

GEOECOLOGY OF KAZAKHSTAN: ZONING, ENVIRONMENTAL STATUS AND MEASURES FOR ENVIRONMENT PROTECTION

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Geoecological zoning of the Republic of Kazakhstan is given. 20 geo-ecological regions are highlighted, including the region 3 with the catastrophic level of environmental destabilization of the natural environment. The main factors of formation of geoecological conditions are natural (geological, climatic, hydrological) and technogenic (especially – industrial, oil, mining) factors. Environmental condition is characterized. Conservation of nature is justified. Considered the regions ecological risk of geosystems of Kazakhstan allow to identify the most important scientific and practical tasks in the field of optimization of natural environment specific natural-anthropogenic geosystems.

Keywords: geoecology, zoning, environmental risk, environment protection, Kazakhstan

The environmental situation is becoming more and more important development affecting all spheres of political and economic prosperity of the state. In the third Millennium the world is changing at an increasingly rapid pace, and the joint action of States to protect the environment often lag behind economic and social change. Gradually, the economy of the countries-members of CIS penetrate the environmental standards of developed countries.

General characteristics of the territory

The area of Kazakhstan is 2 724 900 km². The length from West to East is about 3000 km from the Caspian sea and lower reaches of the Volga to the Altai mountains and China, from North to South and 1700 km from the southern part of the West Siberian plain and the spurs of the Ural mountains to the Tien Shan and the Kyzyl Kum desert. The territory of Kazakhstan lies in the Central and southern latitudes of the temperate zone as far South it comes in a strip, crossing to the subtropics. The total length of the borders of the Republic is 12187 km, including: with the Russian Federation – 6467 km, Uzbekistan – 2300 km, with China – 1460 km, Kyrgyz Republic – 980 km, Turkmenistan – 380 km, on the Caspian sea – 600 km.

Geoecological zoning of the Republic of Kazakhstan

Geoecological zoning of the Republic of Kazakhstan allows to identify regions of the risk of danger of ecological destabilization of the environment, under the environmental risk should understand the likelihood of adverse consequences of any environmental resources (deliberate or accidental, gradual and catastrophic) of anthropogenic changes and factors. Identify areas of environmental risk classification is based on the signs of the degree of environmental stress environment.

Natural geological factors: tectonic faults, neotectonic movements, seismic and geodynamic activity play a large importance for geoecological assessment. Principles and methodology of an integrated geoecological estimation are universal, are applied in regions with the various natural and technogenic conditions, have great value for the environmental management [4–16]. On the territory of Kazakhstan are the following provinces geo-environmental catastrophic and critical levels of interference with the ecological state of the environment [1–3].

The areas with the catastrophic level of ecological destabilization of the environment

1. The waters and dried bottom of the Aral Sea (North Aral province).

The environmental condition. The death of the Aral Sea ecosystem. In 1990, the almost complete cessation of the inflow of river water, lowering of the reservoir 16 m, reducing the water surface area with 66,000 to 26,700 km², increasing the salinity of water from 10 to 46 g/dm³. The formation of a dried out bottom of sea salt desert dust-salt storms take out more than 1 million tons of salt per year. Excess indicators for all components of the environment; pollution of air, water and soil, destruction of biota. Mass human infection due to poor quality of drinking water or lack of it.

Measures for the protection of nature. Restoration of the Aral Sea as geosystems in the previous (1960) settings can not be, because it is the environmental changes become irreversible. This planetary ecological disaster. The solution is only possible on the basis of the International Programme for Saving the Aral Sea. It should be a comprehensive scientific study of the natural and built environment of the entire basin Syr Darya, Amu Darya and the Aral

Sea region. The main objective – to stabilize at the present level of the Aral Sea, the division of the waters with the help of cutting the dams on the target reservoirs. Possible transfer of sea water from the Caspian Sea via water pipeline pumping stations; interbasin transfer of the runoff; interbasin transfer of the Ob river runoff in the Central Asian region on the basis of governmental agreements. Priority actions: strict regulation standards of water use and irrigation land drainage water and the increase in releases of river water into the Aral Sea. Social protection of the population of the Aral Sea region, artificial irrigation, desalination of saline water, and others.

2. The territory of the former Semipalatinsk nuclear test site (Chingiztauskaya province).

The environmental condition. On the territory of the Semipalatinsk nuclear test site from 1949 to 1991. produced 470 nuclear explosions (in 1963 – only underground). The area of the landfill about 9000 km². However, radioactive pollution of the natural environment covered a much greater territory of neighboring regions of Kazakhstan and Russia. Directly in the area of the landfill: the removal of land from agricultural use for decades. The most dangerous radioactive isotopes: strontium-90, cesium-137. For more information on the range in the press are not available.

