

## **CLIMATE CHANGE, CAUSES AND CONSEQUENCES**

**Merime Mustafi<sup>1\*</sup>, Rukije Ibraimi<sup>1</sup>, Zejnedije Ademi<sup>1</sup>**

<sup>1</sup>*Faculty of Natural Sciences and Mathematics, University of Tetovo, RNM*

*Corresponding author e-mail: merime.mustafi@unite.edu.mk*

---

### **Abstract**

Today, the term "climate change" in environmental policy is often linked to current climate change, including raising the average surface temperature of the earth known as global warming. Climate change is a term used in climatology to show the global climate change in the world during different time zones, since the creation of earth till now. Climate change may be caused by inland earth processes, external factors (ex. changes in solar radiation growth) or, recently, by human activity. Some of the factors of climate change are: deforestation, human impact, greenhouse effect, solar radiation effects, creation of industrial centers, etc. The climate of the earth has always changed. Since the beginning of the industrial revolution, the climate has changed as a result of changing the conditions of nature. Today we use the term climate change as we talk about climate change that is taking place since the beginning of the 20th century and is the result of human activities.

**Keywords:** *Climate change, global warming, consequences.*

---

### **1. Introduction**

Earth's warming begins with solar radiation. When solar radiation reaches the Earth, about 30% of this radiation is reflected back into space (Universe) by clouds, atmospheric particles, ground reflective surfaces, and ocean surface. The remainder of this radiation, 70%, is absorbed by earth, air, and ocean, warming the surface of our planet and the atmosphere, enabling life on Earth. However, this radiation does not stay connected to the environment forever. In fact, when rocks, earth, air, and sea warm, they emit (release) infrared radiation or infrared heat. Most of this emitted thermal radiation moves to the outside of our planet, allowing Earth to cool. Part of this outgoing radiation is re-absorbed by atmospheric gases (greenhouse gases) such as water vapor, carbon dioxide, methane, nitrogen oxide, and so on. These gases are known as greenhouse gases due to the capacity to capture this thermal radiation (heat). The re-absorbed thermal radiation from these gases is re-emitted again towards the ground surface. So, these gases a part of the heat (heat) does not allow them to leave our planet. This function of greenhouse gases is very important for life on Earth. Through them, the average temperature on Earth's surface is about 15. If these gases did not exist, this average temperature would be at such a low temperature's life would not exist in the form it is now.

However, these greenhouse gases have already become a problem for the planet's climate. This problem does not come from their existence in the atmosphere but by the increase in their quantity over normal. This growth has come as a result of human activity.

### **3. Causes of global warming**

The industrial revolution that began in 1750, originally in England, then throughout Europe, and globally, needed energy resources to support the same. Like fossil fuels, fossil fuels were used: coal, oil and natural gas. Through the process of combustion, the energy was released which put into operation the entire industrial mechanism. But this had consequences that were not observed at first. During the combustion process, large amounts of gases were released into the atmosphere, such as: carbon dioxide, methane, nitrogen oxide, etc. These gases besides air pollution and adverse health effects would have a consequence that was slowly accumulating in the atmosphere and that would create problems in the future. These consequences have started to emerge in the last decades. Since 1750, to date, the amount of these gasses has begun to grow in large proportions. Today, at a global level, fossil resources are the main sources for electricity generation <sup>[1]</sup>.

According to IPCC reports, the amount of carbon dioxide in the atmosphere has increased by 35% over the period before 1750, methane has increased by 148%, and nitrogen oxide has increased by 18%. Only in 2014, people have thrown 8 billion tons of carbon dioxide into the atmosphere. For 260 years, the natural balance of these gases and the average temperature on Earth has been depleted.

These greenhouse gases after their release move to the atmosphere, where they stand for decades or even more. Now, the impact of these gasses on the global warming phenomenon is also explained here. As the amount of these gases has increased in the atmosphere, the amount of thermal radiation that is absorbed and re-emitted by these gases increases. In short, the Earth keeps more heat than before, causing the temperatures to rise. If this ratio of greenhouse gases continues to remain at this rate, according to IPCC, by 2100 the global average temperature will increase too or worse in the worst scenario.

