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## GREENHOUSE EFFECT AND ITS EFFECTS ON CLIMATE

**Mamadaliyeva N.Z.**

Associate professor, Kokand State Pedagogical institute, doctor of philosophy in physical and  
Mathematical Sciences (PhD)

**Meliboyev M.**

Associate professor of Kokand State Pedagogical institute, candidate of physical and  
Mathematical Sciences

**Toxirova M.O.**

Teacher of the Kokand State Pedagogical institute

**Annotation.** This article cites data on the Parnik effect and its effects on climate change and ways to mitigate its adverse effects.

**Keywords:** parnik effect, heat accumulation, thermal radiation, thermal insulator.

The most necessary source of power for the existence of life on Earth is solar radiation - the electromagnetic rays of The Sun entering the Earth's atmosphere. Solar energy is the cause of all atmospheric processes associated with the alternation of seasons, as well as changes in weather conditions. About half of the solar energy is a visible part of the spectrum that we understand as sunlight. This radiation freely passes through the atmosphere, it is absorbed and warmed by the surface of land and oceans. But solar radiation has been falling on the surface of the Earth every day for thousands to thousands of years. Why then the earth does not heat up and does not turn into a small Sun? The whole point is that both the Earth and the surface of the water radiate energy in a form other than itself: invisible infrared light emits heat. On average, the more energy comes to earth as sunlight, the more power goes out into outer space as infrared light. Thus, a thermal equilibrium is formed on our planet. The whole point is exactly what temperature is balanced. If it were not for the atmosphere, the average temperature on the Earth's surface would have been -23 degrees. The fact that the atmosphere has a protective device that absorbs infrared light on the Earth's surface ensures that the current average temperature is at +15 degrees. The rise in temperature is associated with the "parnik effect" or accumulation of heat in the atmosphere. It also intensifies as carbon dioxide gas and water vapor increase in the atmosphere. These gases absorb infrared radiation well. Such a process also occurs in a small view on a simple polyz Teplice. In it, the function of a gas absorber is performed by a transparent film that conducts sunlight unhindered, but it does not conduct well the temperature of the soil directed from the bottom to the top. In subsequent years, the concentration of carbon dioxide gas in the atmosphere has become more and more concentrated. This is due to the fossil fuels as well as the large amount of burning of wood from year to year. The consequence of this is that the average air temperature on the Earth's surface is rising by 0.5 degrees every hundred years. If even in the future

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About the authors : Mamadaliyeva N. Z.

Corresponding author- Email:

the rate of fuel combustion and an increase in the concentration of parnik gases in the air is maintained, by some estimates, the climate may warm up even more in the new century.

The mechanism of the greenhouse effect or the greenhouse effect can be described as follows: the Earth's surface, heated by the radiation from the sun, itself becomes a source of long-wave infrared (thermal) radiation. Some of this radiation goes into space and some is reflected by some gases in the atmosphere and heats the surface air layers. The main source of life and all natural processes on Earth is the radiant energy of the Sun. The energy of solar radiation of all wavelengths entering the planet in a unit time perpendicular to the sun's rays is called the solar constant and is  $1.4 \text{ kJ} / \text{cm}^2$ . This is two billionth of the energy emitted by the surface of the Sun. The atmosphere absorbs 20% of the total amount of solar energy reaching the Earth. About 34% of the energy that penetrates deep into the atmosphere and reaches the Earth's surface is reflected by atmospheric clouds, aerosols in it, and the Earth's surface. Thus, 46% of the solar energy reaches the earth's surface and is absorbed by it. In turn, the surface of land and water emits long-wave infrared (heat) radiation, which partly goes into space and partly remains in the atmosphere, remains in the gases contained in it and heats the surface layers of the air.

This separation of the Earth from space created favorable conditions for the development of living organisms. Sunlight is absorbed by the surface of the planet and its atmosphere (especially radiation in the near UV and IR regions) and heats them. The heated surface and atmosphere of the planet radiates in the far infrared range: for example, on Earth, 75% of thermal radiation falls in the range of 7.8-28 microns, for Venus - in the range of 3.3-12 microns. The atmosphere containing gases that absorb in this region of the spectrum (greenhouse gases -  $\text{H}_2\text{O}$ ,  $\text{CO}_2$ ,  $\text{CH}_4$ , etc.) is significantly opaque to such radiation directed to space from its surface, that is, it has a large optical thickness in the IR range. Due to this transparency, the atmosphere becomes a good heat insulator, which, in turn, causes the absorbed solar energy to be re-emitted into space. As a result, the effective temperature of the Earth as a radiator turns out to be lower than its surface temperature.