Measures for the protection of nature. Addressing ecological disaster – on the basis of the law of the Republic of Kazakhstan “On social protection of citizens suffered from nuclear tests at the Semipalatinsk nuclear test site” (of 18.12.1992). A comprehensive study of the effects of nuclear testing on the basis of the International Programme. Restoration of natural geosystems through land reclamation. Socio-economic and legal benefits to the population affected by the test. Mass health examinations and treatment for people living near the site. Careful monitoring of the use of any types of natural resources from the zone of ecological disaster.

3. Industrial area of Rudny Altai (West Altai mountain province).

The environmental condition. The powerful concentration of giant enterprises of non-ferrous metallurgy in agglomeration years. Ust-Kamenogorsk, Zyrjanovsk, Ridder and adjacent mines. Adverse climatic conditions, ground-level temperature inversions, calm, fog exacerbate pollution. Air pollution, water and soil emissions of lead, zinc, copper, mercury, arsenic, cadmium and others. There are about 100 contaminants, including the most dangerous to human health heavy metals (immune,

hematopoietic, cardiovascular system). Accumulated 1 billion. Tons of man-made waste. Accumulation of heavy metals (lead, cadmium) in agricultural production.

Measures for the protection of nature. The zone of ecological disaster on the territory of the East Kazakhstan region. The reduction of power and a reshaping of the enterprises of nonferrous metallurgy, equipment for their advanced treatment facilities, introduction of wasteless technologies. Strict control over the observance of ecological standards of environment quality. Reconstruction and relocation of industrial enterprises, improvement of technological processes in ferrous metallurgy and mining industry. The adoption of the State program on improvement of ecological situation in the Ore Altai. Widespread mass medical examination of the population. Given the unfavorable natural-climatic conditions of the region possible closure or conversion of industrial enterprises.

Regions with a critical level of ecological destabilization of the environment [2]

4. Eastern Aral Sea region (Lower Syrdarya province).

The environmental condition. Air pollution as a result of the removal of pylesolevogo basin of the Aral Sea. Uncontrolled pollution p. Syrdarya industrial and domestic waste, chemical fertilizers and pesticides. Repeated excess of MPC in the water content of chlorides, sulfates, nitrates, nitrites. Undrinkable water causes gastrointestinal disease.

Measures for the protection of nature. Restoring normal levels of cleanliness of air and water resources by improving production technology, waste water treatment. Ensuring effective measures to protect water resources of the entire river basin river Syrdarya based Interstate Program (IFAS).

5. Shymkent industrial hub (Syr Darya province).

The environmental condition. Very strong air pollution in industrial emissions of lead, zinc, nitrogen, hydrocarbons, silicon dust, asbestos and others. In the soil – arsenic, lead, cadmium, pollution river Badam.

Measures for the protection of nature. Wasteless tehnologiya equipment companies perfect treatment facilities. Partial re-industrial enterprises, removing some of them outside the city limits. Ozelenenie industrial and residential areas, strict control of the environment,

6. Balkhash industrial hub (North Balkhash province).

The environmental condition. Air pollution Balkhash combine “Kazakhmys”. Dominated

gas emissions of lead, molybdenum, copper and sulfur. Dumps and wastewater pollute the lake. Balkhash (copper, lead, zinc, arsenic, fluoride, sulfates, chlorides, etc.). Huge piles Kounrad mine (pit depth – 400 m). Air pollution from the mine dust.

Measures for the protection of nature. Further improvement of waste-free production technology, proven in the Balkhash TPK: utilization of sulfur dioxide, flotation leaching of copper, the use of slag and strains in the construction industry, and others. Non-release of industrial effluents into the lake Balkhash. Landscaping, recultivation of mining waste dumps and sludge.

7. Temirtauskiy industrial hub (Yereimantau-Bayanaul province).

The environmental condition. Air pollution from industrial gases of ferrous metallurgy (industrial complex “Ispat-karmet”), the chemical industry: dust, nitrogen oxides, sulfur, and others. It is heavily contaminated river. Nura wastewater plant of synthetic rubber: soderzhanie mercury in water 2–8, soil 8 times higher than the MPC.

Measures for the protection of nature. The introduction of non-waste production of advanced technology, with the capture of waste gases of metallurgical and chemical production. Improved sewage treatment plants, water recycling. Pollution prevention river Nura and Sarkand reservoir. Plantations and protective green areas. In the long term – resettlement outside the industrial zone.

8. Karaganda industrial region (Ermentau-Bayanaul province).

The environmental condition. Air pollution by dust, ash of the coal industry. Man-caused land subsidence as a result of the construction of mines, cuts. Waste heaps of rock – the sources of dust pollution of soil and water resources. Violation of groundwater aquifers during the extraction of coal.

