



## CLIMATE CHANGE AND ECOLOGY

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**ABSTRACT.** *Climate change and ecology are one of the most pressing problems in the world today, and they are closely interconnected. This article provides complete information about the causes of climate change, its impact on ecosystems, social consequences, the situation in Uzbekistan and its solutions. Also, a list of used literature is provided at the end of the article. This study studies the impact of climate change on the ecological environment. The damage caused to ecosystems as a result of increasing global temperatures, changing precipitation patterns, and increasing extreme weather events is analyzed. Problems such as soil degradation, depletion of water resources, and loss of biodiversity due to the increase in the concentration of greenhouse gases in the atmosphere are considered. The impact on soil and water resources is observed in the acceleration of desertification, land degradation, depletion of drinking water sources, and disruption of the water cycle. The decline in biodiversity is due to the ability of flora and fauna in different regions to adapt to climate change, the high number of species at risk of extinction. Human health and economic impacts, diseases caused by high temperatures, food security problems and impacts on agriculture. Adaptation strategies for prevention include ensuring carbon neutrality, using renewable energy sources, restoring ecosystems and developing sustainable development strategies.*



**Keywords:** *Climate change, greenhouse gases, ecosystem degradation, biodiversity, water resources, sustainable development, hydropower, degradation.*

**INTRODUCTION.** In recent decades, climate change has become one of the most serious environmental problems on a global scale. As a result of the increase in the amount of greenhouse gases emitted into the atmosphere, the average temperature on the Earth's surface is increasing significantly. This is leading to changes in weather conditions, disruption of the precipitation regime, and an increase in natural disasters such as droughts and floods. The impact of climate change on ecosystems is very wide-ranging, causing problems such as soil degradation, depletion of water resources, and a decrease in biodiversity. Accelerated desertification, deforestation, and melting glaciers have a negative impact not only on the natural environment, but also on human life. Reduced productivity in the agricultural sector, shortage of drinking water, and increased air pollution pose a serious threat to socio-economic stability. This study analyzes the main factors of climate change, its impact on ecological systems and humanity. It also provides scientifically based proposals for measures that should be taken to achieve sustainable development and maintain ecological balance. Climate change and ecology are among the most pressing problems of humanity. Increasing global temperatures, depletion of natural resources and environmental pollution pose a serious threat to our planet. Factors such as harmful gases released into the atmosphere, deforestation and water scarcity are disrupting the ecological balance and accelerating climate change. This problem has a significant impact not only on the natural environment, but also on human health and economic stability. Therefore, preventing climate change and protecting the ecological environment have become one of the most important tasks on a global scale today. Climate change and ecology are closely interconnected, and human activity has a significant impact on these processes. Greenhouse gases released into the atmosphere, such as carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrogen





oxides ( $\text{NO}_x$ ), are causing an increase in Earth's temperature and accelerating global warming. This leads to droughts, storms, melting glaciers and rising sea levels. Ecological problems are not only causing climate change, but also reducing biodiversity. Deforestation, water and air pollution, and soil degradation are leading to the loss of animal and plant species. For example, the Amazon rainforest is the world's largest oxygen supplier, but large areas are being lost there every year due to illegal logging and fires. Climate change is also having a serious impact on agriculture. As a result of declining productivity, water scarcity and climate change, food security is at risk worldwide. In particular, the reduction in the water volume of the Amu Darya and Syr Darya rivers in Central Asia is negatively affecting agriculture in the region. The following measures should be taken to address environmental problems, such as the use of renewable energy sources to reduce harmful gases emitted into the atmosphere, the expansion of forest protection and greening, the efficient use of water and land resources and waste recycling, the use of sustainable agricultural methods and the production of environmentally friendly products. Everyone can contribute to preserving nature. Not being indifferent to environmental problems and taking measures to protect the environment are one of the important conditions for ensuring a sustainable life for future generations. Climate change and ecology are closely interconnected and directly affect the quality of life on our planet. In recent years, rising global temperatures have led to melting glaciers, rising sea levels, and an increase in extreme weather events. This has led to droughts, water shortages, and reduced yields, posing a serious threat to human food security. Among the environmental problems, air, water and soil pollution also play an important role. Greenhouse gases carbon dioxide, methane and nitrous oxides released into the atmosphere accelerate the process of global warming. Deforestation reduces the production of oxygen and the absorption of carbon dioxide, leading to a disruption of the ecological balance. In addition, the increase in plastic waste damages marine and terrestrial ecosystems and poses a threat to living organisms. The following measures are important to curb climate change and maintain ecological stability,



