Learn STEM

Innovative Model of learning STEM in secondary schools

School Education
ERASMUS+

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LearnSTEM

Draft on the learning Units for
Topic “Pollution” by Greece

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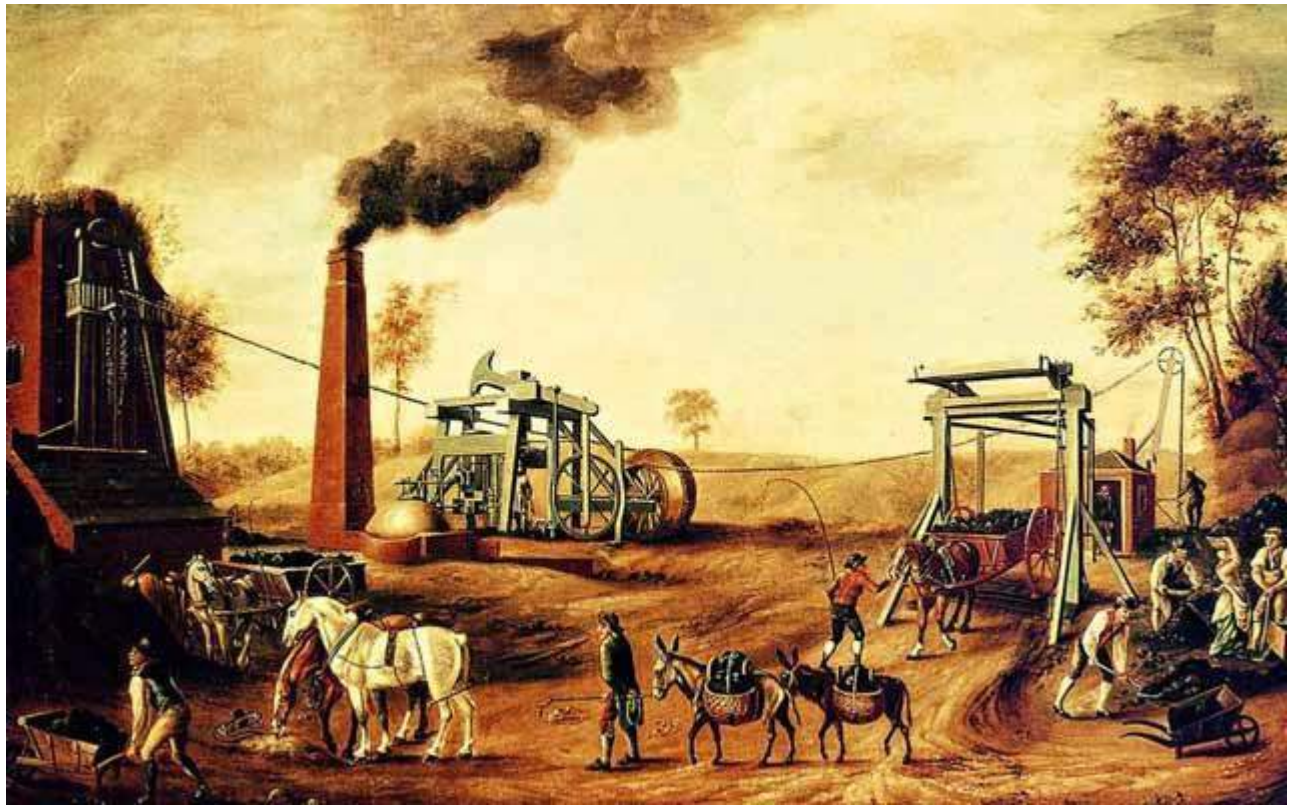

The achievements of the modern economy have their roots in the Industrial Revolution. During the first period of the Industrial Revolution, almost everyone believed that the main result would be the improvement of life, and that the Earth was so large and so rich in raw materials that it could fuel unlimited growth.

Today, we are all aware of the serious problems that have accumulated on our planet. Economic activities (production and consumption) are the reason for the development and overuse of natural resources, as well as the main source of pollution.

For thousands of years man lived in harmony with natural cycles. Nature has no garbage: the by-products of one process are the useful wholes of another. Until the time of the industrial revolution, human societies functioned in much the same way.

The leftovers were not garbage but food for the animals. Old clothes were repaired and turned into new ones and when they were too worn out they were made into rugs.

With technological and industrial development, thousands of new products were created and their mass production became possible. Since his appearance on earth, man has intervened in his natural environment at an ever-increasing rate as a consequence of the increase in population and his manufacturing capacity.

The result is the ever-increasing amount of waste, overuse of natural resources and pollution. Today's linear economic model and philosophy of "disposable" products exacerbates the problem.

Environmental protection is an important factor for human well-being and must undoubtedly be a parameter for the development of a place along with economic, political and social criteria. In fact, given the fact that a specific environmental problem directly affects the inhabitants of a usually limited geographical unit, it is clear that addressing this problem requires direct popular participation.

The destruction of forests, wetlands and other natural ecosystems as well as the pollution of the atmosphere, water and soil are the result of man's reckless behaviour towards nature.

The consequences of the exploitation of natural resources are becoming more and more noticeable.

The disappearance of species of flora and fauna, deforestation leading to desertification, the degradation of the aquatic environment and the quality of the atmosphere lead more and more people to recognize the danger of disturbing the ecological balance and the necessity of taking measures to stop the course of destruction and degradation of the natural environment.

All this and above all the risk of extinction of many species of wild flora and fauna as well as the risk of degradation of many habitats resulted in the mobilization to take measures to protect and preserve the natural heritage.

The effort to preserve nature already started about a century and a half ago, through the creation of protected areas.

The first attempt to institutionalize protected areas is considered globally to be the establishment of Yellowstone National Park in the USA, in 1872.

Since then, thousands of protected areas have been declared around the world, which depending on their characteristics , are of different types and have many different names (areas of absolute protection, natural reserves, marine reserves, natural parks, national parks, protected landscapes, etc.).

But the protection of nature cannot be achieved only by declaring protected areas.

It is necessary to integrate the sustainable use of natural resources into development policy, since the pressures that natural ecosystems face come from all sectors of development (agriculture, industry, tourism, transport, etc.).

