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Climate Change and the Way to Sustainable Energy Use

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Abstract: Climate change is a pressing threat and poses great risks to the global economy. One of the consequences of global warming is climate change, the most visible effects of which are melting polar caps, rising sea levels - some Pacific islands are already disappearing, and their inhabitants are already to emigrate to other islands. Safer - increased frequency of extreme weather events, droughts, forest fires, floods, ecosystem degradation and biodiversity loss. In other words, global warming "disrupts" the climate. It should be noted that the climate has never been stable; in the history of our planet, the climate has always changed, but the current climate crisis is unique in terms of speed, intensity, causes and, above all, consequences. Anthropogenic climate change has already led to substantial changes in the environments and extremes of many climate variables. Additional climate change is now inevitable, but its speed and scale depend on the success of global mitigation policies. Romania has committed through the Integrated National Plan in the field of Energy and Climate Change 2021-2030 to reduce by 2030 by 43.9% ETS (EU Emissions Trading System) emissions compared to 2005 values and to increase the global share of energy from renewable sources in gross final energy consumption by 30.7%.

Keywords: climate change; energy resources; sustainable energy

JEL Classification: Q54

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1. Introduction

It is known that life on Earth has become possible due to the solar energy that reaches the earth largely in the form of light. About 30% of sunlight returns into space being reflected by the atmosphere, and the rest, reaching the earth's surface, is reflected in the form of infrared radiation. It is slowly lifted by the air currents, and the penetration into space is delayed due to "greenhouse gases" such as: vapors, carbon dioxide, ozone and methane.

Greenhouse gases, which make up only 1% of the atmosphere, act as a cover for the earth or as a glass roof of a greenhouse, keeping the temperature of the planet about 30 ° C higher than it would be without them. We owe the appearance of life to this natural warming of the Earth. Over millions of years of life on Earth, the planet has had a beneficial greenhouse effect, thanks to which the temperature has been suitable for the development of life and civilization. This perfect balance, however, is very sensitive and in just a few decades, the amplification of the greenhouse effect can cause global catastrophes.

Human activities contribute to the thickening of the shell made up of greenhouse gases. The natural levels of these gases are exceeded by carbon dioxide emissions from the burning of coal, oil and natural gas; methane and nitrogen oxide produced as a result of agricultural activities and changes in land use and a number of other long-lived gases resulting from industrial activity and not produced in nature.

These changes are taking place at an unprecedented speed. If emissions continue to rise in the same proportions, it is almost certain that atmospheric carbon dioxide levels will double be compared to those in the pre-industrial period of the 21st century. The result is known as global warming of the earth's surface in the lower layers of the atmosphere. Computerized climate models estimate that the average global temperature will increase by 1.4°C to 5.8°C by 2100.

Even a small increase in temperature will be accompanied by climate change, such as: cloud cover, precipitation, wind and the duration of the seasons.

Carbon dioxide contributes more than 60% of global warming. The proportion of people who use coal, oil and natural gas far exceeds the speed at which fossil fuels are produced. As a result, carbon is released into the atmosphere, affecting the carbon cycle established over millions of years, which is a balanced carbon exchange system between air, ocean and terrestrial vegetation. At present, it is estimated that the carbon dioxide content of the atmosphere increases by 10% every 20 years. Global warming caused by the greenhouse effect is a major problem. If greenhouse gas emissions continue as before, we will face some severe consequences: rising sea levels, extreme weather conditions, ocean acidification, mass extinctions.

2. Climate Change

The world, as we know it, is changing! And human is responsible for many of the events that take place worldwide. Global warming is one of the consequences of human activity on earth, when material gain and well-being have been more important than the safety of an environment.

The issue of climate change is recognized by the United Nations (UN) as one of the most important global issues. Climate change is one of today's most important issues. In the last 130 years, the average temperature on Earth has increased by 1 ° C. Even a seemingly small rise in temperature on a global scale is dangerous for plants, animals and humans.

It is more accurate to refer to "climate change" than to "global warming" because rising temperatures, is warming, are only part of the processes of climate change on Earth. Along with the climate, all nature is unbalanced: glaciers and permafrost are melting, the level of the Planetary Ocean is rising, floods, droughts and hurricanes are increasing, the weather is becoming more and more changeable. Climate change is leading to the death of many animals and plants that are not adapted to the new conditions, causing significant economic damage, threatening the health and even life of people.

