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ВЛИЯНИЕ КРИЗИСА АРАЛЬСКОГО МОРЯ НА ФЛОРУ И ФАУНУ, А ТАКЖЕ НА СЕЛЬСКОЕ ХОЗЯЙСТВО РЕГИОНА

INFLUENCE OF THE ARAL CRISIS ON FLORA AND FAUNA, AS WELL AS ON AGRICULTURE OF THE REGION

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Аннотация. В данной статье представлен обновленный вариант текстовой версии о состоянии окружающей среды Республики Узбекистан и кафедре «Экология» Ташкентского государственного технического университета, подготовленном в 2016 году. Его цель – предоставить широкие слои общественности и лиц, принимающих решения, с легкостью для понимания, современной и надежной экологической информации.

Annotation. This article represents the updated version of the texted version on the state of environment of the Republic of Uzbekistan and on the department «Ecology» Tashkent state technical university, prepared in 2016. Its purpose is providing of the broad sections of the public and decision-makers with easy for understanding, modern and reliable environmental information.

Ключевые слова: экология, охрана окружающей среды, загрязнение, водные ресурсы, население, Аральское море, пустыня «Аралкум», региональная флора.

Keywords: Ecology, Environmental Protection, Pollution, water resources, the population, Aral Sea, desert «Aralkum», The regional flora.

The basic attention in the report is given to the description of the some priority national environmental problems, identified at the development of the National Environmental Action Plan for Sustainable Development of the Republic of Uzbekistan: Deficit of water resources; Degradation of pasture and arable lands; air pollution of urban territories; Environmental pollution in oil fields area; Environmental pollution with industrial and municipal solid waste; Shortage of forests and especially protected territories; Pollution of the water bodies with wastewater. Most of the sands and soils in the Pre-Aral area are light and easily transported by wind [1].

The brief characteristic of the causes of occurrence of problems and description of actions on their elimination is given in this report. The article is based on the official statistical information, materials of the Ministry of Natural Resources and Environmental Protection of the Republic of Uzbekistan [2].

The Aral Sea is the largest inland body of salty reservoirs in the world. Situated in the centre of the Central Asian deserts at an altitude of 53 metres above the sea level, the Aral Sea functions as a gigantic evaporator. About 60 km² of water evaporates per year. The sea contributed to hydrothermal regime improvement, influenced water regimes of arid plants, pastures productivity, and provided normal functioning of artesian wells etc. Ecological balance in the basin was formed in the first half of the 20th century and was stable up to the beginning of the 1960's, with a volume of 1,064 kmi, and a water territory of 66.4 thousand kml. Because of irrevocable removal of river water on irrigated territories, ecological balance began to decline. Only half of the previous river runoff reached the Aral Sea. But even this quantity of water was not sufficient to support sea level at 53 m. However as a result of a tendency of economy development in agrarian areas, leading to growth of irrigated territories and volumes of irrevocable water consumption during years of water shortages, water flow into deltas of the Amudarya and Syrdarya rivers was reduced sharply. In 1982 and 1983 this made up only 2.28 and 3.25 km³, respectively. Since 1961 the sea level has declined with increasing speed from 20 to 80–90 cm per year.

During the last 50 years, from 1960 to 2010, the sea received less than 2,000 km³ of river water, which led to the lowering of the sea level by 22 m, accompanied by a reduction of the volume of the water area by 87 %.

As a result of the complete stop of the Amudarya and Syrdarya runoff and expansion of irrigated territories without any control of the Aral Sea and environmental needs, a serious complex of ecological, social and economic problems was formed in the Pre-Aral area. These problems by origin and level of consequences have an international character. The sea has lost its fishery and transport importance. It was divided into two parts, the Bolshoi and the Maly (Northern) Aral, and moved 140–190 km away from the original shore. From exposed salty bed (35 thousand kml) up to 100 million tons of salty dust flew out annually. Suspended solids in the form of aerosols with agricultural pesticides, fertilizers and other harmful components of industrial and municipal wastes prevail in the composition of the winds. A new qualitative phase of desertification affecting the Pre-Aral ecosystem degradation, regional and global climate, mountainous flow-forming systems and water-salty regime of agricultural zone takes place.



