



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



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



**G-GLOBAL**

## **ECO-EFFICIENT USE OF NATURAL RESOURCES AS A BASIS FOR “GREEN” ECONOMY**

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The increasing global threats associated with climate change, the problems of energy, water and food security, as well as regional conflicts require new solutions and the integration of the efforts of the entire world community. This is reflected in the global idea of the UN Conference on sustainable development “RIO+20”: “The future that we want”, which is based on the concept of transition to a green economy.

Basically the outcome of the “RIO+20” reflected interregional initiative of Kazakhstan Partnership Programme “Green bridge”, which is voluntary and open to the participation of the partners of all countries [1].

Previously Initiative of Astana “Green Bridge” was supported at the VI Ministerial Conference of the countries of the Asia-Pacific region and the VII pan-European Ministerial Conference on “Environment for Europe” (September, 2010 and 2011 in Astana city).

The main purpose of Astana Initiative is the development of the partnership on the development plans of transition from traditional models of the economy to the concepts of sustainable “green” growth, including the development of low-carbon and adaptation to climate change, sustainable urban development, the promotion of “green” business, and “green” technologies, the promotion of a sustainable way of life and improve the quality of life [2], [3].

Among the key priority directions of the Partnership Programme “Green Bridge” is to increase the eco-efficiency of use of natural resources and investment in ecosystem services [4]. In the context of biological diversity is of key importance for social and economic development and it is absolutely necessary for the survival of humanity. It offers goods and services of benefit to the global and local levels. On the planet preservation of biodiversity is directly connected with activities of daily living and socio-economic well-being of millions of people and contributing, thus, to sustainable development and the fight against poverty.

In this connection at the first UN Conference on Sustainable Development (June 5, 1992, Rio de Janeiro) was adopted the international agreement - the Convention on Biological Diversity. The Republic of Kazakhstan ratified the Convention in 1994, having taken up the following obligations:

the adoption of measures for the conservation and sustainable use of biological diversity into ongoing national plans, programmes and policies, conducting their monitoring and evaluation of the impact on the environment;

biodiversity conservation of in-situ and ex-situ, i.e. the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties.

For the implementation of the provisions of the Convention on biological diversity, as well as in accordance with the strategic plan of sustainable development of the country, in 1999, was developed the first National Strategy and Action Plan on conservation and sustainable use of biological diversity [5].

Biodiversity includes species, intra-specific forms, and the population of all types of plants, microorganisms and animals, as well as the diversity of ecosystems, common as in the natural environment, and created from the varieties, breeds, lines and strains, cultivated, grown and bred by man.

The problem of conservation and balanced use of this important source of livelihood for the topicality is incomparable with any other problem of mankind [6]. To determine priority actions for protection of the objects of biological diversity in Kazakhstan were identified priorities on a number of criteria. Among them, the conservation of ecosystems and the sustainable use of natural capital are fundamental directions of our National Strategy and Action Plan on conservation and sustainable use of biodiversity.

These commitments were reflected in the draft of the new National Strategy and Action Plan on biodiversity conservation, the strategic objectives which aim to combat the main causes of biodiversity loss due to the inclusion of the topic of biodiversity in activities of government and society. Reduction of direct loads on biodiversity and promote of sustainable use. The improvement of the status of biodiversity on the basis of sustainable mechanisms for the protection of ecosystems, species and genetic diversity and the increase in benefits for all people by improving the effectiveness of use of biodiversity, planning, management and creation of optimal natural potential.

For the implementation of the goals defined twenty main tasks. Determination of the value of biodiversity, including these indicators in national programmes and development plans; to minimize the reduction of biodiversity on the basis of economic incentives to activities aimed at the conservation of biological potential and environmental sustainability areas; reduction of the rates of degradation of natural habitats of flora and fauna. Development of mechanisms or systems of sustainable use of natural resources of different ecosystems on the basis of reduction of the anthropogenic load in view of climate change and resource needs [7].

The most effective measure to preserve rare and endangered species of plants and animals, unique reference areas, natural and historical-cultural complexes and objects having special ecological, scientific and recreational importance, is the creation of specially protected natural territories.