Following the principles of sustainable living, as expressed in 1991 in the report "caring for the earth: a strategy for life based on sustainable development" of the three most important organizations for the conservation of nature (International Union for Conservation of Nature, United Nations Environment and the World Wide Fund for Nature) and the decisions taken at the Rio World Conference in 1992, the new understanding that prevails today places protected areas at the center of the strategy for sustainable development and focuses on the benefits that these areas can provide to local communities.

The combination of protection and development can be achieved through the management of protected areas. That is, all the actions and measures necessary for the protection, organization and operation of the proposed areas.

Thus, the perception that prevails today supports the active management of the proposed areas, with the aim of highlighting all their values and functions (ecological, aesthetic, historical, cultural, economic, etc.) without, however, ignoring the main aim of protection.

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Greece, due to its geographical position (crossroads of 3 continents and biogeographic regions), its wide variety of climatic conditions, geological background and geomorphology (intense relief, valleys, coastal fragmentation, islands) presents - in relation to its area - a large biodiversity.

Greek nature is characterized by rich native flora and fauna, by representative habitats, especially natural, geomorphological formations and by landscapes of unique beauty. This value needs special efforts to protect and preserve it.

The need to protect Greek nature was recognized and expressed with the declaration of the first National Forest on Mount Olympus in 1938.

Before that, efforts to protect nature were limited to legislative measures mainly within the framework of forestry legislation. The concept of nature protection in Greece followed the path of other countries of the world by establishing mainly protected areas and treating them as "forbidden" areas for humans. This practice is abandoned along the way, obeying the lessons of international experience, slowly giving way to the management of these areas, with the aim of developing the wider environment.

According to the Gazette of the Government of the Hellenic Republic and the law passed for the protection of the environment, according to article 1 it is defined that:

"The purpose of the law is to establish fundamental rules and to establish criteria and mechanisms for the protection of the environment, so that man, as an individual and as a member of society, lives in a high-quality environment, in which health is protected and to favour the development of his personality. Environmental protection, a fundamental and integral part of the cultural and development process and policy, is implemented separately through democratic planning».

In article 2 in the meaning of the same law they are understood as:

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Environment: the set of natural and man-made factors and elements that are in interaction and affect the ecological balance, the quality of life, the health of the inhabitants, the historical and cultural tradition and the aesthetic values.

Protection of the environment: **the set of actions, measures and projects aimed at preventing the degradation of the environment or restoring, maintaining or improving it.**

Pollution: the presence in the environment of pollutants, i.e. any kind of substances, noise, radiation or other forms of energy in quantity, concentration or duration that can cause negative effects on health, living organisms and ecosystems or total damage and generally make the environment unsuitable for its intended uses.

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Contamination: the form of pollution characterized by the presence of pathogenic microorganisms in the environment or indicators indicating the possibility of the presence of such microorganisms.

Atmospheric pollution: the direct or indirect introduction into the atmosphere by humans of substances or energy with harmful effects that can cause adverse effects on human health, harm living organisms and ecosystems, cause material damage and affect or interfere with the recreational function and generally render the environment unsuitable for its intended uses.