The average annual variation of global temperature in the last decade (2011-2020) was 1.31^{0}C and far exceeded previous periods. It was 1.01^{0}C in the previous decade (2001-2010) and 0.58^{0}C in the previous decade (1991-2000).

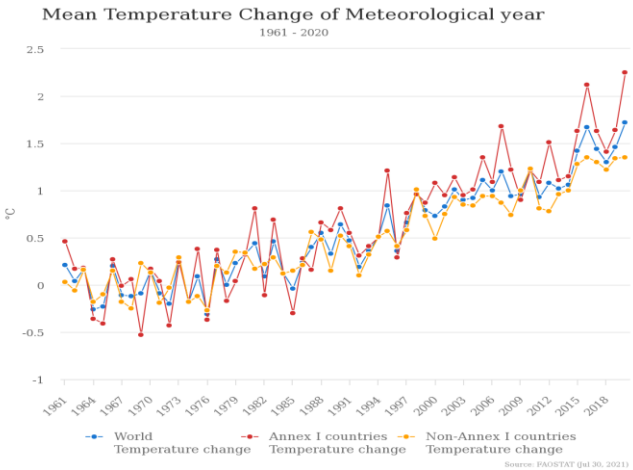

Figure 1. Mean Annual Temperature Anomalies Over Land for World, Annex I Countries (Developed, According to the Climate Convention) and Non-Annex I Countries (Developing)

Source: FAO, 2021. Temperature Change Statistics 1961–2020: Global, regional and country trends. FAOSTAT Analytical Brief Series No. 19. Rome.

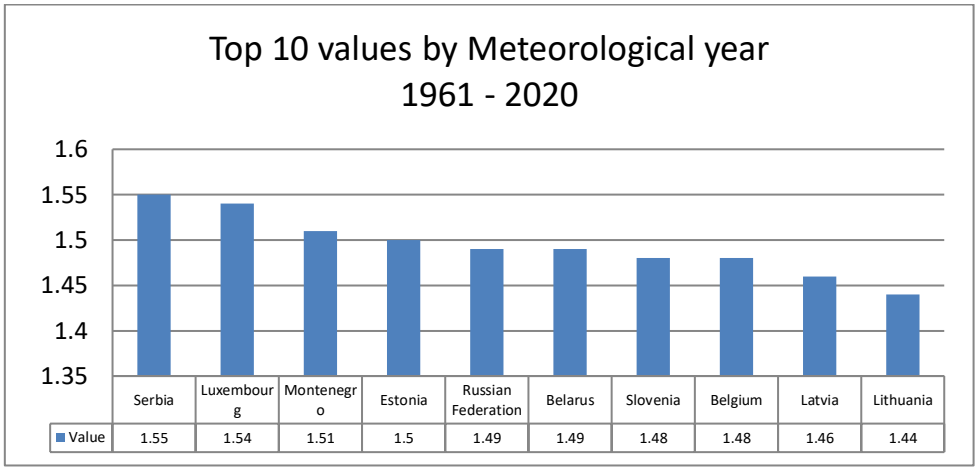

Figure 2. Top 10 Values by Meteorological Year 1961 – 2020

Source: FAO, 2021. Temperature Change Statistics 1961–2020: Global, regional and country trends. FAOSTAT Analytical Brief Series No. 19. Rome.

In 2020, 158 countries and territories had an average annual temperature change of 1.0^{0}C higher than normal. Over 70% of them recorded average annual temperature changes above 1.5^{0}C.

The 10 largest annual average temperature changes were recorded in European countries and especially in Eastern and Northern Europe: the Russian Federation (3.7^{0}C), Estonia (3.6^{0}C), Belarus and Latvia (3.5^{0}C), Lithuania (3.4^{0}C), Finland (3.3^{0}C), the Republic of Moldova and Ukraine (3.0^{0}C), Sweden (2.9^{0}C) and Kazakhstan (2.8^{0}C).

