



Ministry of Environment Protection of the Republic of Kazakhstan



*RSE «Information and Analytical Center of  
Environmental Protection»*



**G-GLOBAL**

## STABILIZATION OF THE ENVIRONMENTAL SITUATION – THE BASIS OF DEVELOPMENT OF THE “GREEN ECONOMY” IN THE ARAL SEA REGION

**Author, Scientific Adviser – Lyudmila Vladimirovna Shabanova**

Candidate of Biological Sciences, corresponding member of the Academy “Ecology”, Deputy Director General of the RSE “Informational and Analytical Center of Environment Protection” of the Ministry of Environment Protection of the Republic of Kazakhstan, Astana, Republic Of Kazakhstan.

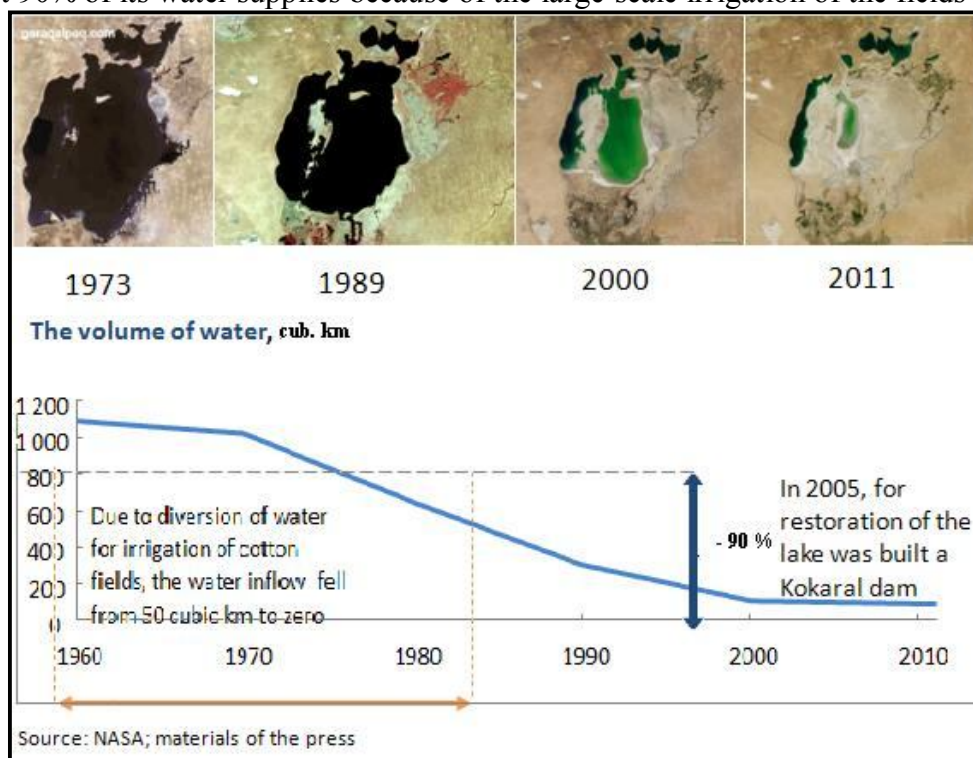
**Co-Executor – Abzal Eslyambekovich Jussupov**

Head of the Department of Environmental Knowledge and International Conventions of the RSE “Informational and Analytical Center of Environment Protection” of the Ministry of Environment Protection of the Republic of Kazakhstan, Astana, Republic of Kazakhstan.

**Co-Executor – Gulbarshin Serikovna Bekbenbetova**

Specialist of the Department of Environmental Knowledge and International Conventions of the RSE “Informational and Analytical Center of Environment Protection” of the Ministry of Environment Protection of the Republic of Kazakhstan, Astana, Republic of Kazakhstan.

Kazakhstani Aral Sea region is a region of the ecological crisis, which resulted in drying of the Aral Sea in regulation of the rivers flow in the Aral Sea basin and the emergence of the devastated ecosystems on the dry bottom of the Aral Sea [1]. Just over 40 years, the Aral Sea has lost 90% of its water supplies because of the large-scale irrigation of the fields (Fig.1).



