



Ministry of Environment Protection of the Republic of Kazakhstan



*RSE «Information and Analytical Center of
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THE ECOSYSTEM APPROACH OF DEFINING THE ACCEPTABLE LEVEL OF WATER-LAND RESOURCES USAGE UNDER THE FRAMEWORK OF PRIORITIES OF THE “GREEN” ECONOMY

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The world practice of ecological regulation of the state of the environment and the use of natural resources has been developed over a long period by the method of precedents depending on the needs arising in the process of development of specific environmental and production systems.

In a basis of ecological norms of maximum permissible level of water-land resources usage has laid the ecosystem approach, which defines a comprehensive assessment of the anthropogenic influence and geography of natural objects.

The concept includes provisions such as systematic removal of resources; the scale of pollution of natural systems; the large-scale degradation of lands; development of wind and water erosion of soils, salinity; the rhythm disturbance regulation of substances circulation and energy in the background ecosystems.

The environmental regulation is divided into three stages:

The 1st stage – Assessment of the modern state of ecosystems includes zoning of specific areas: the natural ecological; geographical zoning; botanical and geographical; landscape; agro-landscape; geo-ecological; administrative and economic; social and economic; and ecological zoning.

A variety of different methods (approaches) of zoning of the territories allows evaluating the current state of ecosystems and the general characteristics of the loss of resource potential (desertification) of specific territories within the regions of Kazakhstan, administrative regions, districts and local territories. A comprehensive analysis of these methods allows carrying out an environmental zoning of territories, which characterizes the state of complex of ecosystems and their indicators for the identification of risks and the desertification degree (hazardous areas: strong, moderate, and weak).

In general, the 1st stage of environmental regulation determines the degree of degradation of the resource potential (ecosystem diversity); a set of indicators, gradually accumulated violations in ecosystems; hazardous areas and resource loss/desertification.

The 2nd stage – The degree of transformation of ecosystems includes the assessment of the functional importance of ecosystem services (landscape stabilizing, environment-forming, water-regulating, water erosional, and the relief-stabilizing); internal (natural) risk of loss of the resource potential (desertification: sandy, detritus, and forest areas); the types and degree of disturbance of ecosystems (desertification). Furthermore, taking into account a specific criteria and indicators of ecosystem degradation: degradation of aquatic ecosystems; soil degradation; degradation of vegetation; and land degradation.

The 3rd stage – Environmental damage assessment of the territories is regulated by the Articles of the Ecological Code of the Republic of Kazakhstan on economic assessment of damage caused to the environment, including direct and indirect methods, as well as the procedure for assessing the cost of damage [1]. The rules of the economic assessment of damage from pollution of the environment approves by the Government of the Republic of Kazakhstan [2].

In our opinion, the proposed methodologies do not allow to get a detailed objective assessment of the value of ecosystems and damage from anthropogenic activities, so as not taken into account a resource-saving, relief-stabilizing, water-holding functions, as well as the time required for restoration of natural systems under anthropogenic loads.

The main problems associated with valuation and redress to the natural systems and urbanized territories are the absence of a common methodological approach; the use of the methods without taking into account the social-economic consequences (damage to health, property); gaps in the assessment of ecosystems and the natural and anthropogenic complexes, including water resources, subsurfaces, urban soils; ecosystems of especially protected natural territories; vegetation, which is not included in the Forest Fund; rare plants and animal species, as well as the absence of estimates of the negative impacts of oil pollution and uniformity in terms of damage and harm to the environment.

In the assessment of damages should be taken into account a speed of renewal of a natural resource, i.e. the time required for the return of ecosystem to the background state; time to self-destruction of the scale of natural systems pollution in accordance with their natural abilities on adsorption and disposal of pollutants of the soil, water, and air; the rate of recovery of large-scale degradation of lands due to the development of wind and water erosion of soils, salinity, and the disruptions of the regulation of turnover and energy circle in the background ecosystems.

The loss includes an actual damages plus the loss of profits: the costs of systems restoration (recultivation, overgrassing, cleaning of water reservoirs from pollution, reconstruction of water facilities, planting of forest belts, green plantations, and the restoration of flora and fauna); and revenue deficiency (low productivity of pastures and livestock, crops of agricultural lands, fishing animals, medicinal plants, and fisheries).

For a more correct assessment of the damage, we offer the use of the results of the environmental audit on agricultural activities, industrial enterprises activities and private business structures activities.

To reduce damage to the environment, we offer the concept of sustainable use of natural and economic systems. The purpose of this concept is to achieve a balance of the economic social aspects of anthropogenic activities in an environmentally safe level [3].

To improve efficiency index of resources use in natural and economic systems, it is necessary to conduct their landscape zoning; an assessment of their geochemical condition; the diversity of systems and their stability to the anthropogenic loads; the degree of transformation of natural and economic systems, resources of water supplies (surface and groundwater); the degree of their pollution, types, mechanical composition, salinity, swampy, pollution with heavy metals (Geochemistry), soils bonitet; hazard of risk of the territories to climate change (flooding,

xerophytization). Analysis should carry out a comprehensive assessment of the capacity of the territories for the development of schemes of environmentally sound levels of sustainable use of natural and economic systems and conduct the works on implementation of resource-saving technologies.