The analysis of the modern condition of the Natural-Reserve Fund of the Republic of Kazakhstan shows that out of 178 species of mammals is protected by data-140 species (78,6%), among them 22 species listed in the Red Book of the Republic of Kazakhstan 346 species of birds (87,4%), 31 species of reptiles (63,2%), 23 species of fish (22,1%). They do not provide for the preservation of the unique floral and faunal diversity of Kazakhstan and support the sustainability of the whole complex of natural ecosystems.

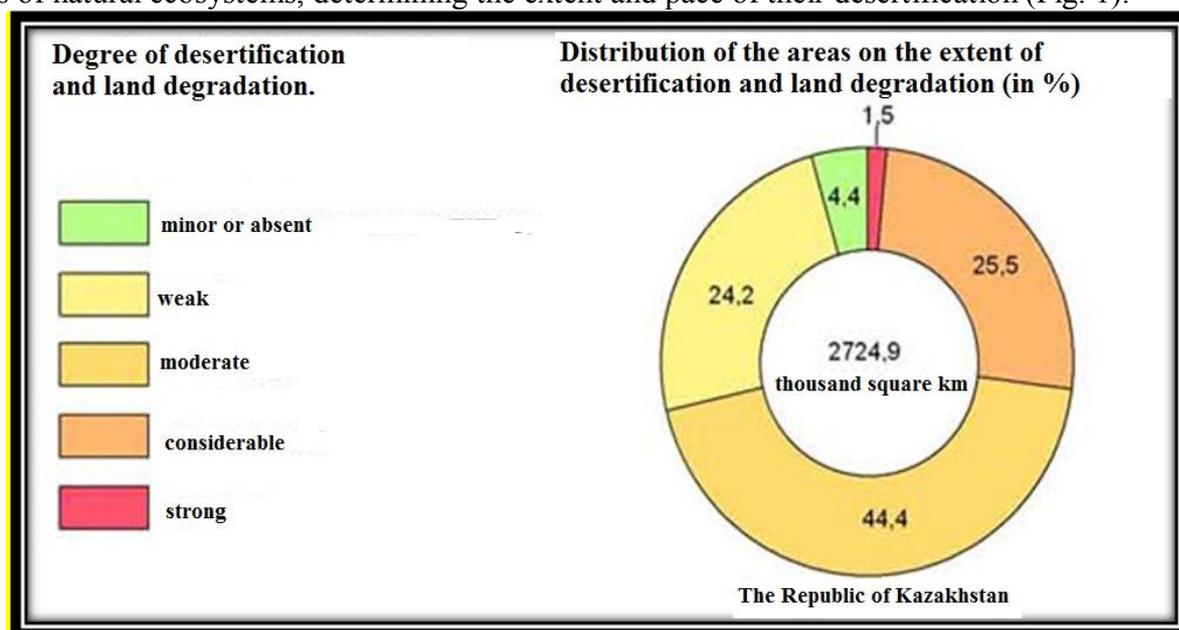
In Kazakhstan there are a number of globally important ecosystems, including the Northern desert, relict fir forests and the unique mountain ecosystems. The desert and the mountain system of Kazakhstan are included in the Global Inventory of the World Fund of the wild nature. Covers the most important ecological regions (the Central Asian desert and middle Asian montane steppe and woodlands). To the list of wetlands of international significance of the Ramsar Convention has been included the territory of the delta of the Ural River with the adjacent coast of the Caspian Sea, Alakol-Sasykkol and Tengiz-Korgalzhyn lakes system.

The main factors of decrease and loss of landscape and biological diversity in Kazakhstan are technogenic and anthropogenic impact on the environment, as well as natural processes of od

and desertification. Biodiversity loss continues because of the destruction of natural ecosystems, changes in the water regime of the territories, the loss of forests, over-exploitation of biological resources, discharge of industrial and irrigation water, the introduction of alien species of plants and animals. Threat of loss of biodiversity is enhanced by climate change, which is connected with the increase of temperature, the deterioration of the water ecosystems and, accordingly, the acceleration of the pace of desertification, the loss of the resource potential.

