



**Ministry of Environment Protection of the Republic of Kazakhstan**



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



**G-GLOBAL**

## **CREATION OF AN ENABLING ENVIRONMENT AND INCREASE THE QUALITY OF LIFE – PRIORITIES OF THE “GREEN ECONOMY”**

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The Republic of Kazakhstan, being a full participant in the global development process, has taken on the commitment to the objectives set out in Agenda for the XXI century (Rio-de-Janeiro, 1992), Declaration of Millennium Summit (New York, 2000) and the World Summits on Sustainable Development (Johannesburg, RIO+10, 2002; Rio de Janeiro, RIO+20, 2012). In the decisions of the summits were defined the aims to develop ways of stabilization of the environmental situation as factors ensuring improvement of the quality of life and improving the health of population.

The growing global threats, associated with climate change, problems of ecological, energy, water and food security, require new solutions and integration of the modern community efforts. These factors lead to a wide spread of stresses, increase in the number of diseases, and reduction of immune status and mutagenesis, stimulate the processes of migration from ecologically unfavorable regions and worsen the living conditions of poor people.

The vast territories of the Aral Sea region are a zone of ecological disaster. Intensive desertification and sustainable irreversible processes of the environmental degradation of the natural environment have caused deterioration of life conditions, increases in the incidence of new socio-economic situation in the region.

In our Republic the issues of legal regulation and measures of social protection of the population living in ecologically unfavorable regions of the Aral Sea region defined at the legislative level [1]. With account of the severity degree of the current ecological situation of the territory of ecological disaster in the Aral Sea region includes the zone of ecological catastrophe; the ecological crisis and the environmental pre-crisis state.

This are all districts of Kyzylorda region and Kyzyl-Orda city; Biganinsky, Irgizskiy, Mugodzharskiy, Temirskiy, and Chelkarskiy districts of Aktobe region; Arysskiy, Otrar, Suzak, Turkestan, and Chardarinskiy areas of the South-Kazakhstan region; and Ulytau district<sup>1</sup> of Karaganda region. Analysis of the ecological status of these territories has shown that the degree of desertification, and land degradation determine the formation of the Kazakhstan part of the Aral Sea zones of ecological risk.

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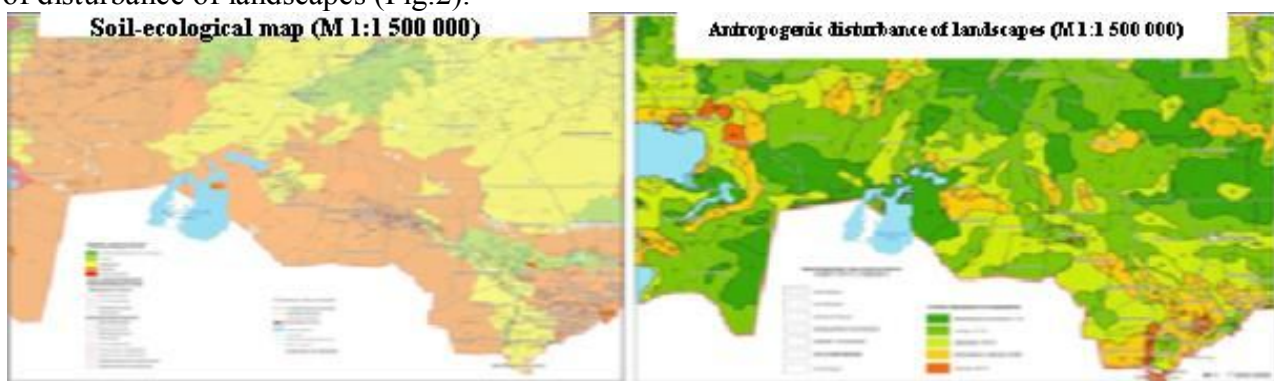
<sup>1</sup> In 1997 Dzhezdinskiy district of Zhezkazgan region was abolished. In this case the entire territories of the district of 30 village councils were transferred to Ulytau district of the Karaganda region.