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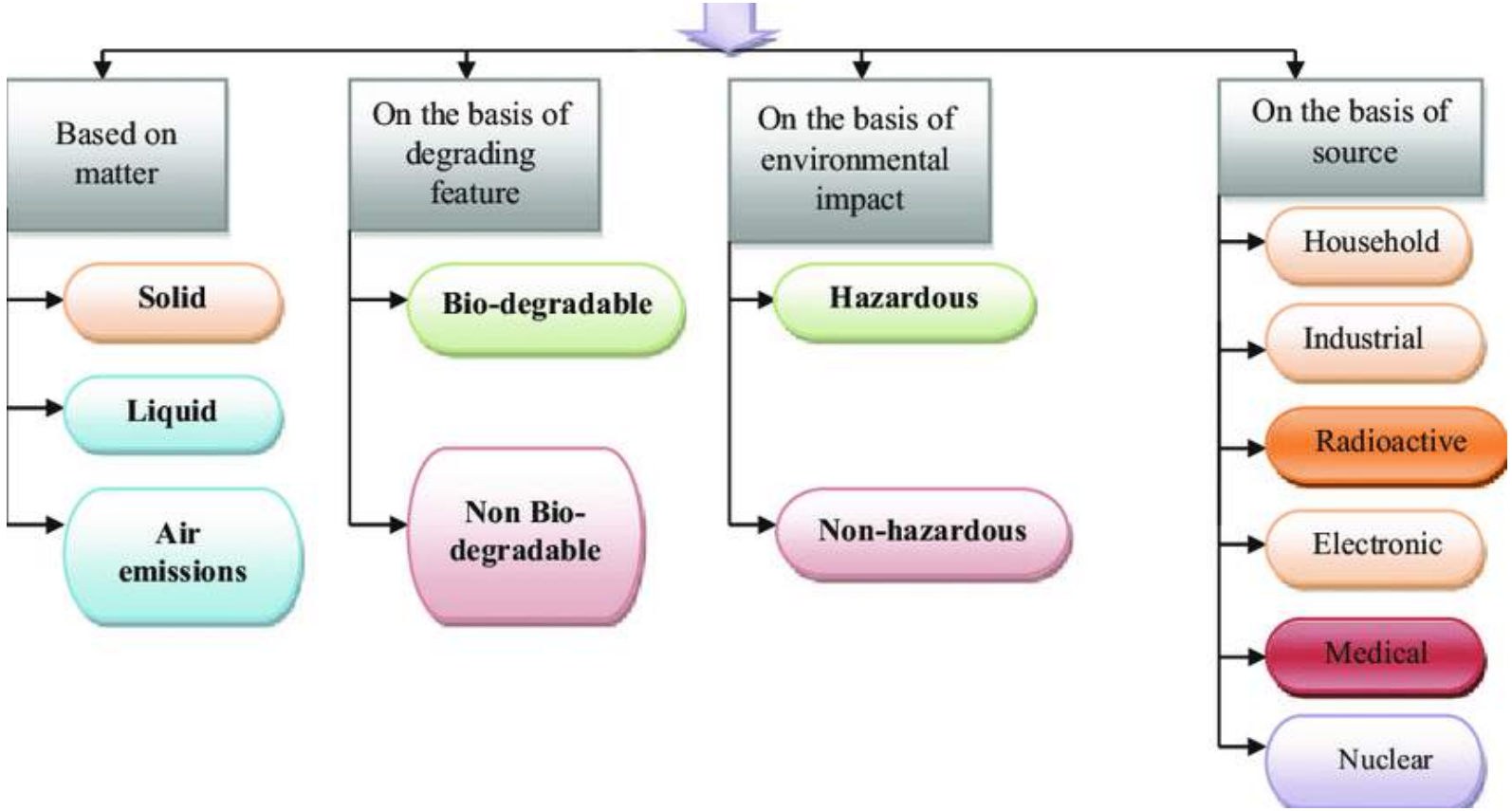
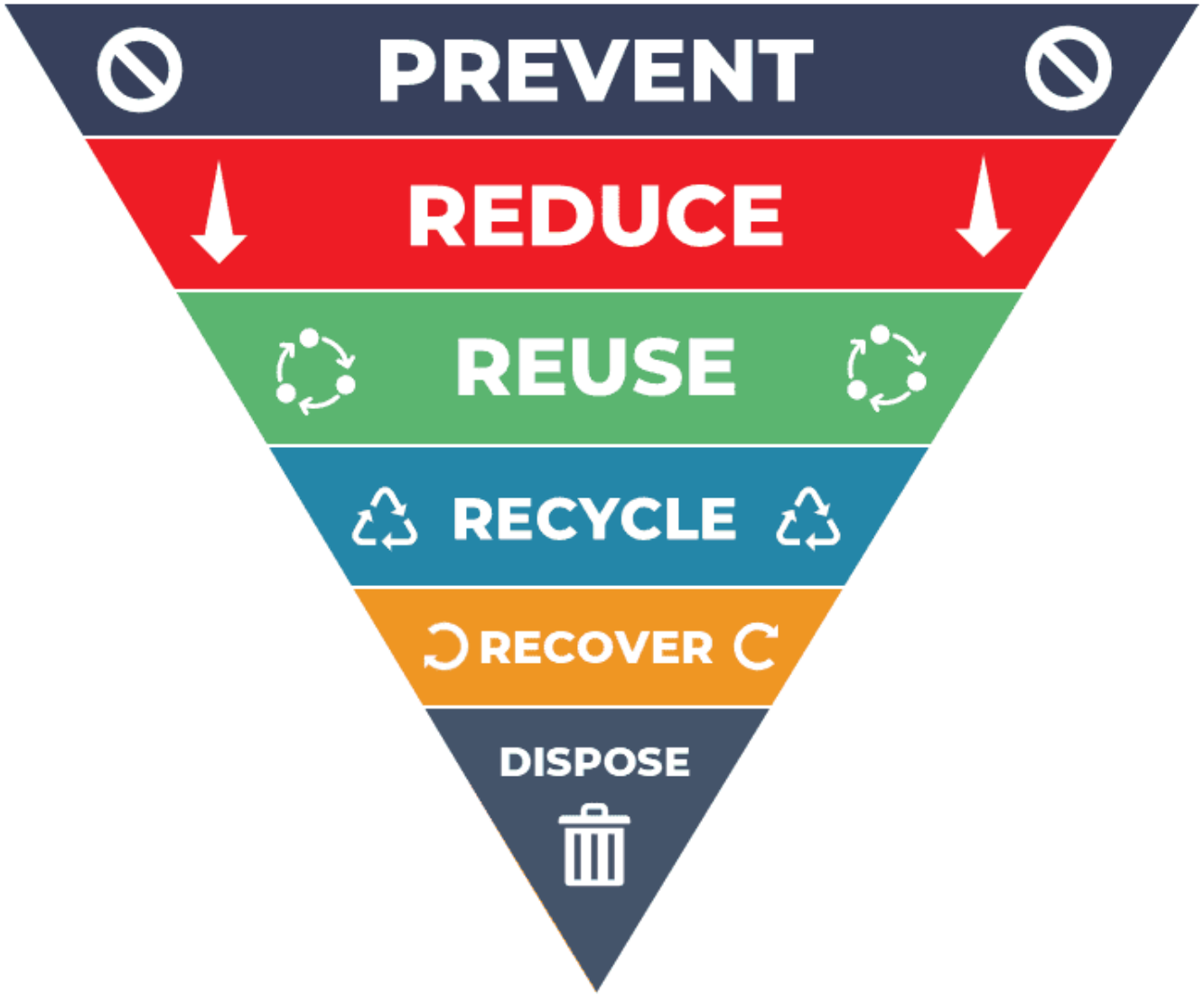


Waste: any amount of pollutants (substances, noise, radiation or other forms of energy) in any physical state or objects from which their owner wants or must or is obliged to get rid of.

Municipal waste: household waste, waste from commercial shops, offices or commercial enterprises as well as other waste that can, due to its nature or composition, be equated with domestic waste.



Waste management:

all the activities of collecting, sorting, transporting, processing, reusing or finally disposing of waste in natural receivers with the aim of protecting the environment.

AREAS OF ENVIRONMENTAL PROBLEMS

The quality of the environment in Greece is generally good. In some important areas where the quality of the environment had been degraded, the situation has improved significantly in recent years and in some the degradation has been avoided. Nevertheless, some key OECD indicators indicate that Greece has a high pollution intensity.

Some of the most pressing problems of our time are:

- The depletion of stratospheric ozone
- The increase in global temperature (greenhouse effect)
- The desertification of agricultural lands
- The intensity of the acid rain effect
- Deforestation
- The extinction of animal species
- Pollution and contamination of water, air and soil
- The depletion of natural resources

The progress that remains to be made, along with the prospects for economic growth and the possible increase in environmental needs combined with the increase in income require an environmental reform. This reform has already started (in environmental legislation and regulations, significant progress has already been achieved).

Despite this, there are still some Decrees and Ministerial decisions that remain to be enacted for the full implementation of certain Legislation. There are also EU directives which have not yet been fully incorporated into the National Legislation.

The environmental problem therefore still exists, and in fact in some areas it has increased significantly.

