## CLIMATIC CHANGES AND THEIR EFFECTS ON THE ENVIRONMENT

# Adrian BAVARU<sup>1</sup>, Rodica BERCU<sup>2</sup>

**Abstract.** Over the past few decades, there have been modifications of the climatic factors, the intensification of meteorological phenomena that deviate from the normal and have a negative influence on the natural frame and on life in general. According to the specialists in the field, all these climatic modifications start from the phenomenon of global warming caused mainly by the anthropogenic influence which leads to the occurrence of the so-called "greenhouse effect". The consequences of this phenomena is analized in the present paper. Due to the expansion of dry areas and the shortage of drinkable water, both life in general and human life will be affect as well. The temperature increase will lead to the melting of glaciers and ice caps or the two poles as well as causing the floods effect in the costal and islander zones of Terra. Finally, is mentioned a last novelty from astrophysic field, that "beginning with 2014 on the Earth will start a climate cooling in a new "ice age"

Key words: global worming, climatic factors, environment

### Introduction

Over the past few decades, there have been modifications of the climatic factors, the intensification of meteorological phenomena that deviate from the normal and have a negative influence on the natural frame and on life in general.

The specialists are warning that a global modification of the climate – if it should occur – "would be the most dangerous natural risk possible for humankind and quite possibly the greatest of all possible natural risks."

The anthropogenic activity currently tends to determine a global modification of the climate and consequently modifications of the environment (we are not discussing the natural causes that occurred in the past). Even though climatic risks take place in all the parts of the globe – the specialists consider that the temperate zone witnesses the most numerous and various climatic risks that affect the environment (thus, our zone as well) [1].

In 1995, the scientists from GIEC (The International Group of Experts for the Study of Climatic Changes) warned that the Earth entered a period of climatic

<sup>&</sup>lt;sup>1</sup> Prof. Department of Botany, Faculty of Natural and Agricultural Sciences, "Ovidius" University, Constanta, Romania, Honorary Member of Academy of Romanian Scientists, email: abavaru@yahoo.com

<sup>&</sup>lt;sup>2</sup> Prof. Department of Botany, Faculty of Natural and Agricultural Sciences, "Ovidius" University, Constanta, email: rodicabercu@yahoo.com

instability that would lead to the degradation of the economic and social environment, and off course, of the natural frame. Consequently, the UN created the so-called Intergovernmental Panel on Climate Change (IPCC) which, together with the other two instances mentioned above (and others), periodically analyzes in joint sessions the current problems of the global climate, also adopting appropriate measures which are presented then to all the countries. We also find that nowadays there are more and more unusual meteorological phenomena such as: very high temperatures in summer, diluvial rain and catastrophic floods, strong winds and storms in the form of hurricanes, tornados or typhoons that occurred in our country too (even this summer).

According to the specialists in the field, it is believed that all these climatic modifications start from the phenomenon of global warming caused mainly by the anthropogenic influence. The increase of temperature leads to the occurrence of the so-called "greenhouse effect". Huge quantities of gases have accumulated in the atmosphere such as carbon dioxide (in great concentrations), methane (which causes a greenhouse effect ten times more than carbon dioxide), nitrogen dioxide, fluorocarbons etc. This phenomenon was observed starting with 1980 when a NASA researcher reached the conclusion that these gas accumulations resulted after the burning of oil and other fossil fuels increase the global temperature.

If the average temperature on Earth increased by  $1^{\circ}$ C in the  $20^{\text{th}}$  century starting with 1990, the warming rate will increase even more rapidly and if the rhythm is maintained, the temperature will increase by at least  $1^{\circ}$ C up to approx.  $5^{\circ}$ C or even more towards the end of the  $21^{\text{st}}$  century (according to Hubert Reeves, 2005).