At the same time, the degree of degradation of pasture lands varies in the limits of 17-20%, reedbeds flood plain of the Syrdarya River 40-55%, which causes a significant decrease in productivity of hayfields (from 50 to 80 centner/ha). The degree of ecological transformation of soils on the territory of the Aral Sea region ranges from minor to very strong changes in the soil cover (Fig. 1).



**Fig.1 – Transformation of resource potential of the Aral Sea region**

For example, in the area of dried bottom of the Aral Sea considerable territories turned into sand and saline desert, the source of salt for 150-300 km on the area of up to 25 million ha. The processes of soil degradation caused the changes in the composition of flora and fauna. Anthropogenic (agrogenic, pasture, reclamation, industrial and man-made, line-man-made, forest management) has increased education of the territories with a strong and relatively strong degree of disturbance of landscapes (Fig.2).



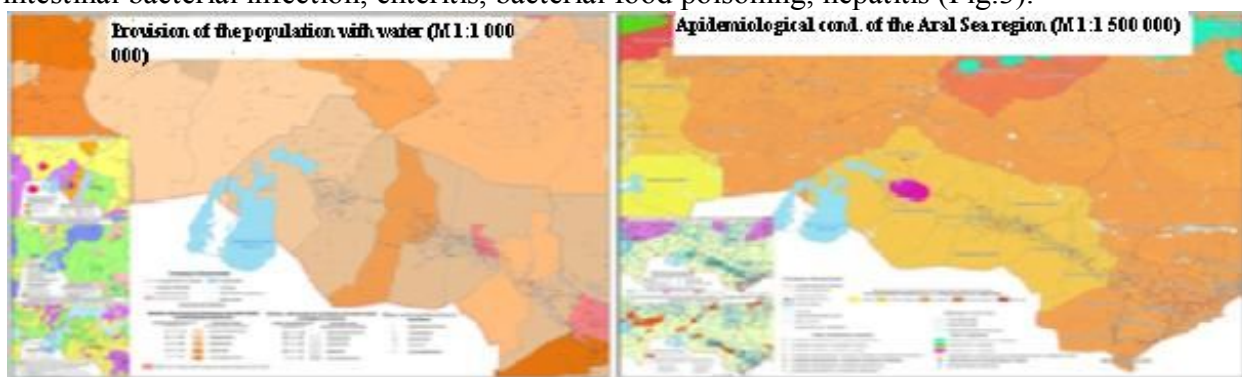
**Fig.2 – Ecological transformation of the Aral Sea territory**

Types of environmental transformation caused by natural phenomena (water and wind erosion, alkalization and salinization) and anthropogenic processes (dehumification, strengthening of water and wind erosion, salinization and alkalization; technological overload; chemical, oil and chemical and radioactive pollution).

The main factors of the loss of the resource potential of the Aral Sea region are the excess of the norms of maximum allowable concentrations of pollutants in the environment (air, water, soil) in size, threatening the life of the population. Destruction of ecosystems and the loss of the ability to heal itself; catastrophic sinking of water objects and excess of centuries-old fluctuations; the reduction of quantitative species composition of ecosystems/biodiversity and decrease of their productivity. All of this leads to the steady growth of the specifics of morbidity and mortality that have a causal relationship with the ecological state of the territories and determine the forced migration for environmental reasons [2].

The causal chain analysis growth in the number of diseases and environmental degradation showed that the population living in the zone of the ecological disaster of the Aral Sea region, there is observed the increase of the basic socially-significant, including chronic diseases on the background of increasing natural and anthropogenic factors of ecological risk.

One of the most important risk factor is the deterioration of the epidemiological status of the territories, the low supply of quality drinking water, which is reflected in increasing the level of infectious diseases. Among infectious diseases prevail salmonella infections, dysentery, intestinal bacterial infection, enteritis, bacterial food poisoning, hepatitis (Fig.3).