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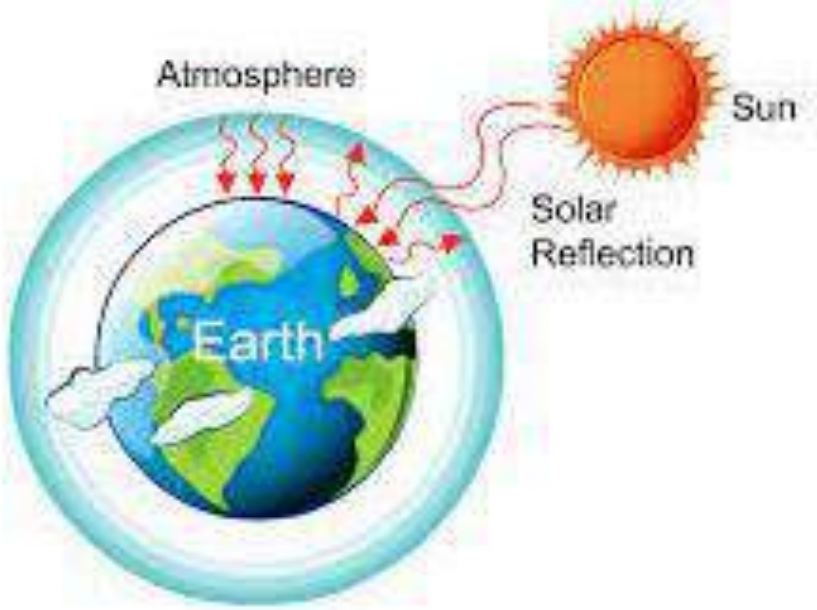
Let's look at the most important areas in general:

Soil	Earth and geology Corrosion, sedimentation, etc. Landscape and public spaces Biodiversity, flora, fauna etc. Waste management Soil contamination Energy and exploitation of natural resources
Atmosphere	Air pollution Noise pollution Climate
Water resources	Protection of drinking water, groundwater reserves Waste water management Earthly water resources, sea water Floods Fishing
Human population	Demography Education Transportation and traffic Recreation Local economy Land uses, urban development, urban and spatial planning

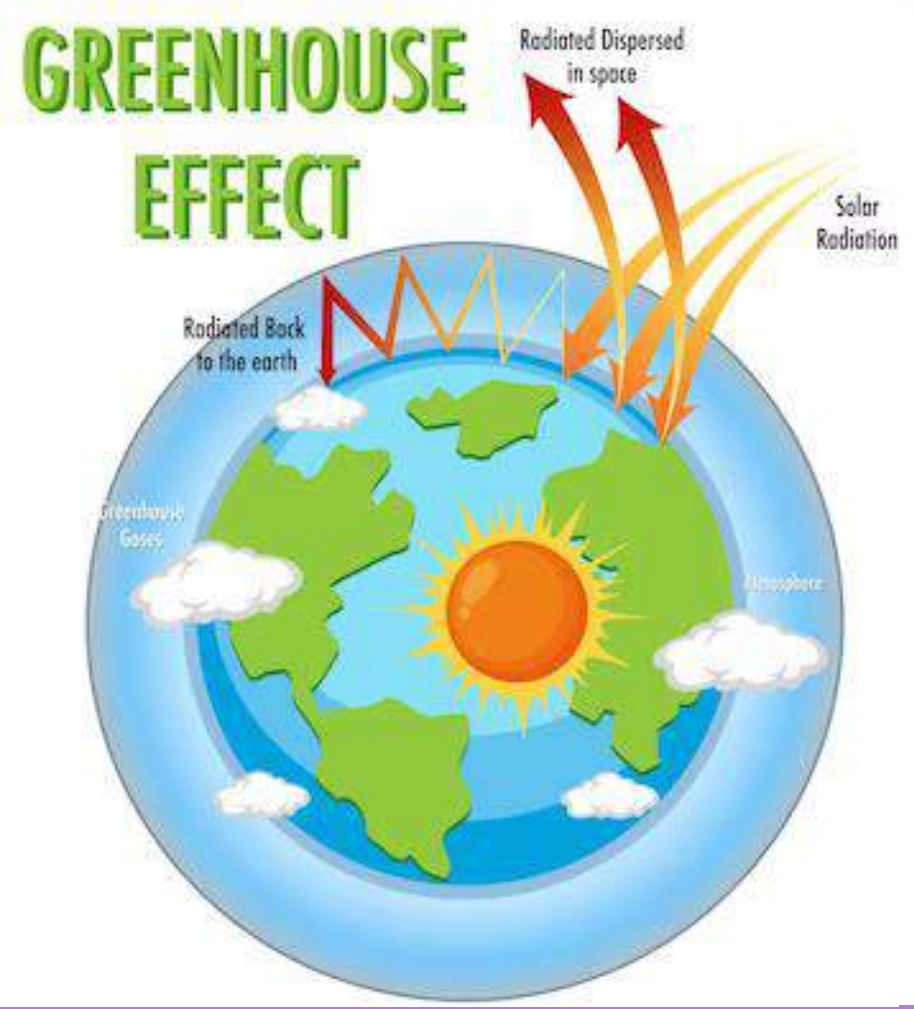
GREENHOUSE EFFECT



The greenhouse effect is the trapping of the sun's thermal radiation in the earth's atmosphere, resulting in a rise in temperature. It is because long-wavelength thermal radiation is trapped in the atmosphere due to the high concentration of carbon dioxide and water vapor. The trapping of thermal radiation in the atmosphere results in an increase in the average temperature, with extremely adverse effects for all living organisms.

The greenhouse effect is a natural phenomenon that essentially accounts for the form of life that exists today on our planet. Since the beginning of the industrial revolution, however, we have been spectators of an ever-increasing emission of greenhouse gases into the atmosphere which is added to any atmospheric concentration of greenhouse gases created by the natural processes by which the same gases are produced by nature (volcanic eruptions, natural fires, hot springs, earthquakes, etc.).