The United Nations formed one of the most specialized groups of scientists, called the Intergovernmental Panel on Climate Change, who agreed to study and analyze the causes and consequences of global warming.

#### *2.1. Carbon dioxide emissions from the burning of fossil fuels with plant origin*

Our ever-growing dependence on the energy generated by the combustion of coal and fuel of plant origin makes the amount of carbon dioxide released in the atmosphere to be very large.

#### *2.2. Carbon dioxide emissions from combustible materials used for transport*

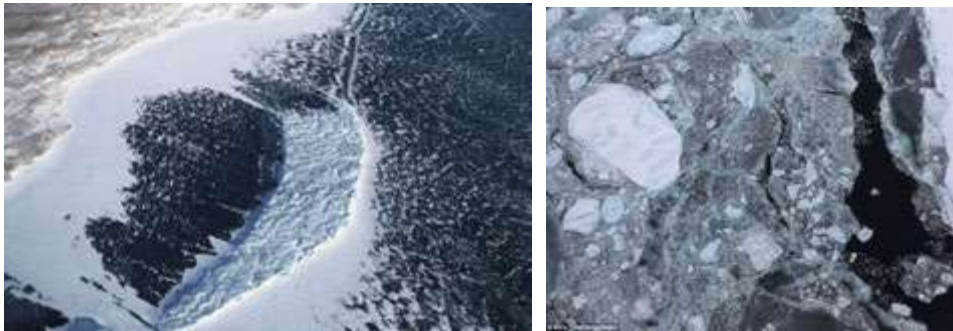
Modern car culture and a good appetite for materials are responsible for 33% of the carbon dioxide in the air. With a population that has an alarming rise, the demand for more cars and the consumption of material goods leads to an increase in the use of fossil fuels for transport and industrial production. Our consumption is far greater than the ways and solutions we have found to mitigate these effects.



**Figure 1.** Carbon dioxide emission

### *2.3. Methane's release, agriculture, and the Arctic shelf*

Methane is a very potent "greenhouse" gas and ranks second behind carbon dioxide. When organic matter is dispersed by bacteria, under the action of oxygen (anaerobic decomposition), for example in the case of unrefined rice, methane is produced. The process is also developed in the barley grain hens and the increase in the quantity of livestock production increases the level of methane released in the atmosphere. Another source of methane production is the glacial masses that keep large amounts of methane. Since the Arctic ice is melting, the amount of methane in the atmosphere is growing, thus affecting global warming <sup>[2]</sup>.



**Figure 2.** The effects of global warming

### *2.4. Deforestation, especially tropical forests that are used for wood and the opening of agricultural lands*

The use of wood for fuel (wood and coal) is one of the causes of the deforestation but alarming is our appetite for wood and paper products or even for products such as palm oil etc. All of this large wood intake has led to a massive phenomenon of deforestation in the world. The forests absorb the carbon contained in the atmosphere and their massive cutting reduces the amount of carbon in the air <sup>[5]</sup>.



**Figure 3.** Deforestation

#### *2.5. Increase in the use of fertilizers in the cultivation of different agricultural crops*

In the second half of the XX century, the use of chemical fertilizers increased a lot (instead of using organic fertilizers obtained from animals). The high nitrogen content used has warmed the agricultural land. The flow and precipitation of these fertilizers through rainfall and rivers create "dead zones" in the oceans. Also, the high levels of nitrate concentration in groundwater are a very worrying problem for human life.