such as the use of green energy sources, reducing harmful emissions through the widespread use of solar, wind and hydropower. Protecting and greening forests, which helps to maintain the balance of atmospheric composition and preserve biodiversity. Recycling waste and using environmentally friendly products, reducing the impact of plastic and other harmful materials on the environment. Rational use of water and natural resources, preventing water shortages and preserving natural ecosystems. It is of great importance to support environmental education and awareness-raising projects aimed at raising the ecological awareness of the population and protecting the environment. Climate change and ecology, global and local impacts, climate change and environmental problems affect all aspects of human life. These processes are damaging the natural environment and causing serious social and economic consequences. As a result of the sharp warming or cooling of the climate, the number of natural disasters such as floods, droughts, and storms is increasing in various regions. Causes and consequences of climate change Another of the main causes of climate change is greenhouse gases released into the atmosphere as a result of human activity. The following factors increase climate change: the large-scale burning of fossil fuels such as oil, gas, and coal; the industry, transport, and energy sectors release a lot of carbon dioxide ( $\text{CO}_2$ ) into the atmosphere. Deforestation, trees absorb carbon dioxide and release oxygen. Deforestation increases the amount of  $\text{CO}_2$  in the air, which intensifies the greenhouse effect. As a result of livestock and agricultural livestock activities, large amounts of methane  $\text{CH}_4$  gas are released into the atmosphere. Also, improper farming practices lead to soil degradation. Industrial waste, production of plastics and chemicals, and improper disposal of waste disrupt the ecological balance. As a result of these factors, the following environmental problems are occurring: global warming has increased the average global temperature by  $1.1^\circ\text{C}$  and this process is ongoing. Due to the depletion of water resources, lakes and rivers are drying up, and water shortages are occurring in agriculture. The melting of polar ice caps, the melting of Arctic and Antarctic glaciers, and the rise in sea levels. The impact on living organisms, the loss of





animal and plant species, and the reduction of biodiversity are being observed. The local impact of ecological problems, climate change and ecological problems in Uzbekistan and Central Asia are manifested as follows, the drying up of the Aral Sea is one of the largest ecological problems in the region, causing soil salinization and the appearance of dust storms. The scarcity of water resources is negatively affecting agriculture in the region, with the water of the Amu Darya and Syrdarya rivers decreasing. Air pollution is worsening air quality in large industrial areas, harming the health of the population. Problems of livestock and agriculture are decreasing productivity as a result of water shortages and soil degradation. Measures and solutions To combat climate change and protect the environment, it is necessary to implement the following measures, for example, the use of renewable energy, the development of solar and wind energy, reduces dependence on fossil fuels. Reforestation and protection of forests, tree planting campaigns help restore the ecological balance. The rational use of water resources, the introduction of drip irrigation technologies can reduce water scarcity. Recycling of plastic and other waste in waste recycling reduces environmental pollution. Environmental education and awareness are of great importance to increase the environmental literacy of the population. Combating climate change and preserving the ecological environment are important tasks of all humanity. If everyone contributes, it will be possible to preserve a cleaner and more sustainable environment for future generations.

**Topic relevance.** Climate change and ecology are one of the most serious global problems today, affecting not only the environment, but also all aspects of human life. The relevance of this issue is explained by the following factors, such as global warming and natural disasters. Over the past 100 years, the average temperature of our planet has increased by 1.1°C. This process continues, and as a result of temperature increases, the following problems arise: changes in precipitation patterns, with heavy rains and floods in some regions, and droughts in other places. Tropical storms and forest fires As a result of global warming, the