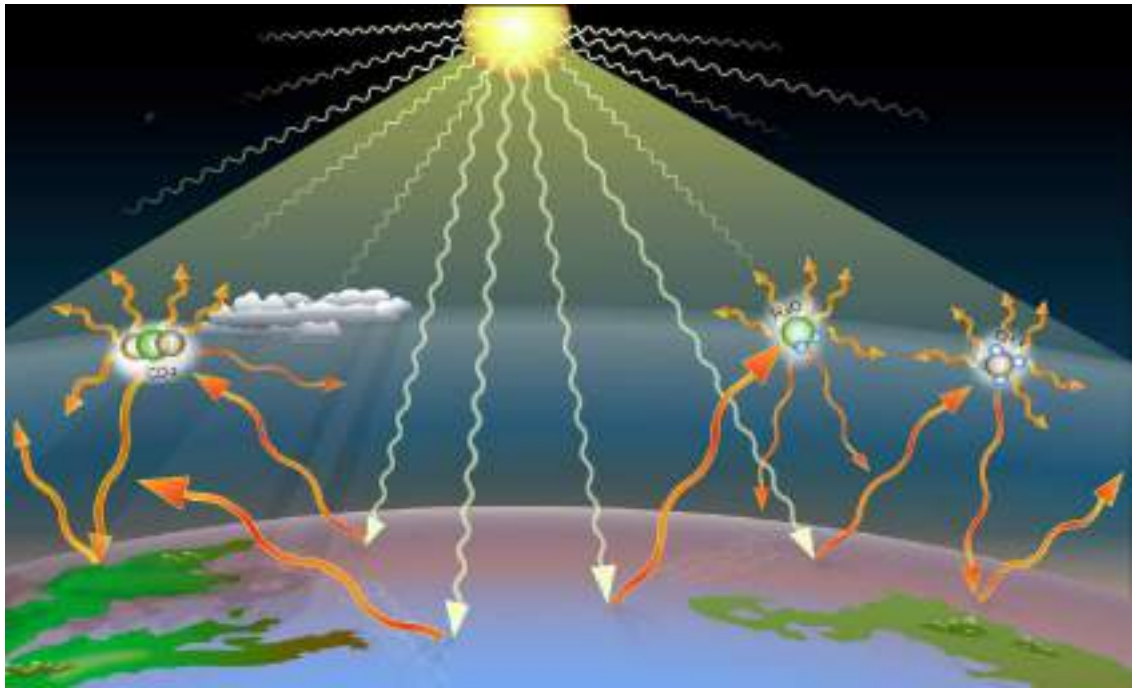
The anthropogenic origin of the increase in greenhouse gas concentrations in the atmosphere raises the research question of Global Warming.



Water vapor is one of the main greenhouse gases, but at the same time it is also an essential component of the hydrological cycle, with the result that its concentration in the atmosphere is very unstable and a purely local phenomenon.

Their condensation and the creation of clouds creates conditions for trapping the long-wavelength radiation emitted by the earth and at the same time reflects the incoming solar radiation.

Various pollutants such as carbon dioxide, nitrogen oxides, methane, chlorofluorocarbons and ozone form a kind of barrier that covers the earth and acts like the glass roof of the greenhouse.



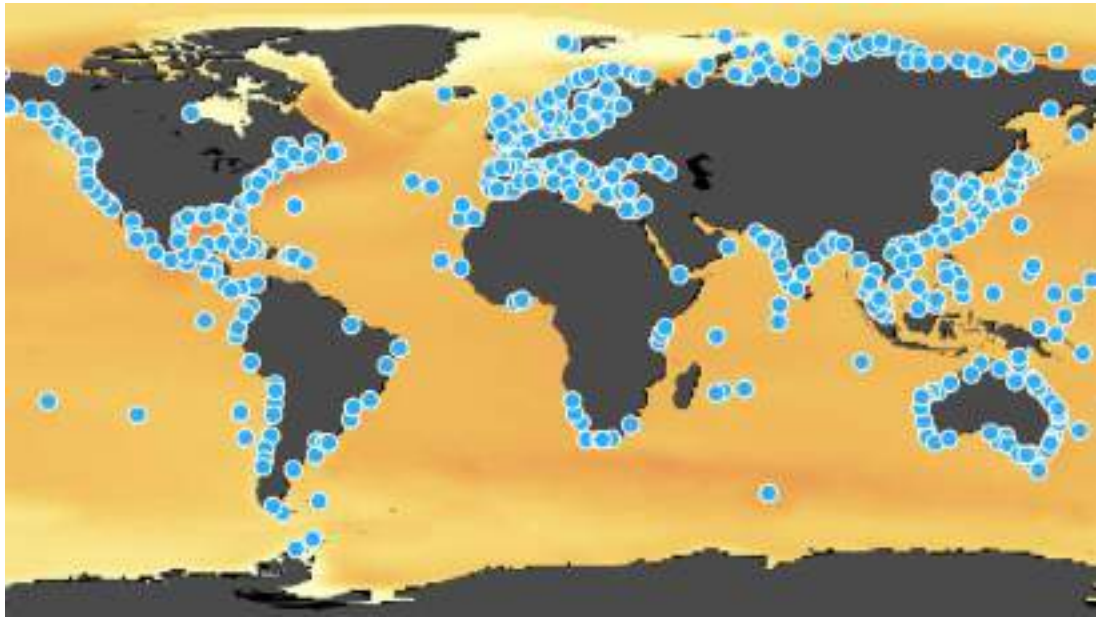
This barrier allows solar radiation to enter the Earth's atmosphere, but prevents thermal radiation from escaping into space. These successive reflections contribute to the increase in the average atmospheric temperature of the planet with what this implies (melting of ice, change of climatic conditions, increase in temperature, etc.).

Of all the pollutants, carbon dioxide is responsible for 50% of the increase, while other pollutants are responsible for the rest.

It has been calculated that since the end of the last century until now the average atmospheric temperature has increased by 0.6 degrees Celsius.

It is predicted by many scientists that by 2070 it will have increased by 3 degrees Celsius; this increase will make the earth as warm as it was 2 million years ago. This increase in temperature will cause the ice caps to melt and the ocean levels to rise by one meter.

There are many areas of the earth where the ground surface does not exceed two meters as for example in Bangladesh where 18% of the area will be under water in the year 2050.



