ГЕОГРАФИЧЕСКИЕ НАУКИ

STUDY OF DESERTIFICATION PROCESSES IN THE ARAL SEA AND WAYS OF THEIR WARNINGS

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ABSTRACT

Desertification as a negative natural phenomenon was especially aggravated in the 70s-80s of the last century and received a large-scale development in the arid zones of the world as a result of severe drought and the irrational use of land, water, plant, mineral and fuel-energy resources by humans. It has become one of the most dangerous natural and anthropogenic processes, with extremely serious environmental and socio-economic consequences.

Key words: Aral Sea, desertification, drought, arid zone, landscape.

According to the estimates of the United Nations Environment Program (UNEP), at present, about 30% of irrigated, 50% of rainfed and 75% of pasture land of the arid zone is covered by desertification. More than 100 countries in Africa, Asia and Latin America with a population of about 900 million people are experiencing the negative effects of desertification [3].

The result of this process is the loss of about 50 thousand km^2 of potentially productive land in the world. In some countries with arid climate there are interruptions in the supply of food to the population, the standard of living of people is falling, the number of environmental refugees is increasing [3].

For the first time, desertification made itself felt in the Sudan-Sahel zone of Africa, when a large number of people died, and millions of livestock heads died from starvation. Desertification is not a frontal phenomenon of the natural onset of the desert on marginal lands, but a gradual degradation of arid landscapes as a result of the exacerbation of the mutual influence of natural and anthropogenic factors. The reasons for it are very complex and multifaceted, but they follow a single scenario.

UNEP documents that of the 45 causes of desertification, 87% are related to human intervention [4].

For the first time, desertification became the subject of widespread discussion in 1977 at the UN Conference in Nairobi (Kenya), where a world plan of action was adopted to combat this natural phenomenon that is very dangerous for humanity. In 1994, the United Nations Convention to Combat Desertification was adopted, which became the legal basis for fulfilling commitments and a new effective step towards the consolidation of countries in addressing issues of environmental protection and sustainable development. In 2004, at the 58th session of the UN General Assembly, 2006 was declared the Year of Deserts and Desertification. In this regard, all countries participating in the UN were invited to establish national committees or focal points to intensify action to combat desertification, not only at the level of governments, international and regional environmental organizations, but also at the level of local government with public participation. At the same time, it was emphasized that the efforts of the world community in solving the problem of desertification will allow not only to weaken its threat, but also to return a significant part of the desert land to a productive agricultural system.

Almost the entire flat territory of Central Asia is located in the zone of deserts, semi-deserts and dry steppes with a population of about 30 million people. Arid lands are mainly confined to the closed inland mainland basin of the Aral Sea, where landscape and biological diversity was formed in a continental climate with negligible rainfall.

Central Asia is a region of ancient irrigated agriculture. Currently, the area of agricultural land is more than 300 million hectares, of which 40 million are arable land, including 10 million hectares of irrigated land. Over 90% of agricultural products are irrigated agriculture, so fresh water is a determining factor for the sustainable development of all sectors of the national economy [1]. The shortage of freshwater resources is growing from year to year and in some dry years the lack of irrigation water threatens the food security of the region. However, the load on land and water resources is constantly increasing, and often they are used irrationally. In recent years, a technical reconstruction of the old irrigation network was partially carried out, new canals and reservoirs were built, in some places anti-filtration lining of sprinklers was carried out, the network of closed and open drainage was expanded, progressive irrigation methods (drip irrigation, subsurface) were introduced. However, this work is far from sufficient. The deterioration of the ameliorative state of the land, as well as the process of desertification of arid landscapes continues. It is particularly pronounced in pasture areas. As a result of overgrazing and non-compliance with pasture rotation at present, more than 70% of pasture land, not only lowland, but also foothill territory, especially around freshwater wells and oases is subject to desertification.

Intensive desertification has led to the fact that the territory of the Aral Sea region has become a zone of ecological disaster. Currently, it covers almost the entire area of irrigated and grazing land. At the dried bottom of the Aral Sea, sand-salt marsh desert Aralkum was formed with an area of more than 6000 km^2, where about 1 billion tons of various salts are concentrated in the upper soil layer.

The rapid drop in sea level and the intensive accumulation of salts caused climate change in the Aral Sea region: the amount of precipitation decreased, the annual amplitude of air temperature and its dustiness increased [2].

In order to overcome the Aral crisis, in 1993 the International Fund for the Aral Saving (IFAS) was created. The heads of the Central Asian countries that are members of the Fund are making major decisions that aimed at ensuring environmental stability of the region.

In 2018, at the next meeting of IFAS, held in the Avaza International Tourist Zone (Turkmenistan), the heads of Central Asian countries stated that the desertification processes in the Aral Sea basin slowed down a bit, but they continue to pose a threat not only to the region, but also to adjacent territories. In this regard, a program of action was adopted to prevent the development of desertification processes that impede the sustainable development of the region. The resolution of the meeting of the International Fund for Saving the Aral Sea says about:

- the positive activities of the IFRS in coordinating and enhancing the cooperation of the heads of the Aral Basin countries, UN agencies and other international organizations in addressing the consequences of the environmental and socio-economic crises;

- the need to improve the organizational structure and legal framework of the MSFA in order to increase the efficiency of its activities and more active interaction with financial institutions and donors in the implementation of projects and programs to prevent desertification;

- the development by the Executive Committee of IFAS (with the involvement of donors) of a program of action to assist the countries of the Aral Sea basin;

- development of a mutually acceptable mechanism for the integrated use of water resources and environmental protection, taking into account the interests of the countries of the basin under consideration;

- constructive negotiations in Almaty, contributing to the development of mutually beneficial cooperation in solving all problems.

Considering that the Aral crisis is far from episodic in nature, a broad discussion of the following forecasting issues is needed:

- patterns of formation and development of the desert ecosystem both in natural conditions and under anthropogenic impact;

- environmental and economic assessment of the processes and consequences of desertification, as well as mapping of various scales;

- desertification processes on the basis of a new methodology for integrated monitoring and the creation of a data bank on landscape degradation.

Research institutes developed various technologies to combat desertification:

- fixing of mobile sands and protection of engineering structures from sand drifts and blowing;

- phytomelioration and reforestation;

- increase the productivity of desert pastures;

- crop development of the desert through the use of local runoff;

- creation of underground reservoirs of fresh water through the collection and accumulation of precipitation;

- the use of solar energy for small consumers in the desert.

At present, a wide network of both ground and space monitoring has been created, new water-saving irrigation technologies and pasture rotation, methods of surface and radical improvement of the state of pastures have been developed and are being gradually introduced.

Conclusion

Long-term experience has shown that the territories of nature reserves in the deserts are very significant for carrying out the researches for studying the mechanism of desertification processes, where various forms of human activity are simulated at special sites and all stages of the interaction of natural and anthropogenic factors are studied.

Intensifying the protection of the natural environment, warning of possible negative processes in it is the most important task of our time, on the solution of which the well-being of present and future generations of the inhabitants of our planet depends.

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