The sea bed, formerly referred to as a so-called «fresh water maker» of vast water collecting basin at the expense of rich sea hydrobiocenose activity, is an artificial anthropogenous volcano, throwing tremendous masses of salt and finely-dispersed dust into the atmosphere. Pollution is increased because the Aral Sea is located along a powerful air stream running from west to east. It contributes to aerosol transference into upper layers and fast spread in the atmosphere of the Earth. That is why traces of pesticides from the Aral region were found in the blood of penguins in the Antarctic, and typical Aral dust has been found on Greenland's glaciers, in Norway's forests, and Byelorussia's fields, all situated thousands of kilometers away from Central Asia. One of the dangerous consequences of the drying off of the Aral Sea, is the increasing degradation of mountainous glaciers of the Himalayas, Pamir, Tiyan-Shan, and Altay, feeding the Syrdarya and Amudarya.

The increase of dust on glacier surfaces and mineralization of precipitation on them lead to intensive melting of glaciers. At present, 1081 glaciers have disappeared in the Pamir-Altay area, 71 glaciers in the Zaili Alatau area, and the volume of glaciers in Akshirak has been sharply reduced.

On average, valley glaciers in the Tiyan-Shan area retreat 7.5–13.1 m per year and grow thicker at the same time. This is a dangerous process for a dry region, because in Central Asia, mountainous glaciers are the only ancient remaining storage of fresh water supply and are the main atmospheric moisture condensators of the region. If the cover of moraine depositions increases, they no longer will be moisture condensators and sharp reduction of the river flow will start. The Aral disaster has deteriorated the sphere of inhabitation of the region sharply, due to polluting of the atmosphere, the drinking water and the soil.

An evaluation of the field with drawl from the dry parts of the Aral Sea bed shows that this magnitude varies from several hundred thousand tons to 20–30 million tons per year. In the composition of dust cloud suspended solids in the form of aerosols with agricultural pesticides, fertilizers and other harmful components of industrial and municipal sewage prevail. Salt content makes up 0.5–1.5 %. Sand-and-salt aerosol effects on oasis soils and pastures are predominantly negative. Replacing multilayer herbage by single-layer, reduces the quantity of useful feeding plants, and often plants that have no feeding value are cultivated. Two million hectares of fertile lands disappeared as a result of overwatering and as a result of fast rise of ground water they got polluted for the second time.

Today these lands are either water logged or salinized. Former arid soils of the Pre-Aral area with automorphic feed and moisture regime became meadow-swamp soils with hydromorphic regime. To support this regime artificially it is necessary to raise standards by 2–3 times, in order not to activate the secondary salinization process. A vicious circle of agriculture was formed in this region, where heavy swamped lands are left. The land-improvement condition of irrigated soils in Central Asia is worsened by collective-drainage water saturated with pesticides and discharged as return runoff into numerous local landscape depressions. As a result, artificial reservoirs-accumulators appear. These reservoirs are a real disaster for surrounding lands. Some of them cause secondary pollution when poisonous bed depositions become dry and are brought on irrigated lands, ruin them and pollute the atmosphere in the surrounding regions.

The most spread pollutants in the Aral Sea are: oil hydrocarbons, phenols, synthetic surface-active substances (SSAS), chlororganic pesticides (COP), heavy metals and minerals. The abundant use of pesticides with high physiological reaction (B-58, metaphos, corotan, butiphos, hexachloran, lindan, DDT etc.) poses a tremendous threat to living organisms. Reservoirs carrying water with undecided compounds of heavy metals and chlororganic pesticides, led to the destruction of fishery, the appearance of cancerogenic diseases, and changes in citogenetic indices. The maximum pollution level by oil hydrocarbons in 1970 was 54 MPC (maximum permissible concentration) in the Maly Aral (MPC = 0,05 mg/dmi), and 80 MPC in the Bolshoi Aral. Since 1978 the tendency to oil hydrocarbons pollution stabilization at the level of MPC is marked. Phenols made up 28 MPC (MPC = 0,001 mg/dmi) in the Maly Aral, and 63 MPC in the Bolshoi Aral. At present there is no information about phenol pollution because observations have been stopped. Concentrations of SSAS and heavy metals do not exceed MPC. Salinization increased from 10 g/l to 40–50 g/l because of lack of fresh water inflow. In the past the uniqueness of the Aral Sea contributed to richness and diversity of the biota which could be compared with Africa. The Pre-Aral area possessed half of the biological species of the former USSR, many of these, however, have disappeared or are threatened. There were 500 kinds of birds, 200 species of mammals and 100 species of fishes, thousands of insects and invertebrates. Before 1960 the river deltas were home to over 70 kinds of mammals and 319 types of birds. At present only 32 kinds of mammals and 160 types of birds remain. In low streams of the Syrdarya River, more than 100 thousand hectares of alluvial soils became salt-marsh, and more than 500 thousand hectares of swamp and meadow-swamp soil became dry. This resulted in the transformation and destruction 5-7 kinds of herbs needed for fodder for sheep, horses, camels and goats. Diseases and death of cattle began, musk-rats cultivation stopped, and sheep live-stock decreased sharply.