Measures for the protection of nature. Disposal of waste from coal mining and coal washing in the construction and road industry. Land reclamation, waste heaps, dumps, with the possible waste rock backfill waste pits, mass planting to reduce the dust content of the air basin. The transfer of the residential areas of hazardous areas, are over exhaust shafts in safe areas.

9. Zhezkazgan industrial hub (Sarysu-Kyzylzhar province).

The environmental condition. Development of polymetallic ores (Satpayev). Combine “Kazakhmys”: concentrating mill, smelter, Zhezdinsky manganese mines. Air pollution

by dust, the flue gases (oxides of sulfur, nitrogen). Large areas of dumps. Water pollution Kengir reservoir.

Measures for the protection of nature. Environmental stabilizatsiya environment through waste-free and low-waste technology. Innovative and effective treatment facilities. Revegetation. The solution of acute problems of water supply and water supply on the basis of construction of water main Irtysh – Karaganda – Zhezkaz Gan. A harmonious blend of nature and architectural ensembles. Greening, industrial and residential zoning.

10. Almaty industrial district (Zailiyskay mountain province).

The environmental condition. The main pollutant Almaty air are vehicles, power plants, boilers (sulfur oxides, carbon, nitrogen, dust). Strong zagryaznenie industrial and municipal runoff of mountain rivers and soils. The sharp decline in reserves and production rate of artesian water. Environmental pollution favor the mountain-valley terrain, ground-level temperature inversions, frequent calms. Underestimation of the direction of mountain-valley winds in the modern building.

Measures for the protection of nature. Environmental stabilization on the basis of the State Program «On urgent measures for the development of the city of Almaty». The introduction of sewage treatment plants and waste-free technology in industrial predpriyatiyah. Prevention of emissions from motor vehicles, by reducing the number of cars in the city with 250 thousand. Units to a minimum. Wide transition to electric transportation a passenger. The development of the underground. Gasification of heating systems of private residential sector. Partial changes in city planning by restoring the “corridors” in residential areas for the penetration of free mountain-valley winds in areas of urban sprawl. Mass planting, reconstruction of irrigation ditch network. Hard, continuous monitoring of environmental conditions.

11. Karatau-Taraz industrial district (Karatau mountain province).

The environmental condition. Strong air pollution, surface water and soil chemical industry (superphosphate production). Among the industrial emissions of the most toxic compounds of fluorine, phosphorus, dust.

Measures for the protection of nature. Reducing gas emissions from the production of phosphate fertilizers. The introduction of non-waste production technologies to capture waste gases. Preventing the spread of toxic substances in the soil. water and food chains – in the human body. The introduction of automation

control state of the environment from an operational system of alerting the population. Redesigning enterprises in the city, in part – the closure or transfer outside the urban area.

12. Kustanai-Rudny Industrial District (Pritobolskaya province).

The environmental condition. Air pollution by dust enterprises iron ore basin, the construction industry and transport. Huge areas of disturbed land, deep pits (Sokolovsky – design depth of over 460 m. Sarbaisky – 630 m). Huge mining dumps near the town of Rudny. Pollution p. Tobol industrial effluents.

Measures for the protection of nature. Land reclamation: the alignment of dumps, seeding grass, plantations use waste rock as ballast material in the construction industry. Preventing waste rock storage on the arable soils. Protection of Tobol and reservoirs on the river.

13. Ekibastuz industrial hub (Priirtyshskaya province).

The environmental condition. Huge brown coal sections: career, waste rock dumps define «industrial landscape», a very strong dust air and soil. Powerful power: CHP-1 and CHP-2 emit large amounts of ash, dust, sulfur oxides and so forth. Ash emissions can be traced for hundreds of kilometers from the town of Ekibastuz.

Measures for the protection of nature. Revegetation. Plantations, phytomelioration. Improving the technology of high-lignite combustion in power. Use of waste rock for road construction and building industry.

14. Nord-Ppukaspiysky (Tengiz industrial district (Caspian province).

The environmental condition. Deep-lying oil reservoirs (5 km). Emissions from the depths of associated gas (hydrogen sulphide, methane) during exploratory drilling (MPC excess of 7–10 times) and industrial oil. Soil erosion in the areas of production due to the indiscriminate laying of roads, “drawing” of drilling rigs. The coastal strip is at risk of flooding under the influence of the transgression of the Caspian Sea.

Measures for the protection of nature. Improving the technology of oil and natural gas. Preventing catastrophic emissions of associated gas located in the bowels of the earth under enormous pressure, and ignition. Improving technology Buzachi oil field, has a high content of asphalt substances and vanadium. Land reclamation, revegetation and soil. Non-random paving dirt roads, in order to prevent soil erosion.