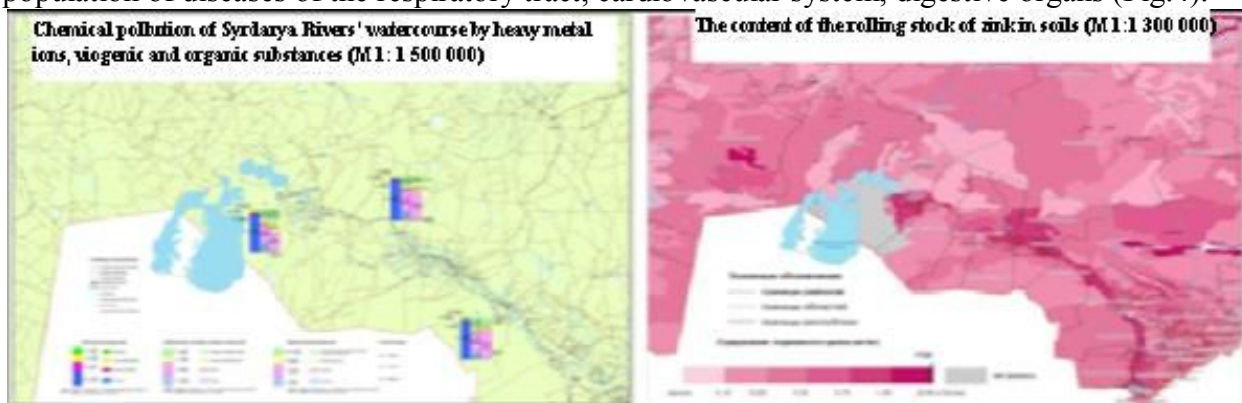


**Fig.3 – Epidemiological condition of the Aral Sea region**

Mapping areas of the Aral Sea region on the contents in the environment substances showing a significant excess of maximum permissible norms of the heavy metals ions, biogenic and organic substances in the floodplain of the Syr Darya River, as well as heavy metals, such as zinc.

This determines the high content of toxicants in the blood, which enter the body with food and water, including for previous years. Drinking water in rural areas by bacteriological pollution from 80 to 100% cases does not correspond to the GOST – “Drinking Water”.

The presence in the environment of toxicants significantly increases the risk of the population of diseases of the respiratory tract, cardiovascular system, digestive organs (Fig.4).



**Fig.4 - The content of toxicants in the environment of the Aral Sea region**

There are social factors of great importance for the improvement of the population that characterize the conditions of life in the region. The high level of unemployment, low income, which does not ensure a good quality of life of the population (good food, clean water, decent housing).

The low level of socio-economic development of the areas of the Aral Sea region is an additional plura, increasing the risk factors for the occurrence of socially significant diseases. The lack of vitamins “B” and “E” is observed in 77-85% of infants, almost all of the pregnant women, the iron-deficiency anemia; 40% of women-mothers have a pronounced lack of body weight; the prevalence of rickets in children in the range of 2.0-2.5 times higher than in other regions. Ecological and economic problems of the region are reflected in a significant migration of working-age persons and, accordingly, growth of the indices, characterizing the aging of the population [2].

Has been identified the dominant group of diseases, which depend on the same factors of the external environment. Among them intestinal infections, and diseases of the digestive system and digestive tract, iron deficiency anemia (Fig.5).