**Figure 4.** Use of fertilizers

### **3. Consequences**

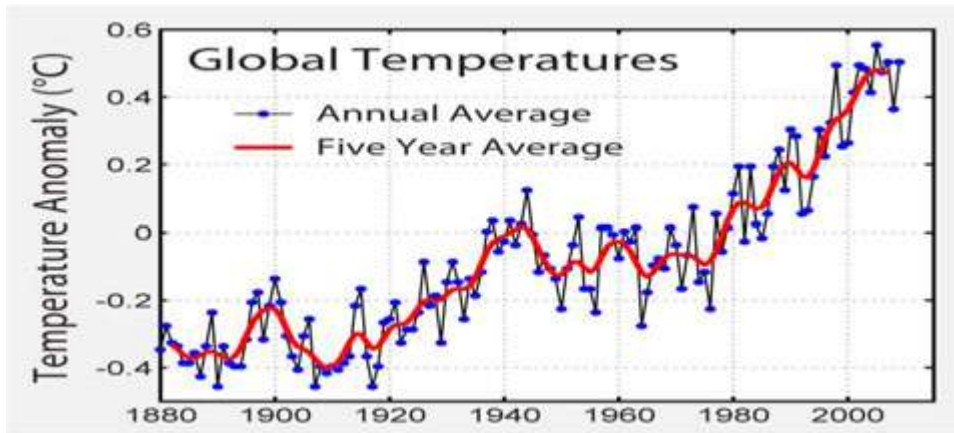
Human-induced global warming has affected many physical and biological processes globally. The greatest impact is on climate change, including the increase in average air and ocean temperature, melting of the Arctic ice, and increasing the average sea level. Because of these climate changes, most of the world's population will experience significant water shortages, food production will be the result of droughts.

So many areas will face low rainfall, and some areas like the North Atlantic will face increased cyclone intensity, hurricanes, which will be followed by a lot of destruction in the affected areas. Increasing global environmental temperatures can expand the path of spreading infectious diseases. Carriers of these diseases- as different insects are quite sensitive to temperature changes. All scenarios related to the consequences of global warming are worrying and alarming <sup>[3]</sup>.

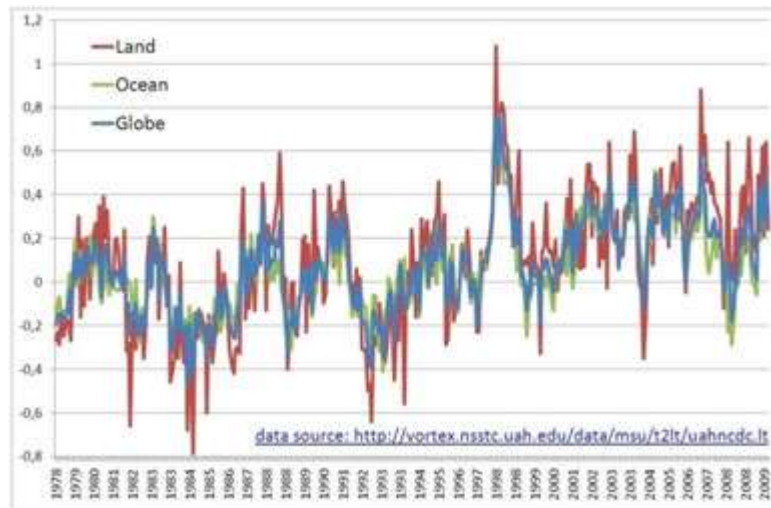
The consequences of climate change are no longer invisible, we are seeing them in real -time, in the form of unprecedented heatwaves, floods, droughts, and mass fires. Most of Europe is stuck by a massive high-pressure wave that allows tropical heat to reach the Arctic. Temperatures above 32 degrees Celsius are stretched to the northern shores of Scandinavia, marking record in

Sweden, Finland, and Norway, at stations over the Arctic Circle. As a result, unexpected fires in Sweden have been verified that have prompted the state to seek help from other countries, like Italy, with more resources to fight the fires. Great Britain has also experienced its driest and hottest summer as well. In the desert of Sahara, in North Africa, on July 5, 2018, the record of all time, 51.3 degrees Celsius, was recorded in Ourgla, Algeria.

Cold and hot, damp or drought, we experience the natural weather conditions all the time, but climate changes are now against us, causing some extremes to be more frequent and intense.



**Figure 5.** The average anomaly of the atmospheric temperature of the earth and the surface of the seas has been reconstructed by The Intergovernmental Panel on Climate Change -IPCC in the last 150 years.