**Fig.1 – Dynamics of ecosystem transformation of the Aral Sea region**

The region is located in the zone of deserts, combines features of the Northern and the Southern deserts of Sugar Gobi desert region. Thanks to the variety of ecological conditions in the Aral Sea basin and the alluvial plains of the Syrdarya Delta, there are marked variations meadows, riparian forests, halophilic and psammophilic plant communities. All of this creates considerable diversity in the distribution of vegetation formation, determines their intrazonal options and clearly-expressed complexity of vegetation and ecosystems.

Flora coast of the Aral Sea is presented 423 species of plants belonging to 44 families and 180 genera. 30 species of which are valuable fodder plants. There are more than 30 species of medicinal plants and 31 species of weed plants. More than 60 species of the local flora are potential soil reclamation plants for reclaimed coastal areas. Drained strip of the Aral Sea is characterized by a smaller variety of flora and fauna compared to the coast. Particular importance for the preservation of the gene pool of the Aral Sea region has the endangered species of plants and plant communities (*Artemisia - scopiformis*/Sagebrush-Virgate, *Atriplex pratovii* Suchor/Orach Pratova, *Calligonum crispatum*/ Calligonum), which belong to different categories of protection and are dispersed on a large territory of the Aral Sea region (Fig. 2).

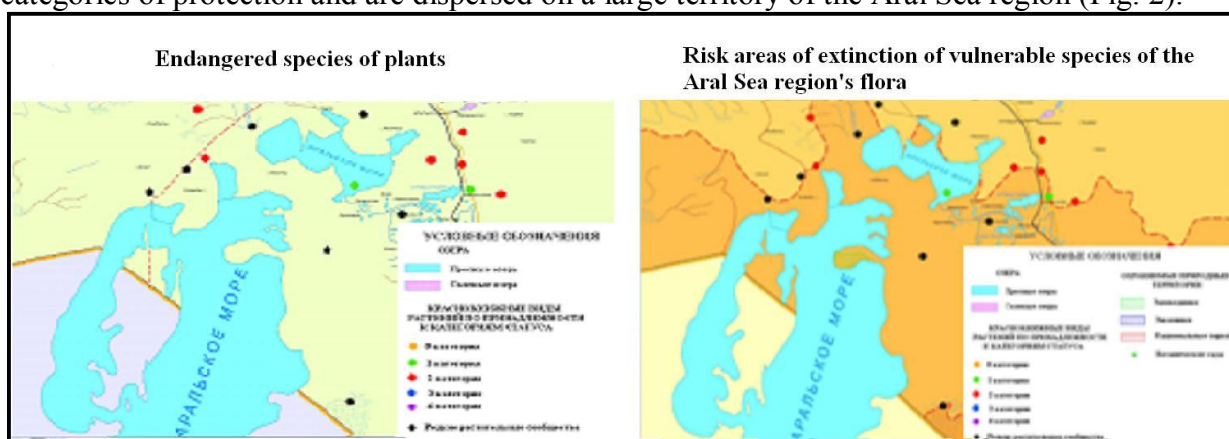


Fig. 2 – Endangered species of plants and risk areas of extinction of vulnerable species of the Aral Sea region's flora

The most effective form of biodiversity conservation and environmental stability in the Aral Sea region is the further implementation of measures to combat desertification, especially in dried up band of the Aral Sea. And it is also development and implementation of new assessment methods and strategies for biological diversity conservation and projects environmental rehabilitation of the region [2]. The involvement of the public in implementation of measures for conservation of species and ecosystem diversity, including development of environmental education and enlightenment, qualification improvement of specialists, as well as the awareness of the population on condition of natural systems and elaboration of joint decisions on stabilization of ecological situation of the Aral Sea region.

Analysis of scientific research results shows that on the territory of the Aral Sea region is dominated by the processes of a significant transformation of ecosystems (desertification), including degradation of soils and vegetation; violation of the volume, mode, the quality of surface water and groundwater, including on irrigated lands; the transformation of relief on the sands; and technogenesis. Types of degradation are selected on the basis of qualitative and quantitative indicators, which characterize changes of stability (stability) of specific, zonal ecosystems and their response to external influences (Fig. 3).