The developed countries, with a strong industry and a large number of cars, are the main guilty parties in this disaster: see Figure 1, 2. Consequently, at the UN conference from Copenhagen in December 2009, over 100 country leaders decided to limit the increase of global temperature to 1.5-2°C. However, the signing of a new treaty fails.

In 1997 in Kyoto (Japan), at the international Conference dedicated to the accumulation of toxic gases and to the greenhouse effect, an immediate reduction of carbon emissions of 5% was established to take place by 2012 (compared to the 1990s). Today, this percentage is inadequate and insufficient. New proposals were made, namely to reduce at half these emissions by 2050. We must also specify that the Kyoto protocol expires in 2010.

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Figure 1. Aggregated greenhouse effect gas emission diagram.



**Figure 2.** Gas emissions due to: **a.** a large number of cars; **b.** developed countries, with a strong industry.

At the next conference, in Copenhagen in December 2009, dedicated to climatic modifications, Europe decided on a reduction of the emissions of 20% by 2020, and even 30% if other countries on other continents agree. However, China claimed the right to continue to emit greenhouse gases in the same quantity as the industrialized countries, but pledged to reduce their intensity by 40-45% by 2020, if other countries do the same. For a better understanding of the seriousness of the phenomenon of gas accumulation in the atmosphere, we will give a statistics for

2007 realized by one of the specialized UN organizations, "U.N. Statistics Division Millenium Development Goal". The conclusion was that 35 developed countries generate <sup>3</sup>/<sub>4</sub> of the total gas emissions (of all the 192 UN countries). We must also specify that, given the rise of industrial production, China increased (not reduced) the gas emissions, reaching the level of emissions from Russian and the USA together. In 2009, China produced 7.43 billion tons of emissions, while in 2008 it produced "only" 6.8 billion tons. At the same time, the USA produced 5.95 billion tons, like in 2009. Another fact is that, at global level, the greenhouse gas emissions decreased by 1.3%, reaching 31.3 billion tons in 2009. It is a good but timid start.

Our country also reduced the emissions in 2009, reaching second place in Europe, after Estonia, with only 42 million tons, given that our annual quota is 76 million tons. At the EU level, the emissions decreased by 11%. All these are explained by the current global recession, but also by the increased investments in alternative energy sources (solar, wind etc).

The industrialized countries are not too willing to take more decisive measures for a drastic reduction of the gas emissions that cause the greenhouse effect. This was obvious at the Copenhagen Conference. Thus, they are willing to pay even a high price for this pollution. For example, the USA wants to use 100 billion dollars by 2020 in order to fight the climate modifications if other industrialized countries do the same. Australia, France, Japan, Great Britain, Norway and the USA announced immediately a financial aid of 3.5 billion dollars for three years with the purpose of taking measures to stop deforestations in the third world countries (with tropical and equatorial climate where the "green lung" of the Earth is located) [2]. Japan alone offers huge amounts of money for other measures just as long as it is not forced to reduce the emissions of toxic gases: see Figure 3.



Figure 3. Greenhouse effect and climate modifications caused by:a. deforestations;b. emissions of toxic gases.

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The calculations accomplished by the researchers from the "Geophysical Research Letters" show that a layer of soot accumulates in the atmosphere. It is resulted from the launching of rockets: see Figure 4. This leads to the cooling of the Earth by 0.7°C, but in the Antarctic area, the temperature will be 0.8°C higher. Moreover, the ozone layer in the stratosphere will be affected. It protects us against the UV rays and it will be thinner at the Equator by 1% and at the poles by 10%. Consequently to the warming by 1°C at the poles, the ice caps will be reduced by 5-15%: see Figure 5.



**Figure 4.** A layer of soot accumulates in the atmosphere: **a.** caused by launching of rockets; **b.** the expansion of dry areas will also affect agriculture.



raficul cauzelor schimbarilor climatice și apariț "efectului de seră"

Figure 5. The reasons of climate changes and the release of greenhouse effect.

What are the consequences of global warming by 2-3°C on our planet in the future?