Thus, delayed thermal radiation from the earth's surface (like a film over a greenhouse) received the figurative name of the greenhouse effect. Gases that trap heat radiation and prevent heat from escaping into space are called greenhouse gases. Due to a number of objective reasons, the increased greenhouse effect has had negative consequences for the ecology of our planet. The greenhouse effect: causes and consequences The first mention of the nature of the greenhouse effect appeared in 1827 in an article by the physicist Jean Baptiste Joseph Fourier. His work was based on the experience of the Swiss Nicolas Theodore de Saussure, who measured the temperature of a stained glass container exposed to sunlight. The scientist found out that the temperature inside is higher because heat energy cannot pass through the cloudy glass. Using this experiment, Fourier noted that not all of the solar energy reaching the Earth's surface is reflected in space. Greenhouse gas traps some of the heat energy in the lower layers of the atmosphere. It consists of:

- carbonic acid;

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- methane;
  - ozone;
  - water vapor.

The consequences of global warming are dangerous for humanity and life on the whole planet. Thus, the greenhouse effect and its consequences cause a chain reaction. See for yourself:

1. The biggest problem is that due to the increase in temperature on the Earth's surface, the polar ice caps are melting and causing the sea level to rise.

2. It causes flooding of fertile land in the valleys.

3. Due to the warming of the atmosphere, the period of snow melting is shortened: they melt faster, seasonal rains end faster. As a result, the number of dry days increases. According to experts, about 200 million hectares of forests will turn into steppes if the average annual temperature rises by one degree.

4. Due to the decrease in the number of green areas, the processing of carbon dioxide as a result of photosynthesis is reduced. The greenhouse effect increases and global warming accelerates.

5. Due to the warming of the earth's surface, the evaporation of water increases, which increases the greenhouse effect.

6. Due to the increase in water and air temperature, the life of a number of living creatures is threatened.

7. Due to the melting of glaciers and the rise in the level of the World Ocean, seasonal boundaries change, climate anomalies (hurricanes, tsunamis) occur more often.

8. The increase in temperature on the Earth's surface has a negative impact on human health and, in addition, causes the development of epidemiological situations associated with the development of dangerous infectious diseases.

The causes of global warming must be reconciled. What to do first:

1. This can be achieved if the amount of emissions into the atmosphere is reduced, environmentally friendly equipment and mechanisms are put into operation everywhere, filters and catalysts are installed; introduction of "green" technologies and processes.

2. Reduce power consumption. For this, it will be necessary to switch to the production of products that consume less energy; increase efficiency in power plants; involvement of residential thermomodernization programs, introduction of energy efficiency improvement technologies.

3. Changing the structure of energy sources. The obtained share increases the total amount of energy produced by alternative sources (sun, wind, water, ground temperature). Reducing the use of fossil energy sources.

4. Development of environmentally friendly and low-carbon technologies in agriculture and industry.

5. Increasing the use of recycled raw materials.

6. Restoration of forests, effective fight against forest fires, increase of green areas.

The solutions to the problems caused by the greenhouse effect are well known. Humanity must understand the consequences of its inappropriate actions, assess the scale of the impending disaster and participate in saving the planet. Greenhouse gases are the gases that cause the global greenhouse effect. The main greenhouse gases are water vapor, carbon dioxide, methane, ozone, halocarbons and nitrous oxide, in order of their approximate influence on the Earth's heat balance. Water vapor is the main natural greenhouse gas responsible for more than 60% of the effect. The direct anthropogenic impact on this source is not significant. At the same time, an increase in the Earth's temperature under the influence of other factors increases evaporation and the total concentration of water vapor in the atmosphere at practically constant relative humidity, which in turn increases the greenhouse effect.

Much research on the greenhouse effect now focuses on the role of carbon dioxide in this effect, although the potential of methane to retain heat in the atmosphere is 20 times greater than that of carbon dioxide. The amount of methane has doubled due to the decomposition of organic residues in wetlands and wet lowlands, as well as leakage from man-made objects: gas pipelines, coal mines, irrigation and increased gas emissions. But there is another source of methane - decaying organic remains in ocean sediments that are preserved frozen on the sea floor. When methane enters the atmosphere, it reacts with oxygen and hydrogen molecules to form carbon dioxide and water vapor, both of which are capable of causing the greenhouse effect.