**The trend of depletion of biodiversity and their implications.** The main criteria for evaluation of the functional importance of ecosystems in the natural landscapes are: geomorphic features of the territory; the nature and type of terrain; mechanical composition and degree of soil salinity; degree of stability of the dominants, subdominants and economic assessment of flora and fauna, among which the vegetation serves as an indicator of the condition of natural systems. In mountain areas the vegetation stabilizes relief and performs the resource-based raw materials role (hayfields, pastures medicines). In case of natural disasters, wood-and-shrubby vegetation can serve as a barrier debris flow. In the desert zone of the main functions of vegetation ecosystems are: landscape and protective, grazing, forestry (with Haloxylon), haymaking, halo reclamation, as well as soil-forming. In the valleys of the rivers vegetation additionally also performs the role of water regulation. Background the state of ecosystems provides the basis for floral and faunal biodiversity.

However, in the present time in connection with the intensification of agricultural production and enhance the technical impact (especially the exploration and development of mineral resources), as well as in connection with significant changes of climate are substantial changes of natural ecosystems, determining the extent and pace of their desertification (Fig. 1).



**Fig.1 – Distribution of Kazakhstan’s areas on the extent of desertification**

Anthropogenic processes of technogenesis numerous and are classified by duration and territorial scope. Under certain conditions they may cause hazards and emergency situations.

Degradation of aquatic ecosystems occurs as a result of toxic pollution that is causing the death of aquatic organisms, and revenues in the water objects of biogenic substances, causing the strengthening of eutrophication, reducing the concentration of oxygen, reduced self-purifying capacity of the water ecosystem. The major pollution hotspots are observed near the enterprises that emit industrial wastes and waste water on the Earth's surface or in a river system without pre-treatment (mining, industry and individual metropolitan areas) with an unreliable system of treatment of industrial and domestic wastewater.

The greatest impact on groundwater has enterprise Karaganda, East Kazakhstan and Aktobe regions. It is noted an area groundwater contamination of petroleum products within all oil and gas producing industry of Kazakhstan.

Tehnozems stand out in all natural areas and are associated with arable dehumidification with prolonged use, salinity and alkalinity, the development of wind and water erosion, and destruction of man-made pollution of soils, overgrazing. Land degradation is influenced by relief forming processes - erosion and deflation. The density of population also reflects the impact of humans on the environment and desertification.

Integral estimation of the disturbance of the natural and anthropogenic ecosystems of the Republic is characterized by the factors, the impact, the extent and types of degradation. Biological natural self-regulation is peculiar to all ecosystems of different degree of disturbance. But the processes of full recovery of natural zonal systems are practically rare. Recovery processes can be fast (up to 10 years) or long (up to 50-100 years or more). Their duration depends on the extent and nature of violations, from the use cases, options for the application of melioration communities.

The risk of loss of biodiversity is possible even to the extent of the weak desertification. In the moderate level the risk is increased. With the strong and very strong degradation of ecosystems, the risk, of course, is strong.

The effects of anthropogenic factors are different, for example, a fire for the steppe vegetation is not so much cause damage to the grass vegetation, as the fires in the forest.

The last one can lead to a complete degradation of the tree-line and can really slow down the processes of self-healing. Mountain areas of the initially have high internal risk of desertification, which has the effect of faults, landslides, rockslides, mudflows, etc., that may result in emergency situations, heavy unpredictable consequences. Increased in recent years construction in the foothills and lowlands is accompanied by the destruction of forests and shrubs could trigger landslides, soil erosion.