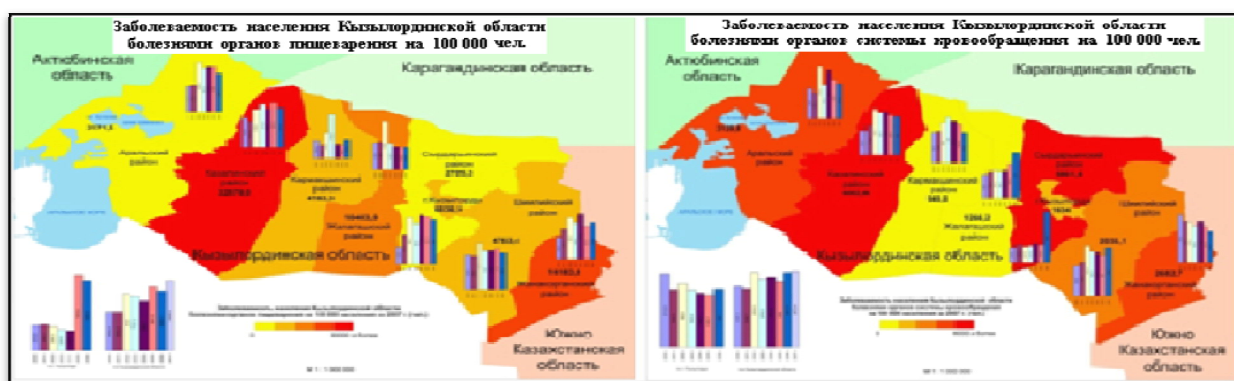


Fig. 5 – Dynamics of diseases of the digestive system and blood circulation

Analysis of socially-significant diseases also showed that to inhabitants of the region are characterized by the cancer, substance abuse and mental disease; rheumatism; systemic lupus erythematosus; localized disease of the connective tissue, diseases of the nervous system and muscles; epilepsy, psoriasis, eczema; diabetes; infantile cerebral paralysis; bronchial asthma, etc. (Fig.6).

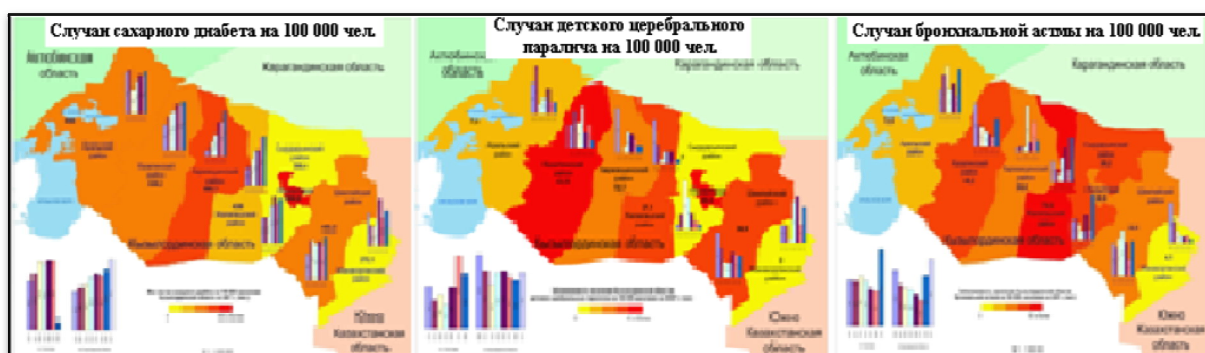


Fig. 6 – Dynamics of socially significant diseases in the population

Widespread diseases representing danger for surrounding people (tuberculosis, sexually transmitted diseases, AIDS, plague, cholera, fever, typhoid fever, anthrax, malaria; leprosy; diphtheria; whooping cough; measles, hepatitis, meningitis; brucellosis, etc.).

Measures are currently being taken to restore the natural potential of the Aral Sea region and improvement of the population in the framework of the implementation of the Strategy “Kazakhstan-2050” and other policy documents of the Republic [3].

The main priority directions of strategic programs are to ensure the access of the population to quality drinking water, through the sanitary and-technical equipping of settlements; provision of qualitative purification of drinking water; improve the culture of consumption; improvement of the quality of the food. The development of the economic infrastructure and the provision of employment growth, health, and the implementation of effective prevention and wellness programs that increase the level of medical-ecological security of the population; improvement of the epidemiological situation.

The application of GIS-technologies made it possible to determine the extent of land degradation and transformation of landscapes, the degree of loss of the resource potential; the area of spreading of toxicants in the environment. On the basis of the environmental mapping (series digital maps) defined the territory of the spread of malignant tumors and other socially significant diseases (by area); the frequency and dynamics of congenital malformations, under the influence of environmental factors. An algorithm has been developed for environmental screening of mother and child health, as well as the degree of intensity of the medico-ecological situations using international criteria of assessment of the indicators of pollution of

environmental objects and changes in the health of the population: satisfactory; the relatively strained; significantly strained; critical and catastrophic.

