastal waters that supply water for the production of all fish.

Two activities are the main causes of pollution:

- 1-Sediment and agriculture = 75% to 80%.
- 2 - Shipping = 12%.

In South America: 98% of untreated used water ends up in the sea.
In the Mediterranean: 50 tons of waste (garbage) is thrown into the sea.
In China, 60 tons of garbage are dumped daily in the Yellow Sea.

Everything is thrown into the sea: sewage, tires, plastic and toxic waste.



Plastic bags account for 60% of visible garbage polluting the sea and cause the death of 1 million fish, 100,000 sea mammals and countless numbers of fish!

Increasingly red tides of algae are formed because of residues of fertilizers in water containing nitrogen. The toxic algae kill fish and absorb almost all the oxygen in the ocean, forming a carpet of moss. The ocean needs oxygen to breathe!

Biodiversity depends on the balance of ecosystems and human activities make the sea suffer.

The sea endures a world of almost 7 billion people reaching 10 billion by 2050.

So we need to continue to reduce consumption and waste and produce energy that does not pollute the environment.

The main environmental effects of pollution

Air pollution is a state of imbalance in nature and brings negative environmental effects.

Acid rain and acidification of soil and water is a consequence of acid deposits formed primarily from combustion of fossil fuels. It leads to decrease the amount of fish, forest and soil degradation.

Smog is the combination of the words smoke and fog.

Eutrofisation is caused by an increase of nutrients in the water resulting in the onset of algae and other plants that block the sunlight on the water surface. These plants capture the entire stock of oxygen that can not be renewed. The eutrofisation causes an imbalance in the ecosystem.

Nitrogen dioxide and ammonia also contribute to this problem.

Destruction of the ozone layer occurs when large amounts of agents break down ozone entering the atmosphere. Ozone is important because it absorbs UV-B ultraviolet radiation from the sun. This type of radiation damages DNA, the immune system and cause skin cancer. It affects vision and brings problems such as cataracts and myopia.

The destruction of ozone is harmful to agriculture. Rice, corn and sunflower are crops susceptible to radiation. The UV-B radiation can also harm aquatic life up to 20 meters underwater and affects species such as plankton, fish larvae, shrimps, crabs and seaweed. Phytoplankton are the food of life in the water and their loss affects entire ecosystems.

Greenhouse effect is mainly caused by methane gas and the carbon dioxide gas and water. These gases absorb infrared radiation emitted by the Earth and return this energy as heat to the earth, causing global warming.

Global warming will increase unless we reduce the amount of gases we send into the atmosphere with our activities.

And when do we send these gases to the atmosphere?

All the time, watching television, using the air conditioner, turning on the light, using a hair dryer, driving a car, playing video games, listening music, using the washing machine , the dishwasher or the microwave.

FIGHTING POLLUTION

There are many ways to fight air pollution and water pollution. The important thing is to recognize pollution as the enemy of the balance of life on Earth and it brings a lot of damage to our health. To preserve life, we must stop the pollution.

Many countries are fighting pollution and others have not even begun. Some measures are working:

- Legislation to combat deforestation
- Placement of filters in the chimneys of factories
- Monitoring of air quality in cities and knowledge of local polluters
- Controlling of the quality of fuels: gasoline, diesel, ethanol.
- Survey on motor vehicles to remove from circulation all vehicles deregulated
- Treatment of domestic sewage
- Creation of bike lanes, as bikes do not pollute.
- Increase of public transportation that pollute less than individual transport.
- Investment and encouraging the use of new clean technologies: eolic (wind), electric cars etc..
- Awareness campaigns to the population

A lot do do!

Before printing, think of your responsibility to preserve the environment and prevent deforestation. Print just the necessary. The choice is yours. The planet belongs to everyone!

Referências

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