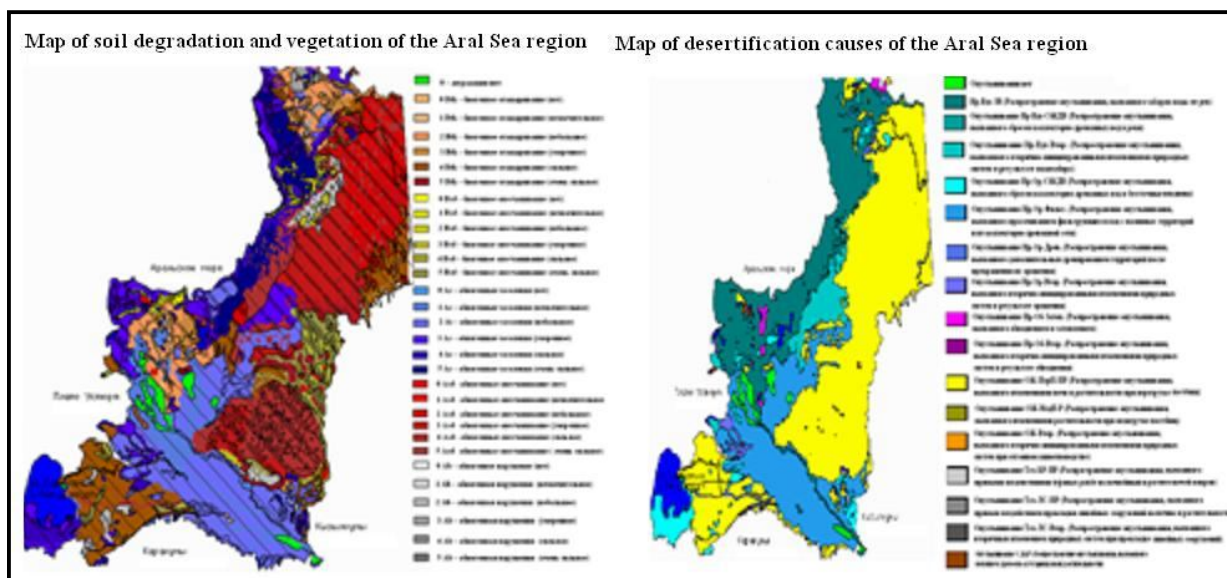


Fig. 3 – Maps of soil degradation, vegetation and desertification causes of the Aral Sea region

Desertification of the Aral Sea region was caused by a fence of water from rivers; discharge of collector-drainage waters into the river; the second time-initiated by changes in natural systems as a result of water intake; discharge of collector-drainage water in closed depressions. One of the factors of desertification is the leaking of the filterable waters from irrigated territories and the collector-drainage network; additional drainage of the territories after the termination of their irrigation; irrigation and flooding; secondary-initiated changes of natural systems as a result of irrigation. The most powerful transformation of soils and vegetation is observed during the reboot of pastures; secondary changes of the natural systems upon nomadic animal industries, tracing linear structures; direct impacts of offshore drilling installations on the soil and vegetative cover; as well as in destruction of the arboreal-shrub vegetation [3].

For the development of an effective system of stabilization of the ecological situation in the region we offer the use the main provisions of ecological zoning concept. Strategy zoning of natural-anthropogenic environment should be considered as the first step of the administrative management and control of the environment, including the development of sustainable management and development of territories. The ecosystem approach and the greening of socio-economic spheres lie in the basis of a system of sustainable management.

The concept of ecological zoning is based on cartographic assessment of ecological condition of ecosystems (Scale 1:100 000, 1:2 500 000). This approach allows defining the transformation (desertification) of natural-territorial complexes with regard to the risk of natural danger of ecosystems degradation, to identify the extent, types, and causes of destabilization of the environment. The used of the main forecasted indicators of the extent and rate desertification taking into account the normative-legal acts and real measures on stabilization and prevention of the violations risk of the environment in accordance with the measures of the sectoral programme “Zhasyl Damu”.