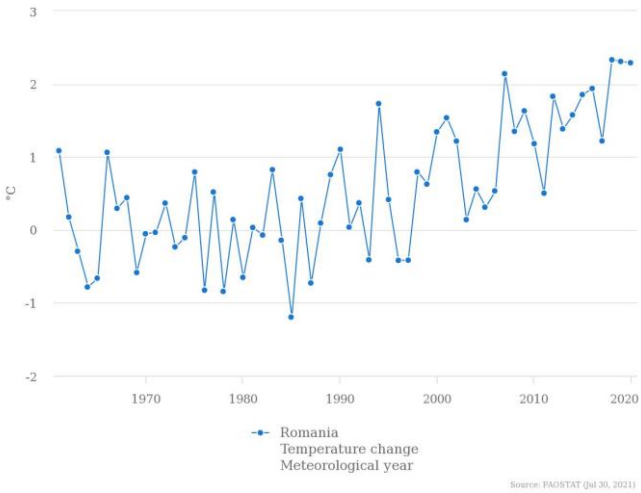

Figure 3. Romania - Temperature Change

3. Sustainable Energy Resources

Today, humanity benefits from a very high dose of comfort, both at home and outside the home due to energy. Unfortunately, not all sources of energy are endless. Electricity production is based on fossil fuels that have a high degree of depletion, such as oil or coal. Fortunately, there are also renewable fuels, which can be used for free, can cover all of society's energy needs and most importantly, do not pollute.

With the increase in the consumption of natural resources, the danger of reducing their volume or even the disappearance of some appeared. One of the classifications has as a criterion the degree of exhaustion and their recovery in time. Thus, the resources are:

inexhaustible	***unchangeable by human intervention***	solar energy
	modifiable by human intervention	water
		air
exhaustible	***non-renewable***	ores
		fossil fuels
	renewable	plants
		animals

Figure 4. Classification of Natural Resources

An energy source is considered renewable when its use does not affect the same for future generations. In practice, we can define a renewable source only when those who come after us can use it in the same way, with the same ease and in identical quantities.

The sun, the wind, the sea, the heat of the subsoil, the energy coming from the waterways, that generated by plants, animals, waste and organic waste are therefore generally considered renewable energy sources.

Also, along with these types of resources we can define solar, wind, marine, geothermal and biomass energy as renewable energies.

Such a classification requires an awareness that resources are not entirely inexhaustible, even some that are considered inexhaustible, such as water, are affected by human activity (due to the water circuit in nature the amount of fresh water does not change, but heavy consumption in certain areas significantly affects its resources).

In the last fifty years, the consumption of raw materials and energy has increased dramatically, causing man to question his own future.

The use of fossil fuels to obtain energy has led to an increase in the content of greenhouse gases in the atmosphere.

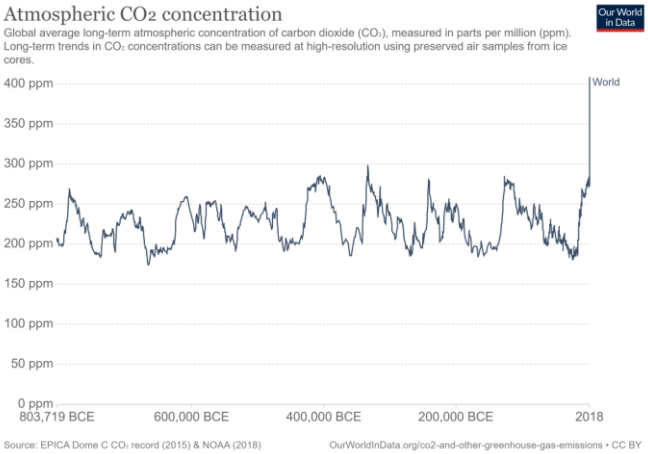

Figure 5. Atmospheric CO2 Concentration

As shown in the figure below, CO2 is the greenhouse gas released in the largest amount. It is usually produced by human activities. Other greenhouse gases are emitted in smaller quantities, but capture heat much more efficiently than CO2, and in some cases are thousands of times stronger.

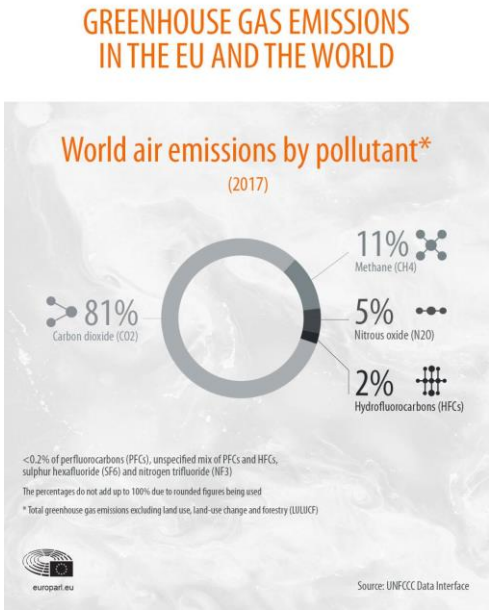

Figure 6. Greenhouse Gas Emissions Produced in the EU in 2017 and the Share of Different Gases