The regional flora is impressive and includes 1,200 flowers, 560 types of tugai forests of which 29 are endemic to Central Asia. The flora of the Aral-Sea coast includes 423 kinds of plants of 44 families and 180 genera. The highest diversity of sand vegetation is concentrated on the former islands of the western coast. The dry strip of the Aral is characterized by lower diversity in comparison with the coast. Among them are 30 species which are



valuable fodder plants, 31 kinds of weeds, and more than 60 kinds of local flora are potential phytomeliorants for dried coasts. The change in water balance caused mineralization of the water in the Aral Sea basin, which led to the loss of unique biocenosis and a number of endemic species of animals. Inflow reduction into the Aral caused irreversible changes of hydrological and hydrochemical sea regimes and hydro systems. Salt balance changes increased the sea salinity 3 times, transforming it into a desert. The formerly flourishing sea ecosystem supported 24 species of fishes that are disappearing. These include carp, perch, sturgeon, salmon, sheat-fish and spike. There were 20 kinds of fish in it, but fishery was based mainly on bream, sazan, aral roach (vobla). Barbel and white-eye fish were caught in the Aral Sea. The first signs of the negative impacts of salinization on ichthyofauna of the Aral Sea, appeared in the mid 1960's when salinity reached 12–14 %. On shallow water the salinity of water increased faster than in the open parts of the sea, negatively affecting spawning places. By 1971 the average salinity exceeded 15 % and resulted in the destruction of fish spawn. Since 1971 the average salinity has reached 12 % in the open part of sea, and the first signs of negative impact on fish have appeared. Some kinds of fish have slowed their growth, and the number of fish has been sharply reduced. By the mid 1970's average salinity of the sea exceeded 14 %, and the natural reproduction of the Aral fish was completely destructed. In the late 1970s several species of fish did not reproduce at all. By 1980 salinity exceeded 18 %. The ecosystems of delta valleys have been transformed greatly by agricultural land use for many centuries. Irrigated or cultivated fields, rice fields and non-cultivated agricultural lands that are characterized by different stages of soil and vegetation cover rehabilitation, are singled out. The following anthropogenic factors that brought about changes in the ecosystems should be considered according to their significance: pastures, land-use, agriculture, transport, city, rural, military objects, hydrotechnical (artificial reservoirs, dams, canals, sewage accumulators), and cattle breeding.

The process of degradation in the Aral region caused progressive crises in the social and economic spheres. The primary victims of the crises were the most vulnerable layers of population, namely children, women, ill-paid inhabitants of cities and rural areas. The region has the highest child mortality rate in the former USSR (10–12 children per 100 newly born), high level of maternity death: about 110 women per 1000 births. Diseases such as TB, infections and parasites, typhus, hepatitis, paratyphoid always accompany poverty. The disease rate has a tendency to increase. In the epicenter of ecological disaster, anemia, dysfunction of thyroid the gland, kidney and liver diseases are wide spread. Blood, oncological diseases, asthma and heart diseases are progressing. Medical research proves that the incidence and growth of these diseases are directly dependent on ecological disaster. In agriculture, there is a steady tendency to transition to ecological management of production. One of the main principles of the above-mentioned tendency is maintenance of positive humus balance in soil at the expense of introduction of alternation of crops and application of organic fertilisers.

For the decision of the set forth above problems of economy of our republic on department «Ecology and ground science» Karakalpak state university of name Berdak, the centre of science on maintenance of ecological and industrial safety of the Central Asian global environmental problems and industrial enterprises of all branches of our republic is created. The centre of science renders the necessary competent and practical help at the decision of various problems both natural, and ethnogeny character, and also develops necessary recommendations under their decision.

We believe that researchers not only be connected with researchers of Uzbekistan, but our academic collaboration will form the foundation of one of the most important scientific projects to solve the environmental problems that threaten a lot of population in whole Central Asia and even the whole globe.

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