The basis for the analysis of extent, causes of transformation and development of schemes of sustainable management of the natural resource potential of the territories are the maps of desertification and maps of ecological risk zones developed by us (Fig. 4).

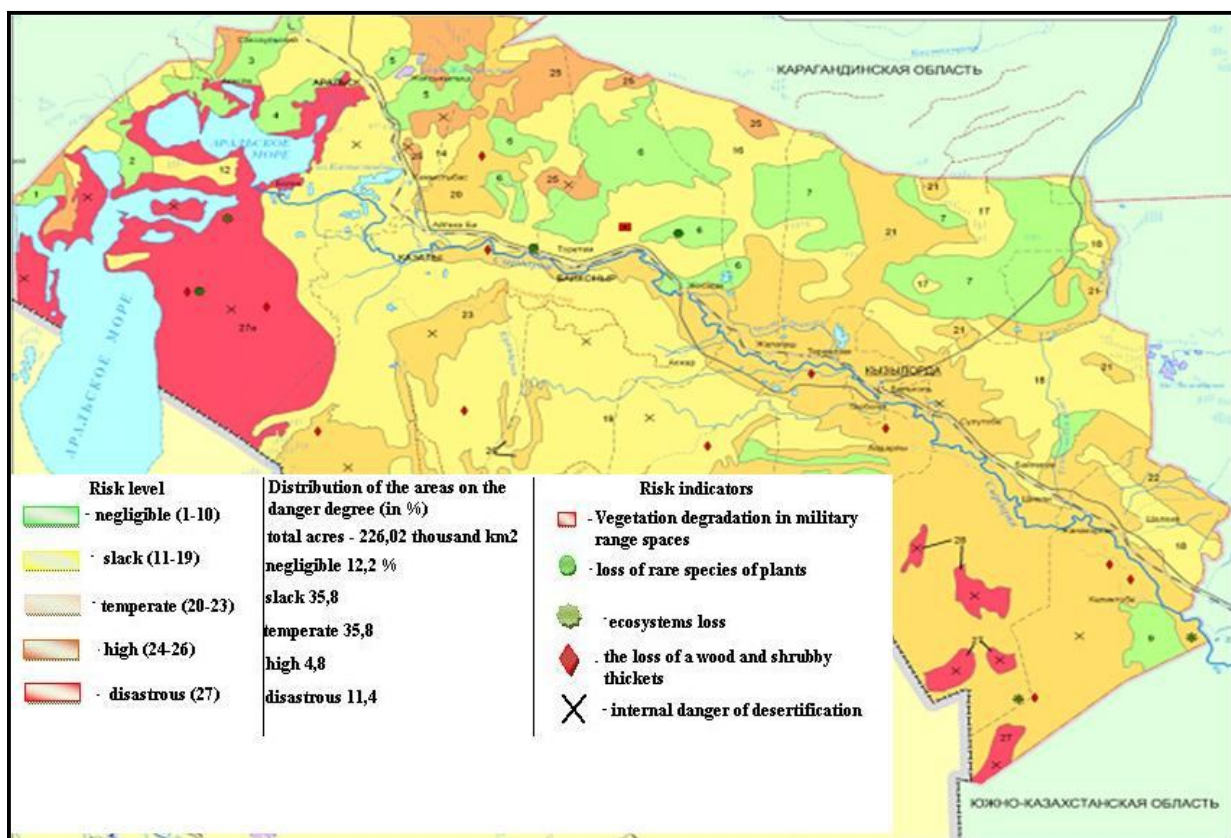
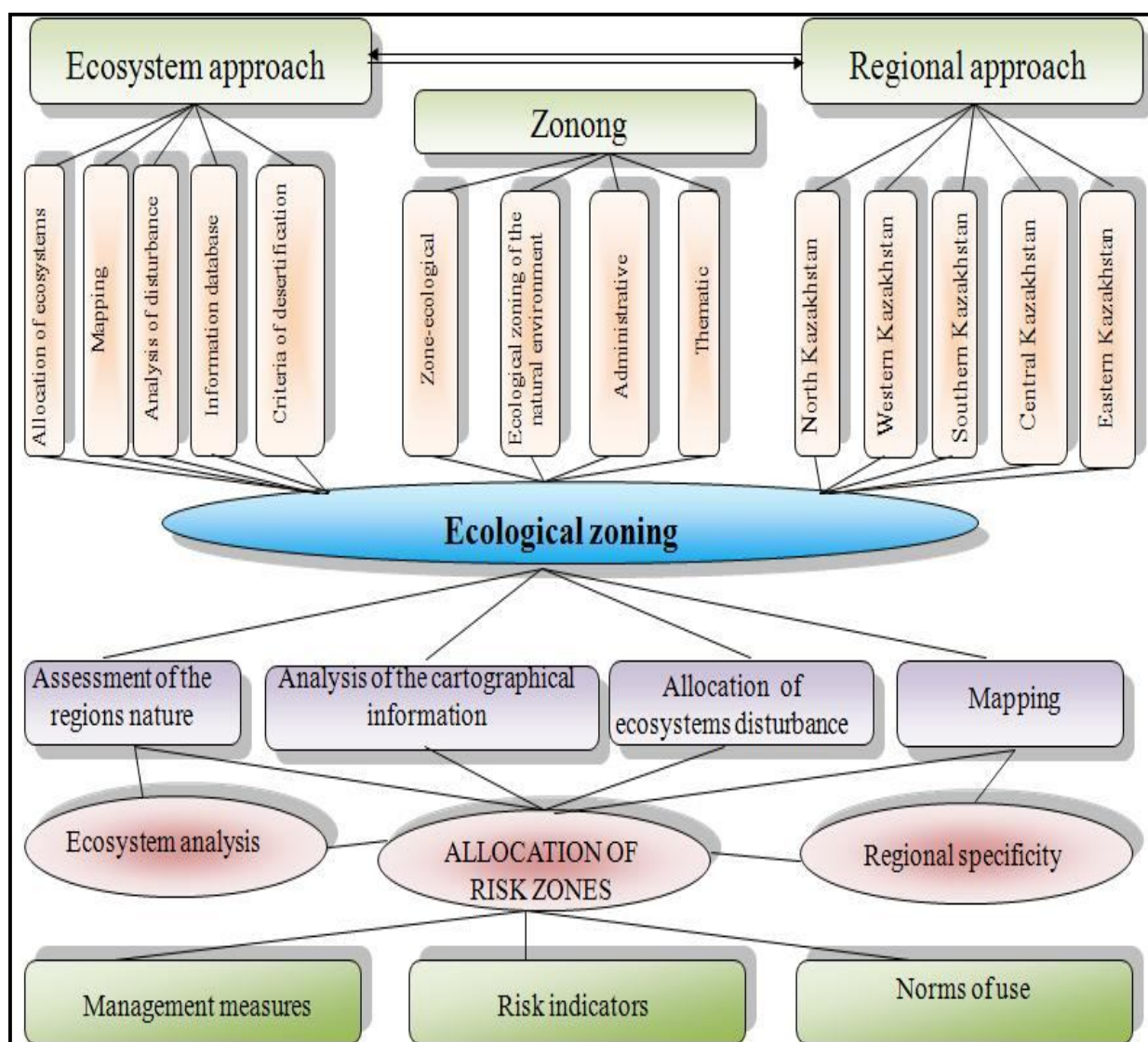