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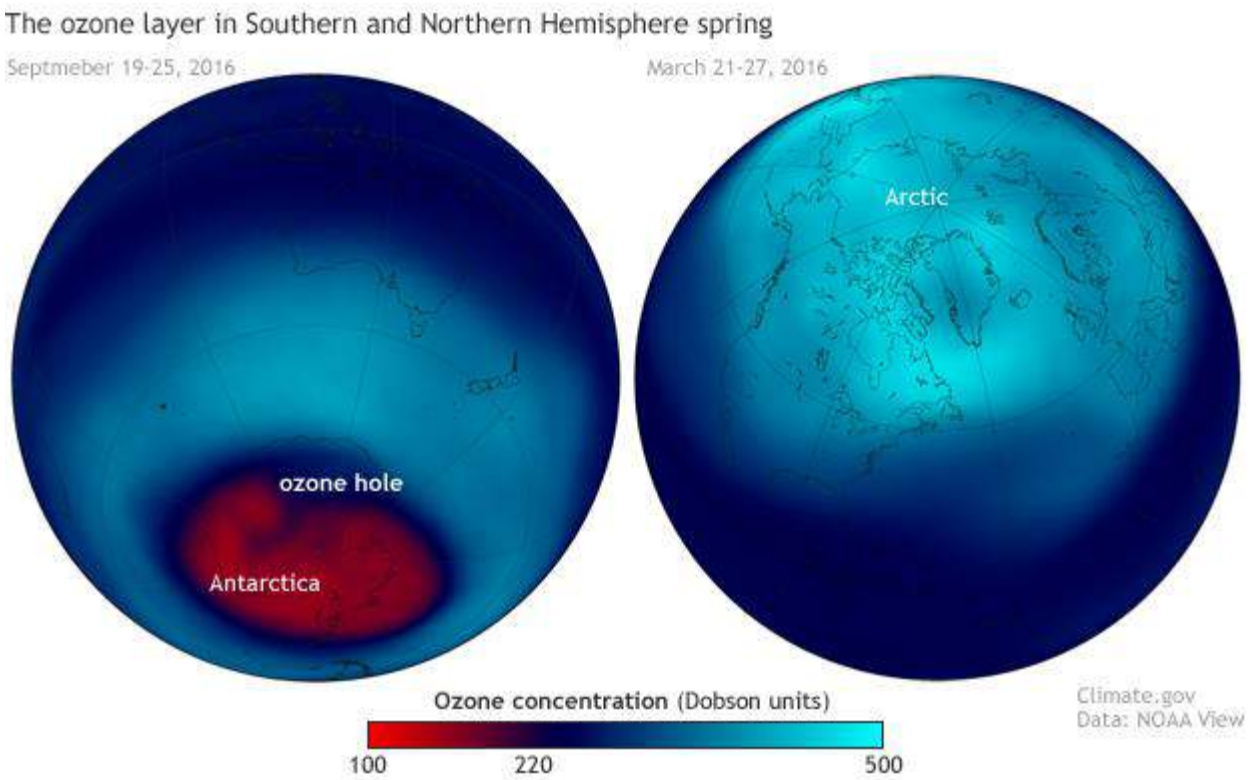
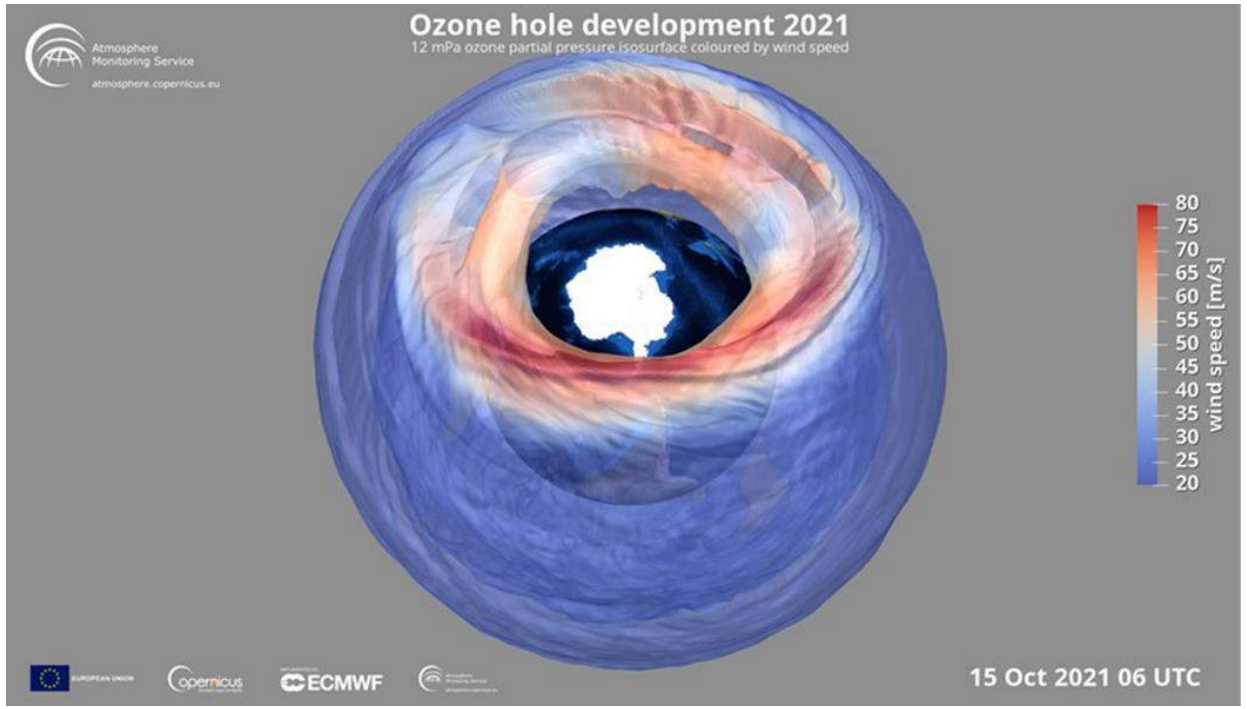
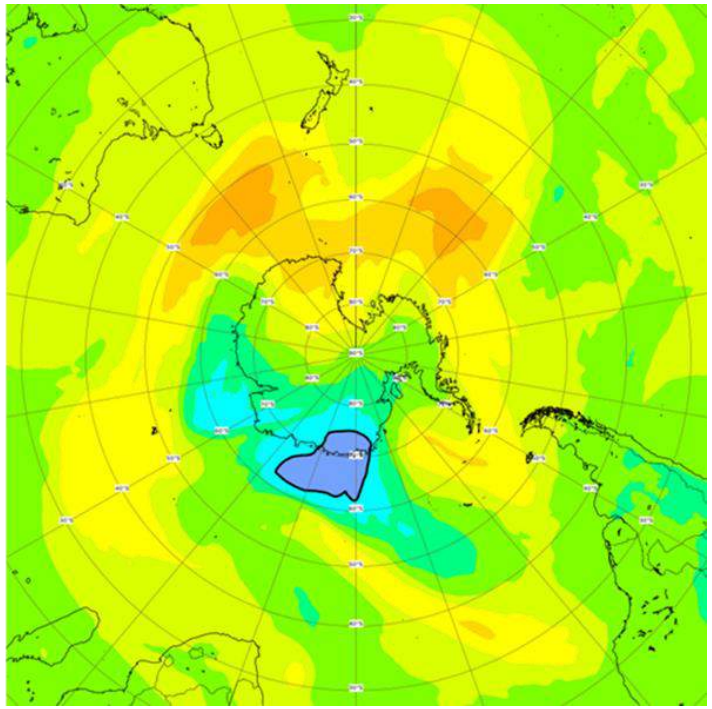
THE OZONE HOLE