In order to improve the productivity of natural and economic systems is required to work on the efficient use of natural resources; to invest ecosystem services (water-saving and resource-saving technologies, state management of terrestrial and aquatic ecosystems, biodiversity protection of natural and economic systems); to create a monitoring system of aerial views, space views, snapshots, statistical data, meteorological data, the samples selection for laboratory-scale research on the content of eco-toxicants; to carry out the processing of data in the situational center; to create a database of emergency response in emergency situations; to create an information database of the status of natural and economic systems [4].

The system should be fully compatible with existing information systems operating at the national and international levels, in particular with the systems of the Ministry of Environment Protection of the Republic of Kazakhstan.

To increase the environmental sustainability index of natural and economic systems, it is necessary to implement the ecosystem approach to ensure a safe level of anthropogenic activities on the relationship and benefit of the public, private and business structures on the use of the territories. Develop mechanisms for the integrated management of territories with regard to their ecological status and importance of the resource significance. To determine the limits for withdrawal of natural resources; to ensure the functioning of the carbon market; to ensure the use of the resource potential on a corporate basis and preferential terms of land use for cultivation of green plantations, forest tracts, private especially protected natural territories, hunting and fish-breeding farms; to develop stimulate measures of population to projects for the rehabilitation of natural and economic systems (lake cleansing, cleaning of coastal areas, river-beds, planting of roadside forest belts, the sands consolidation, desalinization of saline areas) and special environmental requirements on the use of crisis and pre-crisis areas. To attract investments to “Green Kazakhstan” project (national investors, international investors, the programme “Zhasyl Damu”) and to ensure the participation in it of enterprises (borrowers) processing of woods and wastes, production of biofuels, accomplishment of settlements, improvement of especially protected natural territories and nurseries. (Fig. 1).



Fig. 1 – the “Green Kazakhstan” project

We also offer to increase the carbon potential of Kazakhstan's territories at the expense of increasing the productivity of phytomass and development of "green" industry, to introduce alternative sources of energy; to ensure the preservation of biodiversity through the provisions of the Concept on formation of sustainable natural and agro-ecological systems and landscape-ecological bases formation of agricultural production systems.

For environmental systems there are two types of sustainability (resistant and elastic), which are due to the ability of their resistance to the effects for the maintenance of the structure and function. This takes into account indicators of capacity, self-cleaning ability, inertia, and the acceptable limits of change of agro-ecological systems.

The use of conceptual approaches will allow increasing the productivity of natural and agro-ecological systems of our country, which corresponds to priorities of Kazakhstan on transition to a "green" economy in the context of the overall strategy of development of Kazakhstan till 2030.

The major objectives of the given strategy on environmental aspects are aimed at reducing the load on resource base; construction of regional "green" clusters; reduction of the level of environmental pollution; ensuring the protection of key ecosystems and significant national natural objects; reduction of the risk on imposition of trade restrictions in connection with non-fulfillment of international commitments on environmental protection.

Proceeding from the fact that the economic success of Kazakhstan is mainly due to the presence in the country of rich reserves of natural resources, the use of the existing model of growth will lead to the loss of funds by the country's economy; a high level of ineffective use of resources; and degradation of natural systems.

In this case, the inefficient management of land resources, crop farming and the underutilization of fertilizers have caused significant degradation of agricultural lands (about 50%), which led to the drop of crop capacity by 36% over the past 20 years and could lead to a significant decrease in export potential [5].

On the basis of current growth of demand estimates, Kazakhstan may face a shortage of water resources at the catchment level. Storage of water resources is caused to imperfection of the system of their management and the constantly increasing demand for water, which can lead to the failure of water supply and water consumption, for the restoration of which will require significant investment.

Just over 40 years, the Aral Sea has lost 90% of its water supplies because of the large-scale irrigation of cotton fields. The Balkhash Lake may suffer the same fate: when implementing the scenario of accelerated development it will lose 86% of water reserves to 2045. From 16 lake systems that existed around the Balkhash Lake, survived only 5 of them. The water inflow from neighbouring countries has decreased by 2-3% per year. The level of water pollution in Kazakhstan has significantly exceeds the similar level in developed countries [6].

However, our Republic has the potential to create a sustainable "green" economy, having an opportunity for rapid growth in the long term. In this regard, the most important tasks are the problem-solving of water usage to meet the needs of regions; creation of highly efficient system of water resources management at the catchment level and optimization of water supply systems; and ensuring the water security of the country; launching of projects on restoration of soil fertility and structure management of the sown areas depending on the types of agricultural crops. In addition, there is a need for a reorientation of agricultural production on the areas in order to ensure the greatest value, taking into account the limited natural resources; the transformation of agriculture in the industry providing in the long term high level of profits due to the creation of new sources of valuable income.

To perform the set tasks it is necessary to create the conditions for the determination of basic needs and skills for implementation of the projects of "green" economy. For example, to create a highly efficient system of water basin management and land administration, including the formation of the system of control and development of clear rules of resources allocation; as

well as methods of restoration of soils fertility and other methods of farming, not connected with the use of chemical means.

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