number of strong storms, hurricanes and forest fires is increasing. The melting of glaciers and rising sea levels, the melting of polar and mountain glaciers, and the rise in water levels on our planet. This poses a threat to many coastal cities. Threat to food security. Climate change is causing serious damage to agriculture and food production. Drought and reduced water resources are reducing crop yields. Excessive heat and humidity are increasing the spread of diseases and pests, leading to crop losses. Food security is becoming more precarious, leading to poverty and hunger. Water scarcity and resource depletion are key to human survival and economic activity. However, global warming and pollution are accelerating the drying up of rivers and lakes. Groundwater is depleting, and drinking water shortages are increasing. Ecosystems are being destroyed in many regions due to improper management and pollution of water resources. The disruption of ecosystems and threats to wildlife, climate change are directly damaging nature, while deforestation and land degradation are reducing biodiversity. The habitats of animal and plant species are changing, and many species are at risk of extinction. As a result of warming sea waters, coral reefs are being destroyed and ocean ecosystems are changing. Impact on human health Ecological problems and climate change are also harming human health, with respiratory diseases and cardiovascular diseases increasing due to air pollution. Heat waves are increasing due to climate change, and the risk of premature death is increasing. Economic and social consequences Climate change also affects global economic stability, causing major material losses due to natural disasters and environmental crises. Agriculture, fishing and tourism industries are being damaged, and many people are becoming unemployed. Climate migration is increasing, and people are being forced to leave their countries due to water and food shortages. The ecological tragedy of the Aral Sea A pressing problem in Uzbekistan For Central Asia and Uzbekistan in particular, one of the most striking examples of climate change is the drying up of the Aral Sea. As a result of this process, the air is filled with dust, which is harmful to people's health. As a result of salinization of the soil, agricultural productivity is sharply decreasing.





Unemployment and poverty problems are deepening, and people are forced to migrate to other regions. Climate change and the problem of ecology are among the most urgent issues that need to be addressed at the global and local levels. To prevent it, measures such as rational use of natural resources, reduction of harmful gas emissions into the atmosphere, use of renewable energy, and restoration of forests should be taken. If measures are not taken today, future generations will have to live in even more difficult environmental conditions. Climate change and ecology remain one of the most important problems for all countries of the world. Recent scientific research and statistical data show that this problem is deepening. Below are the main ecological and climatic problems observed in recent years and their consequences. Global climate records for 2024-2025 The warmest temperatures were observed around the world in 2023 and early 2024. According to NASA and the World Meteorological Organization (WMO), 2023 was the hottest year on Earth's record. In 2024, heat waves are expected in several regions of Europe, the United States, Asia and Africa. Sea surface temperatures have risen to record highs, accelerating the death of coral reefs. Pollution of the atmosphere and oceans is increasing - more than 8 million tons of plastic waste is dumped into the oceans every year. This is destroying marine ecosystems and causing the death of thousands of species of creatures. Unemployment and poverty problems are deepening, and people are forced to migrate to other regions. Climate change and the problem of ecology are among the most urgent issues that need to be addressed at the global and local levels. To prevent it, measures such as rational use of natural resources, reduction of harmful gas emissions into the atmosphere, use of renewable energy, and restoration of forests should be taken. If measures are not taken today, future generations will have to live in even more difficult environmental conditions. Climate change and ecology remain one of the most important problems for all countries of the world. Recent scientific research and statistical data show that this problem is deepening. Below are the main ecological and climatic problems observed in recent years and their consequences. Global climate records for 2024-2025 The warmest temperatures were observed around



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the Aral Sea region remains difficult. As a result of the drying up of the Aral Sea, the number of dust storms is increasing, which is harming the health of the population in the region. Although programs to switch to green energy sources have been intensified in Uzbekistan and neighboring countries, full results have not yet been achieved. The problem of land degradation is urgent, and desertification is observed in more than 50 percent of Uzbekistan's territory. International measures to combat climate change The Paris Agreement (2015) - adopted with the participation of more than 200 countries and aimed at limiting global temperature increases to 1.5°C above pre-industrial levels. The COP28 conference (2023) is an international forum to combat climate change, where many countries committed to abandoning fossil fuels and switching to green energy. In Uzbekistan, the "Green Uzbekistan" program is implementing a plan to plant 1 billion trees in the country by 2030. Climate change and environmental problems are becoming increasingly serious, becoming relevant for the whole world and Uzbekistan. To mitigate the ecological crisis, it is necessary to strengthen the following measures:

Expand the use of green energy - solar and wind energy. Reduce harmful emissions into the atmosphere - introduce environmentally friendly technologies at industrial enterprises.

Save water resources - develop water-saving technologies and drip irrigation methods.

Expand forest protection and greening - tree planting projects. Strengthen environmental awareness and education - raise public awareness of climate problems. If action is not taken today, future generations will have to live in even more difficult environmental conditions. Therefore, all countries and civil society activists must work together to combat climate change. Climate change and environmental problems are becoming more acute every year. The latest data published by scientific organizations and environmental experts around the world