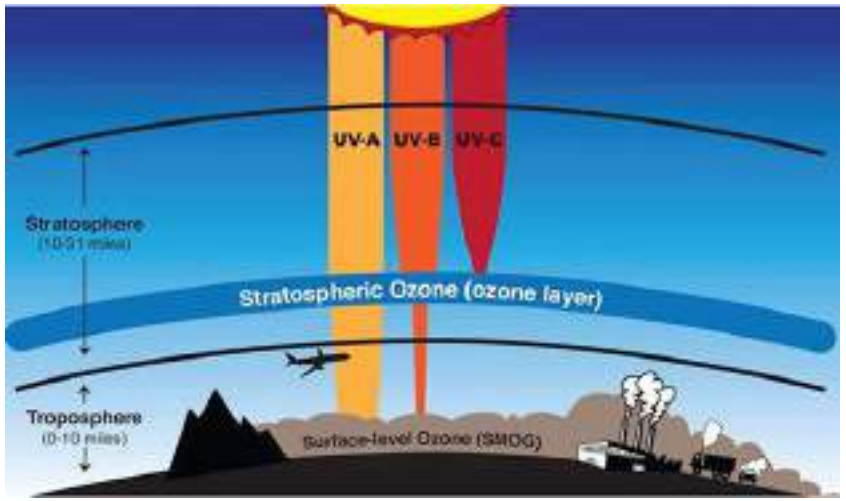
The stratospheric layer is being destroyed by humans at a rate of 1% per year.

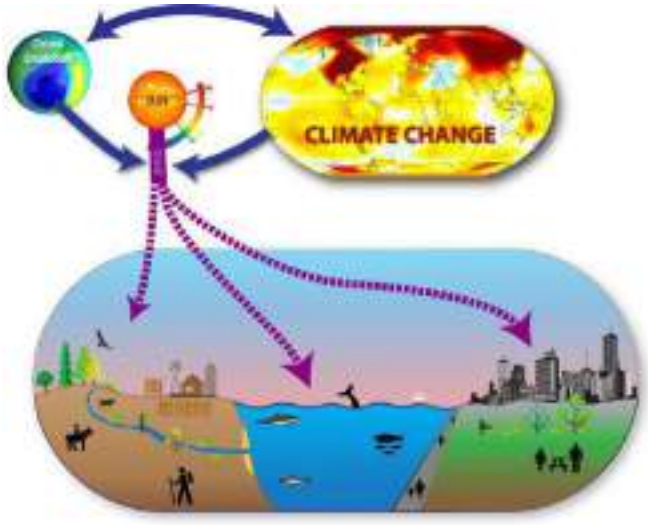
The cause of this destruction is the production of carbon tetrachloride (CFC) and nitrogen oxides (NOx). The most dramatic ozone depletion occurs each year over the South Pole (Antarctica) from September to November.





The ozone layer of the stratosphere is known to be of great importance for the protection of biological systems. This layer has the ability to filter solar radiation by absorbing the dangerous ultraviolet rays. In recent decades, however, a thinning of the ozone layer by approximately 40% has been observed, initially in Antarctica and later in densely populated areas of the B hemisphere, leaving organisms unprotected from ultraviolet radiation.





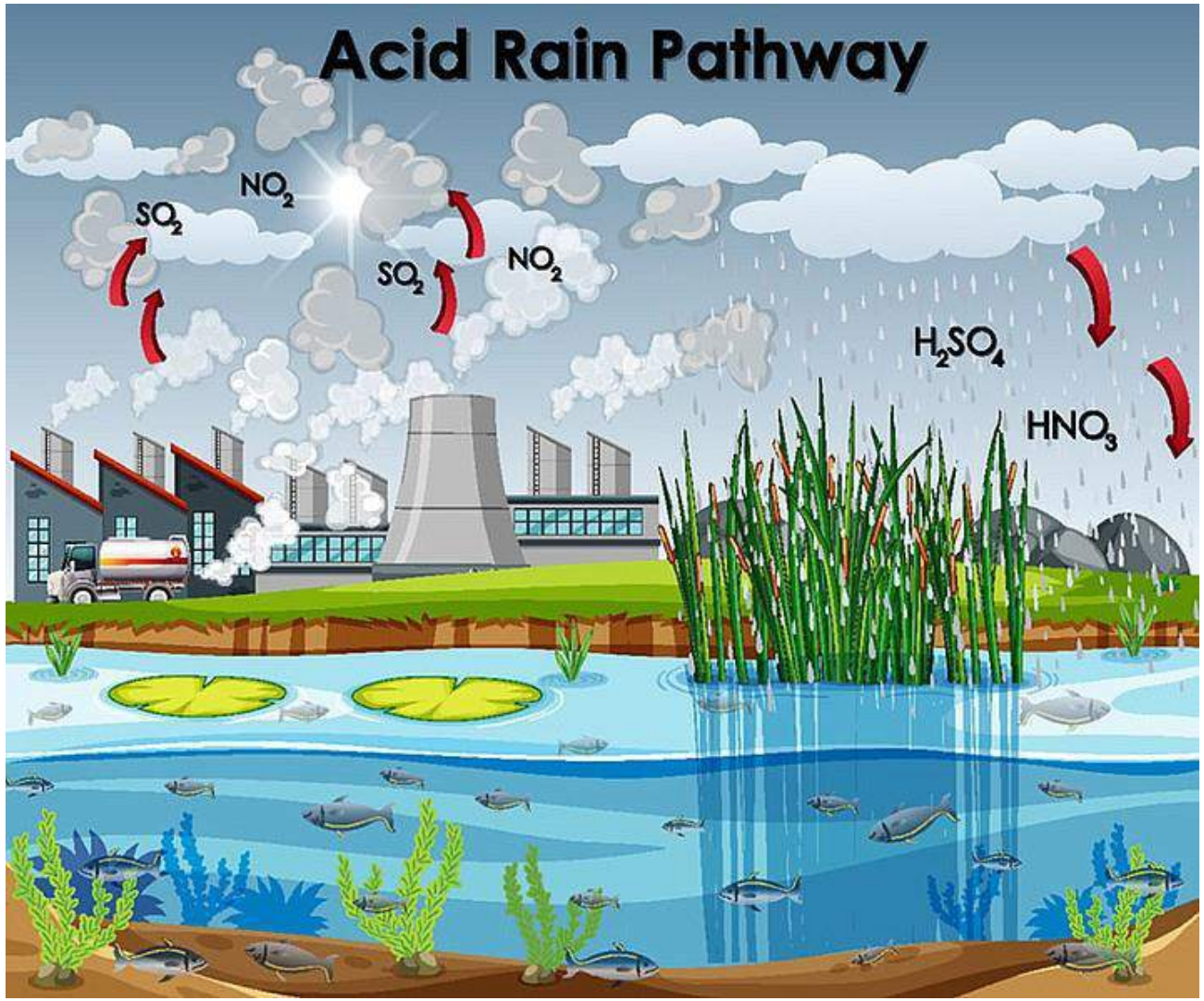
The consequences of the reduction of the ozone zone are considered serious not only for the sustainability of ecosystems but also for meeting the nutritional needs at all levels of the food chains.