Firstly, the specialists estimate that approx. 3.4 billion people (over half of the current population of the Earth) will suffer profoundly because of the shortage of drinkable water, due to the expansion of dry areas, salinization and soil degradation: see Figure 6.



Figure 6. Shortage of drinkable water due to the expansion of dry areas, Salinization and soil degradation.

Until 1970, the dry and arid zones of the globe represented approx. 15% of its surface. However, by 2002 the value reached 30% (it doubled in 32 years) and unfortunately these areas continue to expand [3]. Let us discuss our country, where the average annual temperature has risen by 0.8°C over the past decade. As a consequence, southern Romania, including Dobrogea, is in danger of becoming arid, as the summers here are very hot. In the summer of

2007, in the county of Braila, there was no rain for 147 days and the temperature in the summer months was approximately 40°C. Consequently, all the century-old trees protected by the "Balta Mică a Brăilei" National Park have dried out! In turn, the Park has been taken over by grasses and weeds characteristic to ruderal steppe and which have no value, on the contrary [4].

Secondly, as a result of temperature increase in the warmer zones of the globe, there will be an increase in fires (a fact often present in the mass-media). In the USA, the researchers have recently shown that an increase of temperature by 1.6°C during the warm period of the year will double the number of natural fires and especially anthropogenic fires, mostly in the western part of the USA (California, Texas etc): see Figure 7.



Figure 7. Natural fires.

Thirdly, the temperature increase will lead to the melting of glaciers. The northern hemisphere will be the most affected and zones such as Alaska, the north of Canada, Siberia, and Greenland will suffer the most: see Figure 8. The specialists estimate that an increase of temperature by 4°C (which we hope not to happen) will melt almost the entire glacier cover of Greenland, which would lead to an important increase of the sea level – between 2 and 7 meters on long term. This summer, a huge block of ice broke from a glacier in Greenland. Its surface was bigger than that of Manhattan, according to the American specialists that also signal that in 2010, the arctic bank melted 50% faster than usually (according to the specialists from the National Center for climatic data in the USA).



Figure 8. Patermann glacier fracture in Greenland, satellite image.

The researchers from the prestigious American Universities, Howard and Princeton, have recently published a study in which they warn that a continuation of the temperature rise – of the global climate warming – will lead to the melting of the ice caps in the northern and southern hemispheres in a few hundred years: see Figure 9. This would be a disaster for Earth because the seas and oceans will rise by 9 meters, more than the value estimated by the specialists at the Intergovernmental Panel on Climate Change (IPCC) that talked about 2-7 meters, as mentioned above [5].



Figure 9. Melting of the ice caps.

The experts from NASA and the National Snow and Ice Data Center (NSIDC) from Boulder, Colorado (USA), appreciated that the first eight months of this year have been the warmest of the last 131 years, when temperature was on average 0.7°C higher than between 1951 and 1980. The temperature of ocean waters, also risen above the average, played a decisive role in the decrease of the arctic ice level. The specialists from Washington University appealed to the technique of mathematical modeling and demonstrated that the total volume of arctic ice is the most reduced so far, 10000 km<sup>3</sup> m smaller than 30 years ago. They also demonstrated that the volume of ice is reduced by 17% each decade.

Last year, in 2009, the experts from Cambridge University (Great Britain) also warned that in 30 years time the arctic bank would disappear and the Arctic Ocean will become a safe maritime route. The American specialists believe that if the temperature continues to increase, in 2030 at the latest, the arctic zone will be a memory (in only 20 years time!). The team led by professor Robert Kopp, from Princeton University, shows that during the last interglacial period, 125000 years ago, the ocean level was 6.6-9 higher than today because of the temperatures at the two poles, which were 3.5°C higher. The more and more accentuated global warming that we are living at the moment will have the same consequences, claims professor Kopp. Also, the glaciers in the mountain ranges in the northern hemisphere melt causing thus local floods [6], while the small glaciers will disappear completely (touristic attractions): see Figure 10, b.

