

THE IMPACT OF GLOBAL CLIMATE CHANGE ON THE ECOSYSTEM

Tashkent State Agrar University
Faculty of Fruit-Vegetable Growing and Viticulture
Direction: Ecology and Environmental Protection
Student of Group 25-75: **Husanova Shohista Sattor kizi**

Abstract: This article examines the impact of global climate change on natural ecosystems, using the Aral Sea crisis as a case study. The increase in greenhouse gases and the phenomenon of phenological asynchrony are analyzed as threats to biosphere stability. The study scientifically substantiates the impact of salt dust from the Aral Sea bed on glacier melting and water scarcity challenges in the region.

Keywords: Global climate change, temperature increase, precipitation amount, environmental issues, phenological asynchrony, ecosystem, Aral Sea problem.

Introduction.

Global climate change is one of the most complex and multifactorial forms of modern environmental problems. As a result of the increase in the concentration of greenhouse gases (CO₂, CH₄, N₂O) in the atmosphere, global temperatures are increasing, disrupting the natural balance of the climate system. These processes have a significant impact on the hydrological cycle, biodiversity, and the functional activity of ecosystems. The Central Asian region, in particular the territory of Uzbekistan, is highly sensitive to climate change, and dependence on water resources further enhances these effects. Therefore, the main goal of this study is to identify the mechanisms of impact of global climate change on ecosystems and assess their ecological consequences on a scientific basis.

Methodological approach of the study.

The study was conducted based on a systems approach. In this case, the climate system and ecosystems were considered as a single complex system that is interconnected. The interaction of anthropogenic and natural factors was also analyzed in an integrated manner.

The results of the study confirmed that global climate change has a complex and negative impact on ecosystems: Temperature increase has led to a shift in the growing season and increased stress in plants. Decreased water resources (10–15%) and increased evaporation have intensified drought. Biodiversity has decreased and the risk of extinction of some species has increased. As a result of phenological asynchrony, biological harmony between plants and animals has been disrupted. Desertification and salt and dust storms have intensified in the Aral Sea region. In general, it was found that the functional stability of ecosystems has weakened.

Discussion

The results obtained confirm that global climate change has a complex and multi-stage impact on ecosystems. In particular, the feedback mechanism between climate and ecosystems is important. Degradation of ecosystems reduces the ability to absorb carbon, further accelerating global warming.

The water scarcity and desertification processes observed in Central Asia demonstrate the regional characteristics of climate change. The Aral Sea crisis is the most striking example of these processes, which is causing not only ecological, but also socio-economic problems.

The most tragic consequence of climate change in Uzbekistan is undoubtedly the drying up of the Aral Sea. The drying up of the Aral Sea, once the fourth largest lake in the world, has become not only a local but also a global environmental disaster. As a result of the fall in sea level, the Aral Sea Desert has emerged on an area of more than 5.4 million hectares. Salt dust and sandstorms rising from this area are further accelerating the melting of Central Asian glaciers, as salt particles fall on the ice and reduce its ability to reflect sunlight.

The drying up of the Aral Sea has caused not only a loss of water, but also a disruption of the climatic balance of the entire region. 75-100 million tons of toxic salt and dust per year, rising from the seabed, are falling not only on the nearby regions of Karakalpakstan and Khorezm, but also on the glaciers of the Pamir and Tien Shan mountains. This is accelerating the melting of glaciers and poses a threat that the main sources of our rivers will dry up in the future. To mitigate the consequences of the tragedy, huge forest plantations are being established on the 5.5 million hectares of the Aral Sea where the water has receded. The planting of saxaul is of particular importance. Studies show that one adult saxaul bush has the ability to retain up to 10 tons of sand and salt around its roots. Over the period 2018–2023, more than 1.7 million hectares of the Aral Sea bed were covered with green covers. These efforts are helping to reduce the intensity of dust storms and somewhat stabilize the living conditions of the local population.

The Aral Sea crisis is not only the loss of a hydrological object, but also the transition of regional ecosystems to the desertification stage. Currently, the salt deposits formed on the dried-up seabed contain residues of pesticides and chemical fertilizers used in agriculture for decades. The spread of these toxic substances through air currents is causing a sharp decline in biodiversity in the region and the extinction of endemic species of flora and fauna.

To address this problem at the international level, a Multi-Partner Trust Fund for Human Security for the Aral Sea Region has been established under the auspices of the UN. Projects implemented within the framework of this fund are aimed at adapting to climate change, optimizing water resource management, and creating alternative sources of income for local residents. After all, mitigating the consequences of the Aral Sea tragedy is an integral part of ensuring global ecological stability.

Another problem today is the main factor - global climate change and its components is the increase in temperature. As a result of the accumulation of greenhouse gases in the atmosphere, heat energy is trapped on the Earth's surface, which is increasing the average temperature of our planet.

This global increase in temperature, in turn, is causing a fundamental change in hydrological processes on our planet. In particular, atmospheric warming increases the rate of evaporation of water from the oceans and land surfaces. This directly affects the amount of precipitation and its seasonal distribution, causing devastating floods in some regions, and long-term droughts in regions such as Central Asia.

The most dangerous and biologically complex manifestation of these problems is the phenomenon of phenological asynchrony. Under the influence of global warming, the flowering and leaf formation times (phenophases) of plants are moving much earlier than the calendar time. However, the period of biological awakening of animals (insects, birds) that feed on these plants or pollinate them has not yet come. This time difference — asynchrony — leads to a disruption of the food chain and, ultimately, to the crisis of entire biological communities.

CONCLUSION

In conclusion, technological approaches alone are not enough to combat climate change. The restoration and protection of natural ecosystems, in particular forests, pastures and deserts, should be a priority strategic direction. Greening work being carried out in the Aral Sea region, including the creation of saxaul groves, is of great practical importance in mitigating the negative consequences of climate change. In order to ensure sustainable development in the future, it is important to strengthen climate change adaptation measures, effectively manage water resources, introduce ecological innovations and expand international cooperation. Most importantly, ensuring climate stability by maintaining the integrity of ecosystems remains one of the priority tasks facing humanity.

References

1. Tolibov.Sh. Climate change and its impact on ecology. Tashkent 2024

2. "Climate Box"
3. "National Encyclopedia of Uzbekistan"
4. "Ecology" (Textbook for higher education institutions, edited by P. Baratov).
5. United Nations Development Program (UNDP) report: Monitoring results within the framework of the "Green Aral Sea" initiative (analysis for 2024-2025).
6. "New History of Uzbekistan" (Book 3, Independence period). (Environmental policy and development of the Aral Sea).
- 7.. N. Shodimetov, "Social ecology", Tashkent 2012
8. : P. Gulyomov, "Man and nature", Tashkent 2015
- 9 : B. Turayev, "Biogeography",. Tashkent 2018
10. : A. Ergashev, "General Ecology", Tashkent 2010
- 11.J. Shodmonov, "Ecology and Nature Protection", Tashkent 2019
- 12 Collection of scientific studies on climate change in Central Asia Tashkent 2021
- 13." Data from the Ministry of Ecology of the Republic of Uzbekistan. Tashkent 2024