Source: https://www.europarl.europa.eu/news/ro/headlines/society/20180301STO98928/emisiile-de-gaze-cu-efect-de-sera-pe-tari-si-pe-sectoare-infografic

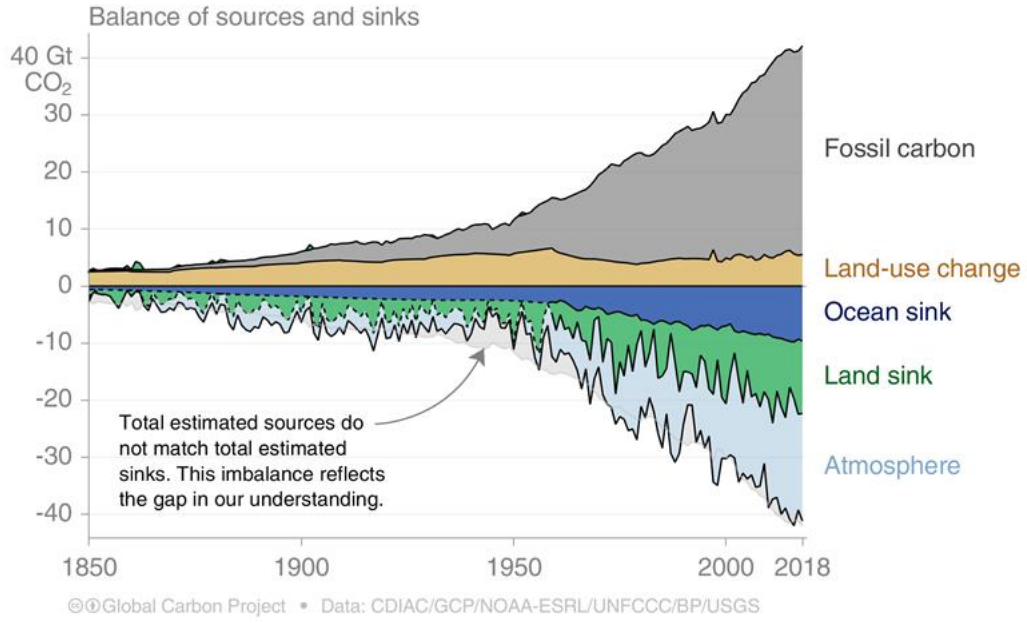

Figure 7. The Main Sources of CO2 Input and Output

The figure above shows the main sources of CO2 input and output. We have two key sources of CO2 - carbon released from the burning of fossil fuels and the release of carbon from land use changes (deforestation, for example). Therefore, they are described as "positive" CO2. But we also have two main sources of carbon "outputs": both the ocean and the earth absorb and store carbon. So some of the CO2 that we emit from fossil fuels and land use change is absorbed and stored in the ocean as well as on the ground. Only the rest of the fraction - which accounts for about half of global emissions - remains in the atmosphere.

Conclusion

The development of western countries and more advanced nations in other parts of the world has brought numerous environmental damage over the centuries, causing enormous environmental and climate disasters.However, these nations are taking steps to convert from the exploitation of non-renewable energy to the use of alternative energies that enable sustainable development: the Sustainable Energy and Climate Action Plan.

In general, when we talk about sustainable energy we refer to that type of production and use of energy that involves sustainable development, which in turn aims not to harm the environment, due to the efficiency of energy use. In fact, the use of

sustainable electricity, ie electricity from sustainable sources (such as water, sun, biomass and wind), makes it possible to reduce energy production through nuclear power plants and coal: these, fossil fuels, despite the fact that they have supported and satisfied the energy needs of the population for at least three centuries of history, today they are considered depletable sources of energy pollute and harm the environment.

Therefore, a change of course is needed: the transition to green energy is the only way to meet the world's energy needs in order to save and reduce the impact on the environment. In this sense, we are talking about energy and sustainable development.

Today we often hear about energy and sustainable development, an approach that aims to support new socially responsible models. The environmental issue is at the center of great debates, both globally and locally, to understand how we can create a more ethical and ecological society. The governments of the world's major countries have planned ambitious decarbonisation programs, based mainly on the use of clean energy sources.

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