The following are the evaluation criteria for the indicators of pollution of environmental objects and changes in the health of the population (Table 1):

**Table 1 - The evaluation criteria for the indicators of pollution of environmental objects and changes**

1. Indicators and criteria of hazard chemical pollution of the habitat of the population
1.1. Atmospheric air
1.1.1. The quantity of emissions into the atmospheric air: - % at the oblast level
- % availability of substances 1-2 class of danger (when $p > 10$ )
Evaluation (score)
1.1.2. The level of air pollution: - criteria air pollution index
the multiplicity of excess of maximum permissible concentration of priority on the dangers of harmful chemicals
Evaluation (score)
1.2. The amount of emissions in water basins % at the oblast level
Evaluation (score)
1.2.2. The level of chemical pollution of the water: - the multiplicity of excess of maximum permissible concentration of priority on the dangers of harmful chemicals
- the value of the index of water pollution
- the value of poly-chlorine pollutants to substances of hazard class 1-2
- the value of poly-chlorine pollutants for substances of 3rd-4th class of danger
- bio-productive complex of 5 (mg/l)
- dissolved oxygen (mg/l)
Evaluation (score)
1.3.1. The level of pollution with heavy metals: - the total value of $Z_c$
Evaluation (score)
1.3.2. The level of pollution with chemical substances of anthropogenic origin: - the multiplicity of excess of maximum permissible concentration of substances of hazard class 1-2
- the same in respect of substances of 3rd-4th class of danger
- the ratio of the concentration to the background (or control) in the absence of maximum permissible concentration
Evaluation (score)
1.3.3. Territorial total load of pesticides (kg/ha cropland)
Evaluation (score)
The total sum of points on the assessment of harmful factors of the environment of the population
2.1.1 Mortality rate (increase in number of times, with account of the structure): - total
nursery 0-14 years old
infantile 0-1
Perinatal
Evaluation (score)
2.1.2. The average life expectancy. The lag from the similar indicators of the territories, the age among: - mankind a) at birth

b) at the age of 15 years
c) at the age of 35 years
d) at the age of 65 years
- womankind
a) at birth
b) at the age of 15 years
c) at the age of 35 years
d) at the age of 65 years
Evaluation (score)
2.2. Incidence and prevalence (magnification): total
nursery
in separate classes and nosological forms of environment-related diseases
Evaluation (score)
2.3. Medico - genetic and immunological parameters (increase in the number of times): - the frequency of congenital malformations
the number (percentage) of children with deviations in physical development
genetic damage in human cells (chromosomal aberrations, DNA breaks, etc.)
Violations of reproductive function of women (complications of pregnancy and childbirth)
- immune changes in(increase of the share of people with severe shifts in the immunogram) (in %)
Evaluation (score)
2.4.1 The excess of toxic chemicals in the bio-substrates human (blood, urine, saliva, hair, nails, teeth, placenta, breastfeeding).
Evaluation (score)
The total sum of points on the assessment of changes in the health of the population

This integrated approach allows making managerial decisions on the improvement of the environmental situation, the improvement of population and economic development in specific territories at the level of individuals, the Executive bodies, and business structures. For example, digital maps of the epidemiological status, pollution eco-toxicants and the availability of data on specific diseases allow you to develop safe tourist routes. Gives the opportunity to the local Executive bodies to work out the optimal scheme of the tolerance limits withdrawal of resources, identify the reserve areas for the production of high-quality agricultural products (crops, animal husbandry); health agencies to develop a scheme to reduce the risk of epidemics, prevention and improvement of the population. For business structures to organize the production and processing of food, pharmaceutical and other products in a manner consistent with the sanitary and technical requirements.

In this regard, we have developed approaches to determination of risk groups in identifying the dominant of socially significant diseases and the extent of their distribution according to the environmental, social and economic situation in the region, provide the opportunity to spend a correlation analysis of the cause-and-effect relations for the development of a sustainable improvement of the quality of life in areas of the Aral Sea region as a perspective region for development of “green” economy.

## REFERENCES

1 Decree of the Government of the Republic of Kazakhstan on 30 March 2000 No. 468 “On approving the list of socially significant diseases and diseases that are dangerous to others”.

2 The program report 003 “Scientific researches in the field of environment protection” in three stages on the topic: “Identification of causal connections 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 MEP of the RK. Astana, the Republic of Kazakhstan, 2008-2010.

3 The programme of action to assist countries of the Aral Sea basin for the period of 2011-2015 (ASBP-3); the branch Programme “Ak-Bulak” for 2011-2020; the branch Programme “Zhasyl Damu for 2010-2014”.