Currently, the ice layer at global level loses 51 km of its surface annually. Let us specify another aspect: glaciers occupy only 11% of the Earth surface but they contain  $\frac{3}{4}$  of its drinkable water. If temperatures increase more than 1.5-2°C, as we showed they could, and no decisive steps are taken, large surfaces will be flooded, especially in the coastal area: see Figure 10, a. This will lead to the

migration of hundreds of millions of people from these places [7]. The territories of Oceania, the Maldives etc or even whole countries such as Bangladesh could lose up to 18% of their territory. What about the Netherlands, or the great coastal cities such as New York, Shanghai, New Orleans, South of Florida, Rotterdam or Amsterdam?



Figure 10. Global warming might cause:a. large surfaces to be floodedb. small glaciers to disappear.

A document, elaborated based on studies made by researchers together with experts in insurance (in order to estimate the damage that might occur), released recently in 2010, has shown that this increase of the ocean level as a result of temperature rising and glacier melting, could affect 149 touristic resorts in the Caribbean, some disappearing completely. Thus, the life of hundreds, maybe even millions of people in the area will be affected. The costs of the disaster are estimated to approximately 187 billion dollars by the end of this century. It would represent a great burden for the 15 countries, members of the Community of Caribbean States. The results of this study will be presented in November 2011 in Mexico at the Conference on climatic problems and we hope it will lead to the signing of a new Cancun treaty.

All the American specialists from the Meteorological Center mentioned above consider that the entire North America could lose 50% of the coastal wetlands.

Add to these floods those caused by unusual precipitations that have turned creeks into rivers and that erase everything in their path, especially in the hill or mountain areas. Thus, we will have a more exact picture of this phenomenon and we will understand better what the floods cause by climatic changes mean: see Figure 11 [8].

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in the costal area;



**Figure 11.** The image of the Earth: **a.** with deep oceans, rich soil and green forests; **b.** desolated by climatic changes.

After we presented the recent phenomenon of "greenhouse effect" and its concrete consequences, a new bomb was launched by the mass-media at the beginning of this summer: the global cooling of the climate.

An astrophysicist of Uzbek origin, Habibullo Abdussamatov, the director of Space Research at the Pulcovo astronomic observer in Sankt Petersburg, declared at the International Conference on climatic changes (Chicago, USA) that in three years time there will be a process of climate cooling (2014) and that the current warming will end in 2012, so we people must prepare for a new "ice age." This will be owed to the Sun whose radiation power will decrease suddenly, after a century of intense solar activity.

The fact itself is a consequence of the reduction of sunspots, solar activity entering a "minimal" phase. According to the specialist, we must exclude the theory according to which the developed countries are responsible for the large volume of greenhouse gases (I believe he is a good friend of Putin and Medvedev, as they are also original from Sankt Petersburg).

So, the industrialized countries are innocent victims of scientists. As argument, he claims that even on Mars, which is 55 million km from Earth, where no people exist, information is gathered by means of ecological robots and the results are that the greenhouse effect is present on Mars too and it reduced the ice layers, a fact discovered and described by astrophysicists on this planet, more precisely, at the south pole of the red planet.

We shall soon see whether he is right or not.

### Conclusions

The recent changes of the climatic factors have led and lead to the emergence of weather phenomena that deviate from normal producing a negative impact on the natural frame and human life.

According to experts, these climate changes due to global warming of the planet – man-caused - and placing so-called "greenhouse" effect

The consequences of this process are the following:

- reduction of water resources especially in warmer areas and expanding aridizare process in these areas being affected people's life.

- the emergence of increasingly frequent fires during the hot periods of the year.

- the glaciers melting, polar ice caps and the glaciers in mountain areas.

- as a result of their melting, the oceans levels will rise causing dagerous flooding in many regions of the world.

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