A 10% ozone depletion can have devastating effects on human health, weakening the body's immune system and increasing the incidence of skin cancer. Ozone is also destroyed by the gases of jet planes. Today on the planet there are many areas where the depletion of the ozone layer can create a new "hole".

ACID PRECISION (ACID RAIN)

By acidic meteoric precipitation we mean rain, snow, hail, fog that have a pH of less than 5.6.

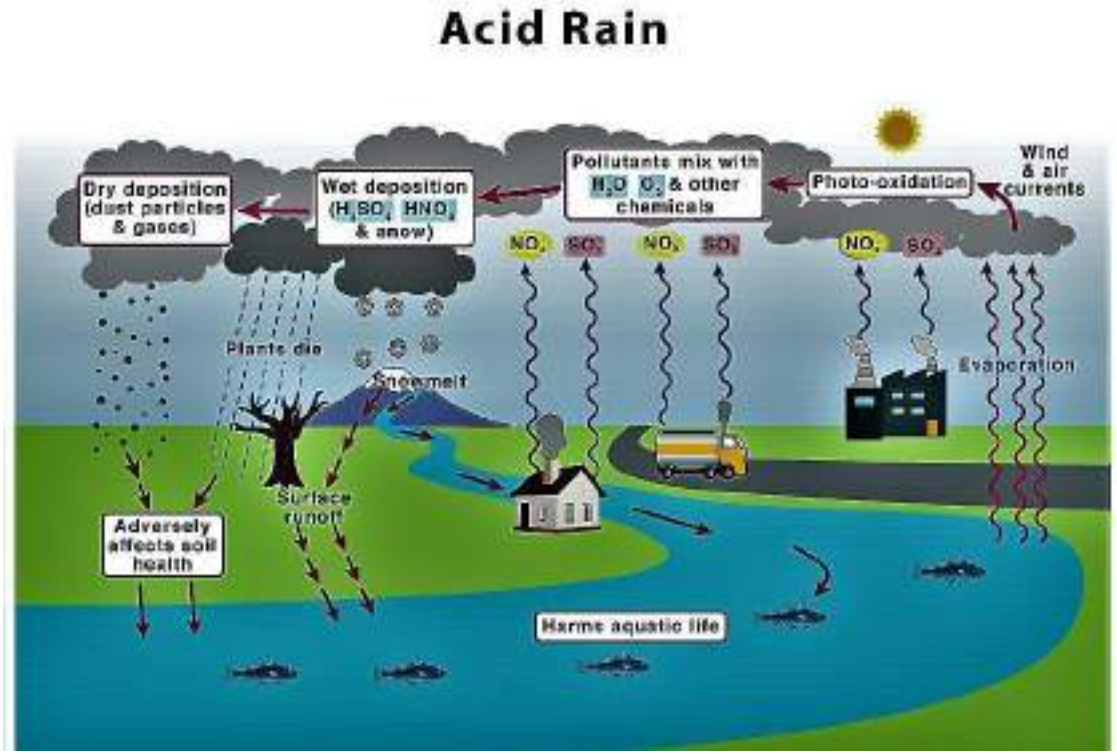
The pH with the effect of carbonic acid from atmospheric carbon dioxide can be in normal rains 5.6 - 6.



Sulphur and nitrogen dioxide, which are released into the atmosphere by some chemical preparations, are oxidized to trioxides, which then, with the presence of moisture in the atmosphere, turn into sulfuric and nitric acid.

These acids can be carried by the winds over long distances and fall to the earth in the form of acid rain. Its main victims are the plants, which are "burned" and destroyed.

It also causes significant damage to monuments, a very serious issue for Greece with its thousands of monuments.



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EFFECT OF ACID RAIN ON FORESTS

Acid rain and pollution generally cause forest trees to stunt growth because it causes leaf stomatal damage and defoliation, resulting in reduced tree vitality, reduced growth, and eventually tree death.

Also, soil pollution causes a surprising depletion of soil nutrients, along with dry years and tree defoliation. In fact, it was found that in years with a lot of pollution and with perhaps less involvement of drought, the trees and especially the lower part of the tree, stop creating annual rings.

The damage to Europe's forests from acid rain has reached great proportions and threatens the forests of Europe's developed countries.

The main factors of forest necrosis are:

- The change of the "chemical" climate.
- Destabilization of forest ecosystems.
- Tree damage and growth changes.
- Change in soil.
- Change the action of decomposers.

Conclusions

Because perhaps the deep cause for the perpetuation of the most important problems of modern societies is the lack of training and theoretical knowledge, the aim of this work is to identify and analyze the most important environmental problems that concern humanity, in order to contribute to the fight against the environmental problem.

It would be negligent not to refer to the human factor and to what extent it can give individual but catalytic characters to the activation of each competent body.

Clearly, the conclusions are very difficult to apply from one moment to the next, but when each of us personally and also the states themselves are led to the level of conscious respect for the environment, then the problem will be addressed to an extent that will make lives and the future of our children auspicious.

Material from University of the Peloponnese (UoP): https://www.uop.gr

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