Fig. 4 - Map of ecological risk zones of Kyzylorda oblast

On the map has shown the areas of ecosystems degradation, their soil-vegetation cover, loss damage of biodiversity and soil fertility. The borders of zones of middle and small scale combine in complex ecosystems on a degree/class desertification within the Kyzylorda region, which were allocated 27 contours of different degree of danger: background (1-10); weak (11-19); moderate (20-23); high (24-26); and catastrophic (27).

At the core of development of this map based the principles of the ecosystem approach for specific areas/regions that include allocation of these ecosystems: mapping; analysis of their destruction, according to criteria of desertification and data on the main characteristics of the status of natural systems components (biotic and abiotic). Using the above mentioned indicators for zoning of specific areas (zone-environmental; ecological zoning on the extent of desertification; administrative and thematic). It is also provided the opportunity to assess the ecological risk of the whole territory of Kazakhstan, on the basis of the bundling of state blocks of specific areas/Aral Sea region/and regions (Northern, Southern, Western, Eastern Kazakhstan).

These approaches allow for an assessment of the natural resources of the territories, to highlight the areas of risk, and to determine the risk indicators for development of norms of resources use and schemes of rational management of the natural potential of ecosystems (Fig. 5).



**Fig. 5 – The scheme of rational management of the natural potential of the ecosystems**

Results of ecological zoning of the Aral Sea region confirm the problems of the natural environment on a large territory of the region [4]. Transformation of the natural environment is a powerful risk factor for the emergence of a number of diseases in the population and a significant worsening of the sanitary-epidemiological condition of the Aral Sea region [5].

To the category of relatively disadvantaged classified a moderately decertified ecosystems (over 40 %), since their operation already requires strict regulation and seasonal monitoring of environmental conditions, especially in times of drought (Fig. 6).



**Fig. 6 – The current state of the Aral Sea (space shoot TerraMetrics 2013/Google)**

The most indicative of the risk area is the area of the Aral-Kyzylkum district of the Aral Sea region (4.6% of the territory of the Republic - 125 900 km<sup>2</sup>), where there was a great desertification (on 20% of the area) as a result of excessive regulation of the rivers. The exposed sandy and alkaline bottom very slowly grows and uncovered vegetation surface is not less than 80%. Is significantly affected the area and as a result of irrigated agriculture and paddy culture - happened secondary salinization of lands. Prevailing here the sandy deserts were earlier subjected to excessive grazing and logging of saxaul. With the decrease of cattle grazing in the present time the degree of their desertification is moderate (20%) and strong (10%). However, the area for the desert vegetation has not been restored, and the internal risk of ecosystem degradation is very high [6].

At the same time, with a favorable prognosis of land use in the Kyzylorda oblast (226,02 thousand km<sup>2</sup>), to sustainable development of the region and the rational use of natural resources, more than 50% of the territory may be transferred in a category with a low degree of transformation and suitable for the economic development and improvement of the population of the region.

All of the above determines the expediency of creation of GIS-system of environmental and economic development of the Aral Sea region, with view of admissible norms of natural resources, measures for stabilization of the ecological situation and rehabilitation of population.

## REFERENCES

- 1 Environmental code of the Republic of Kazakhstan dated on January 9, 2007, (with amendments and additions as on July 23, 2013), chapter 24 – Specific features of legal regulation in the areas of emergency and environmental disaster.
- 2 National report of the Republic of Kazakhstan on biological diversity // RSE “Informational and Analytical Center of Environment Protection” of the Ministry of Environment Protection of the Republic of Kazakhstan. Astana, Republic of Kazakhstan, 2012.
- 3 The program report 003 “Scientific researches in the field of environment protection” for the two phases on the theme: “Development of methods of estimation and measures to

combat desertification in foci of the ecological crisis for of the Aral Sea region” // RSE “Informational and Analytical Center of Environment Protection” of the Ministry of Environment Protection of the Republic of Kazakhstan. Astana, Republic of Kazakhstan, 2008-2009.

4 The program report 003 “Scientific researches in the field of environment protection” for three phases on the theme: “Ecological zoning of the Republic of Kazakhstan” // RSE “Informational and Analytical Center of Environment Protection” of the Ministry of Environment Protection of the Republic of Kazakhstan. Astana, Republic of Kazakhstan, 2008-2010.

5 The program report 003 “Scientific researches in the field of environment protection” for three phases on the theme: “Identifying cause-and-effect relations of socially significant diseases of the population living in the zone of the ecological disaster of the Aral Sea region” // RSE “Informational and Analytical Center of Environment Protection” of the Ministry of Environment Protection of the Republic of Kazakhstan. Astana, Republic of Kazakhstan, 2008-2010.

6 The program report 003 “Scientific researches in the field of environment protection” for three phases on the theme: “System development of ecological regulation of the level of water-land resources use in Kazakhstan” // RSE “Informational and Analytical Center of Environment Protection” of the Ministry of Environment Protection of the Republic of Kazakhstan. Astana, Republic of Kazakhstan, 2008-2010.