confirm that this process is accelerating. Below are new findings on climate change, current problems and recommendations for solving them. Latest scientific studies and forecasts Weather forecasts for 2025 and beyond According to the World Meteorological Organization (WMO) and NASA, 2024-2025 may be a period of climate records being broken. In February 2024, the global average temperature increased by  $+1.56^{\circ}\text{C}$ , which is above the recommended limit of the Paris Agreement. Ocean surface temperatures have reached record levels, and sea level rise could reach 1 meter by 2100. Extreme weather events are accelerating In 2023, more than 400 major natural disasters occurred around the world (hurricanes, droughts, forest fires and floods). The largest forest fires were observed in Canada, the USA and Australia, which destroyed millions of hectares of forest. In India and Pakistan, temperatures above  $50^{\circ}\text{C}$  were observed in 2023 due to heat waves. Water scarcity and desertification Threats for Uzbekistan and Central Asia According to the Ministry of Ecology of the Republic of Uzbekistan, the water volume in the Amu Darya and Syrdarya basins is decreasing by 2-5% annually. Desertification is accelerating in Karakalpakstan, Bukhara, Navoi and Kashkadarya regions. Due to the inefficiency of irrigation systems, 30% of water is lost annually. The Aral Sea tragedy continues Soil salinity in the Aral Sea region has reached 80%, which is reducing agricultural productivity. More than 70% of the population living in the Aral Sea basin suffers from a shortage of drinking water. The Uzbek government and international organizations are implementing projects to transform the Aral Sea into a "green zone", but no significant results have been achieved yet. Climate migrants and the risk of migration According to UN estimates, more than 200 million people will be forced to migrate by 2050 due to climate change. Living conditions in Africa, South Asia, and Central Asia are worsening, and people are migrating to other regions due to water and food shortages. In Uzbekistan and neighboring countries, rural-urban migration is also accelerating. Ecosystem degradation and threats to wildlife. Loss of wildlife Since 1970, about 68% of wild animals have disappeared worldwide. The number of snow leopards, deer, and other rare animals is declining in Central Asia. Animal





habitats are being lost in the desert and semi-desert regions of Uzbekistan. Ocean ecosystems are being damaged, the acidity of seawater is increasing, and coral reefs are dying. Marine animals are being poisoned by microplastics and chemicals. The amount of harmful gases emitted by industry and transport is increasing - carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>) emissions in the Earth's atmosphere have reached record levels. Industry and fuel use release more than 35 billion tons of CO<sub>2</sub> into the atmosphere every year. Air pollution is also a major problem in Uzbekistan, with the cities of Tashkent and Samarkand experiencing serious air pollution. New projects and activities to combat climate change Green Uzbekistan initiative The government of Uzbekistan is developing a program to plant 1 billion trees in the country by 2030. It is planned to create forests on more than 100,000 hectares by 2024 to combat desertification. Renewable energy projects New power plants are being built in Uzbekistan to use solar and wind energy. By 2025, it is planned to obtain 25% of the country's energy from renewable sources. Climate change and environmental problems are becoming more acute every year. Today, it is important to implement the following measures at the global and local levels, for example: Strengthening environmental legislation, taking decisive measures to reduce industrial and transport emissions. Widespread introduction of water-saving technologies, development of drip irrigation and other advanced technologies. Tree planting and combating desertification, expanding green areas and reforestation. Strengthening environmental education and awareness-raising - raising environmental awareness of the population. Transition to renewable energy sources, widespread use of wind, solar and biofuels. If decisive measures are not taken now, climate change and the ecological crisis can have very serious consequences for future generations. This requires joint action by all countries and members of society at the global and local levels.

**CONCLUSION.** Climate change and environmental problems have become a pressing issue for the whole world, and the acceleration of these



processes is causing negative consequences on a global and local scale. Atmospheric pollution, global warming, depletion of water resources, desertification, drought and an increase in natural disasters are directly affecting human life and nature. Recent scientific studies on the intensification of climate change show that global temperatures are constantly increasing. 2023 was the hottest year in Earth's history, and this trend continues in 2024. Rising sea levels, melting glaciers and an increase in greenhouse gases in the atmosphere are disrupting natural ecosystems. The problem of water scarcity and desertification is that water resources are decreasing all over the world. Central Asia, including Uzbekistan, is also facing this problem. The decrease in water volume in the Amu Darya and Syrdarya basins is seriously affecting agriculture. The drying up of the Aral Sea has brought an ecological disaster to the entire region. To increase agricultural efficiency, it is necessary to widely introduce water-saving technologies and drip irrigation methods. Environmental problems and impact on human health.

Atmospheric pollution, plastic waste and harmful gases have a negative impact on human health. Every year, more than 7 million people in the world die from various diseases due to air pollution. In Uzbekistan, air pollution levels are also increasing in large cities.

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