**Figure 6.** Average anomalies of the atmospheric temperature of land and sea surfaces, as recorded in the last 30 years by satellite<sup>[1]</sup>.

Regarding the fact that global warming is occurring at unprecedented speed, prompted the commitment of many different world institutions to monitor natural phenomena. While scientists are trying to find out how quickly the temperatures are rising, and what will happen as the result of this increase. Based on the analysis it was concluded that the dynamics of climate parameters will be manifested through some natural changes, such as:

- *Changes in quantity, intensity and rainfall distribution for one season*
- *Natural disasters*
- *Temperature changes*
- *Flood*
- *Frequent warm waves*
- *Drought*
- *Changes in the concentrations of CO<sub>2</sub> (carbon dioxide) and O<sub>3</sub> (ozone) in the atmosphere.*

According to the UN, from 1995 to 2018, storms and floods caused 1.8 trillion damage, and according to the World Health Organization estimates, the global cost of damages caused by floods has increased by 6% a year. It is predicted that the damages caused by flooding in Europe will be fivefold by 2050. One of the reasons is global warming. The frequency and severity of hurricanes vary naturally.

The Balkan region is estimated to be in the high impact of climate change and natural disasters globally and Albania as well. The balance shows that from 1990 until the end of 2017, 962326 people are affected by natural disasters, mainly flooding. Climate change and urbanization of areas with high potential natural disaster risk will quadruple the risks in the Balkans by 2080, warns the World Bank. Only in May 2014, unprecedented rainfall in Bosnia and Herzegovina affected 1 million people, 25% of the population, causing losses and damage. In Serbia, damages and losses were evaluated -agriculture was the most vulnerable sector. Because of climate change, the share of agriculture in the GDP of the region has fallen from 17% to 10%. As a consequence of the changes, the potentials for fire risk have also increased. Dangers from fires are already severe in all Western Balkan countries, driven by extreme temperatures. As rainfall frequencies like droughts are expected to deteriorate. The whole region will be affected, but droughts will have more consequences in Albania, Macedonia, Montenegro and the south of Bosnia.



**Figure 7.** The effects of climate change

#### **4. Conclusion**

With the advancement of science has come up with high technology for measuring and perfect methods for assessing climate change. But making predictions and statistics about future global warming development is a very complicated job because it depends on many natural and anthropogenic factors. The IPCC has made prognoses until 2100, describing possible scenarios: CO<sub>2</sub> concentration will increase by 90% according to the milder scenario, 250% according to the toughest scenario compared to the 1750 concentration. Temperature world land from 1990 to 2100 may increase from 1.4 to 5.8 ° C. It is anticipated that in the next few decades there will

be an increase of 0.1 to 0.2 ° C every decade. The global sea level may increase from 9 to 88 cm in the period from 1990 to 2100. However, climate change and its consequences will not be biased and equally applicable across the land surface. It is expected that glacial masses and snow coverings in the northern hemisphere will be reduced while in the southern hemisphere slightly will increase due to the distribution of rainfall. Regional climatic changes of several years ahead, and especially temperature rise, severely affected many physiological and biological systems. In many regions of the world, there is documented the intense fusion of ice masses, the reduction of lime, the delay of freezing and the melting of ice melting in rivers and lakes, the disappearance of some plant and animal populations, the unexpected appearance of some insects at times inadequate (Climate Change 2001b). More and more frequent droughts and floods have an impact on the socio-economic character, for example, with demographic migration. Climate change is unsuitable in systems related to human life, including water resources, agriculture, afforestation, coastal areas, industry, energy, health, etc.

## **References**

- [1]. Kendre, W.G (2007) Climatology, Oxford
- [2]. Millosavlecic, M. Meteorologija, Beograd, 1986
- [3]. Peter Gleckler, Nature Climate Change, 2017
- [4]. Astroalbastronomy.woldpress.com/nryshimet klimatike
- [5]. Jernej Stritih (strategija e ndryshimeve klimatike), 2016, Sllovenia
- [7]. Stern Review. Part V: Policy Responses for Adaptation. 20 Adaptation in the developing world.