According to previous projections, all the released methane will turn into carbon dioxide and water within about 10 years. If so, then the increase in carbon dioxide concentration will be the main reason for the warming of our planet. Sources of carbon dioxide in the Earth's atmosphere are volcanic emissions, life activities of organisms and human activities. Anthropogenic sources - burning of fossil fuels, burning of biomass (including deforestation), some industrial processes (for example, cement production). Plants are the main consumers of carbon dioxide. Usually, the biocenosis absorbs approximately the same amount of carbon dioxide as it produces (including due to the decomposition

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of biomass). This effect was first modeled by the physicist Philippe de Saussure, who exposed a glass-covered container to the sun and then measured the temperature difference between the inside and outside. The air inside was warmer, as if the container was receiving solar energy from the outside. In 1827, the physicist Joseph Fourier suggested that such an effect could also occur with the Earth's atmosphere, which affects the climate.

It was he who came to the conclusion that the temperature in the "greenhouse" rises due to the different transparency of the glass in the infrared and visible ranges, as well as the prevention of hot air escaping from the glass. How does the greenhouse effect affect our planet's climate? Climate conditions on our planet with constant streams of solar radiation and the average annual temperature affect its heat balance, as well as its chemical composition and air temperature. The higher the concentration of greenhouse gases (ozone, methane, carbon dioxide, water vapor) near the Earth's surface, the higher the probability of the greenhouse effect and, accordingly, global warming. In turn, a decrease in the concentration of gases leads to a decrease in temperature and the formation of ice cover in the polar regions. Due to the reflection of the Earth's surface (albedo), the climate on our planet has gone from warming to cooling several times, so the greenhouse effect itself is not a separate problem. However, in recent years, as a result of pollution of the atmosphere with waste gases, thermal power plants and emissions from various factories on Earth, there is an increase in the concentration of carbon dioxide, which leads to global warming and negative consequences for all mankind.

Climate change takes place over decades and hundreds of years or even longer due to natural processes such as the movement of volcanoes, changes in solar activity, circulation of ocean currents, or fundamental changes on Earth. The climate can change due to human society releasing a lot of greenhouse and aerosol gases into the atmosphere, changing the Earth's surface or feeding the ozone layer. Global climate, biological, geological and chemical processes are inextricably linked with natural ecosystems. A change in the course of one process in them also affects others, and in most cases these changes occur more strongly in the second than in the first. The governments of the countries of the world could not ignore the serious warnings about climate change recorded in the first evaluation document of the MGEIK. For this purpose, it was necessary to have a legal obligation to solve the problem.

In December 1989, the UN General Assembly called on governments to make the necessary preparations, and exactly one year later, in December 1990, the Intergovernmental Negotiating Committee on the Framework Convention on Climate Change was established. Negotiations on the convention were complicated. Initially, there were not the same views on the issues of what the Convention should look like and what its ultimate goal is. In addition, the problem was very complex, covering many aspects of economic interests and human activity. Many tried to prove that the Convention should be focused on energy consumption problems. In doing so, they were based on the opinion that the main part of the carbon dioxide released into the atmosphere is formed due to the burning of fossil fuels. But the Convention should cover many other aspects of the economy, including transport, industry, agriculture and forestry. It was clear that the negotiations on the convention were

going to be complicated. Because it requires the adoption of restrictions and limitations that have the potential to dramatically affect economic and social activities around the world.

There are many differences in the views of developing and developed countries on this issue, and they expressed different views in this area. Developing countries insisted that they have the right to economic development. They resisted the idea of limiting or reducing their emissions. Because this situation had a negative impact on their economic growth. According to them, climate change is mainly caused by the activities of developed countries, and therefore these countries should take responsibility and implement the measures set in their territories.

The convention also covers greenhouse gases that are not part of the Montreal Protocol on substances that deplete the ozone layer. Currently, the Convention focuses on the following greenhouse gases: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulfur hexafluoride (SF<sub>6</sub>). These are not the only gases affecting global warming, but they are the main ones. Perfluorocarbons and hydrofluorocarbons replace chlorofluorocarbons. Because chlorofluorocarbons are banned for use as stratospheric ozone depleting agents under the Montreal Protocol of 1987. All of the gases listed above cause global warming, but some of them have a relatively strong effect in this regard. For example, 1 ton of methane creates a greenhouse effect equal to 21 tons of carbon dioxide over a hundred-year period. And 1 ton of hydrofluorocarbon is equivalent to thousands of tons of carbon dioxide. Therefore, carbon dioxide equivalent values of emissions were determined during the preparation for the inventory of emissions of greenhouse gases.

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