15. Mangistau industrial hub (Mangistau province).

The environmental condition. The imperfection of technology of oil production, gas flaring

results in air pollution. Soil erosion near the oilfields. Oil spills negatively affect the condition of water resources, soil and vegetation.

Measures for the protection of nature. Improving the technology of mining and processing Mangyshlak oil differs a high content of paraffin fractions and increased viscosity. Preventing the flaring of associated gas. Land reclamation and soil disturbed during oil production.

16. The Baikonur Cosmodrome (Lower Syrdarya province).

The environmental condition. Periodic launches of carrier rockets break the plasma structure of the ionosphere and affect the ecology of geosystems. Falling to Earth spent stages of rockets from unburnt residues are very toxic fuel – heptyl result in highly contaminated soil, destruction of animals that eat contaminated plants. Flushing toxins into local waterways is extremely dangerous for human health.

Measures for the protection of nature. Development of programs of ecological restoration of lands disturbed as a result of military and space tests. Careful consideration and mapping of areas falling space objects, constant monitoring of the environmental impact areas. Collection and disposal stages and parts of rockets. Land reclamation: where necessary the mechanical removal of soil contaminated with heptyl. Restoration of the productivity rangelands. Clinical examination of the population, animals, control over the quality of agricultural products.

17. Kazakhstan part of the Syrdarya river basin (Syr Darya and the Lower Syr-Darya province).

The environmental condition. The Syr Darya River is heavily polluted by industrial, household and agricultural waste water from the territory of Kazakhstan and Uzbekistan. The main pollutants: chlorides, sulfates, nitrates, pesticides, and others. The content of nitrates in the lower reaches of greater than 45 times the MPC. The water contains pathogens. Water pollution is exacerbated by the constant reduction in rate of flow, making it difficult to self-purification processes.

Measures for the protection of nature. Need Interstate Environment Programme water resources of the river. Syrdarya. Compliance with technological conditions and standards that ensure environmental cleanliness of water resources of the entire river basin. Syrdarya. Monitoring the use of pesticides in agricultural fields and mineral fertilizers, preventing dumping into the river drainage water. Creating vegetative barriers along the river (afforestation),

capable of absorbing chemical ingredients zagryazne-niya aquatic environment. Restoring tugai (riparian forests).

18. The lower reaches of the valley of the river Shu (Moyinkum province).

The environmental condition. As a result of intensive water use in the upper reaches of the river Shu in the lower reaches of a sharp decline in rate of flow, drying up of the river. Pollution reaches river Shu due to washout from agricultural fields of fertilizers, pesticides, water accumulation industrial emissions Zhambyl TPK.

Measures for the protection of nature. Regulation of water use on the basis of an interstate agreement between Kazakhstan and Kyrgyzstan. Control of runoff from irrigated land.

19. The Kazakhstan part of the Irtysh basin (West Altai Mountain province).

The environmental condition. Severe contamination of the river Irtysh within the Rudny Altai the industrial and domestic sewage. Ust-Kamenogorsk, Ridder, Zyryanovsk, village Deep, etc. handed down by the rivers Bukhtarma, Ulba Krasnoyarka etc. the Main pollutants: cadmium, copper, zinc and other heavy metals, petroleum products.

Measures for the protection of nature. Prevention of pollution of the river by powerful mining industry, ferrous metallurgy, power industry. Environmental risk factors is carried out in China damming runoff. Black Irtysh, which will cause a decrease runoff. Irtysh at least 20% and dramatically exacerbate water problems in Central Kazakhstan.

20. Sorbulak lake drive wastewater Almaty (Ili province).

The environmental condition. Wastewater storage Almaty is located in the natural relief depression near the river. Kaskelen. Artificial pond overflowing sewage and is in critical condition. The volume of waste water is close to the limit marks (800 000 000 m³). Perhaps a repeat of the catastrophic break the earthen dam, which caused human casualties, pollution Kapshagai reservoir.

Measures for the protection of nature. Strengthening wastewater storage dam. Mass planting fast-growing poplar trees to enhance the transpiration of water and strengthen the banks. Widespread use of water for watering of irrigated lands in view of the prevention of pollution by toxic agricultural products.

In the provinces, as the geo-ecological systems are interconnected natural ingredients creates an opportunity to foresee and avoid or eliminate the adverse environmental impact of human activities [3]. This opens up the possibility of using these geo-environmental rec-

ommendations to support both current and future activities in the field of nature protection, allows to calculate the economic effect of environmental work, opens prospects for conservation and transformation of the nature of Kazakhstan.

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