Retrospective analysis of materials on desertification emphasizes the predominance of anthropogenic factors influence on the destabilization of the environment. The Aral Sea and the Ile-Balkhash regions with a population of 5.4 million people are most affected by desertification. Regulation of river flow has led to the cessation of the flood, lowering of groundwater levels; increase the amount of saline lands and reduction of a livestock of cattle. The water shortage has had a negative impact on the development of the economy and the living conditions of the population. Living conditions have deteriorated habitat for wild animals and fish. In Northern and Central Kazakhstan from water erosion affected 5.6 million hectares of arable land and reduced crop productivity by 20-30 %. In the Caspian zone of the sea flooded 357 thousand hectares of fertile coastal pastures and hayfields. Around industrial centers was happened land pollution with emissions of the enterprises. About 10 million hectares of pastures and arable land withdrawn from circulation on the grounds of the military-industrial complex.

The amount of the damage from desertification in Kazakhstan is estimated in tens of millions us dollars. Depletion of water resources has caused a decline in production, reduced jobs, reduced the standard of living of the population and caused the migration of the population from areas of ecological crisis.

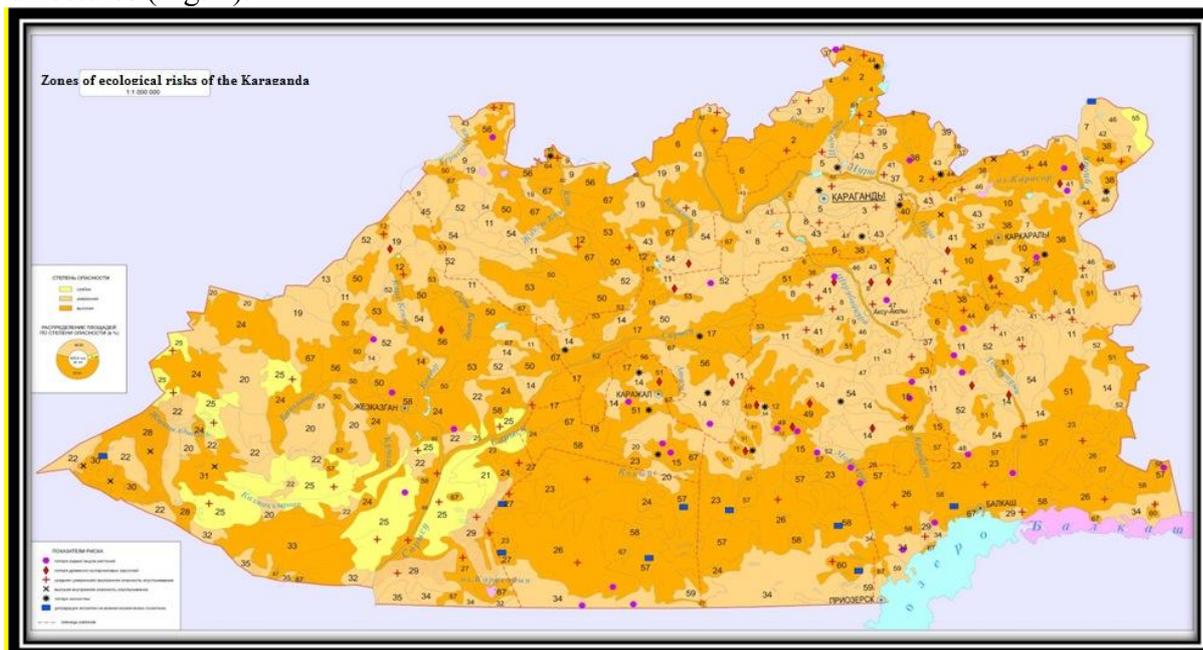
From 14 regions of the Republic of Kazakhstan, only in five of them (Aktobe, Mangistau, North-Kazakhstan, Karaganda and Kostanay) a negative attributes (i.e. desertification) were noted at 30% grassland. In other areas the degradation is about 30-50% and above.

On arable lands everywhere increased soil erosion and dehumidification. Content of humus has decreased by 25-30%. In this regard was decreased soil fertility, productivity of crops. 17 million hectares of arable land displayed in fallow lands into pastures. But weed deposits, overgrown by weeds, contribute to the increase in the number of insects - pests of crops. Salinization of soil, water and wind erosion, decrease of humus, secondary salinization for discharge of water from irrigation to neighbouring areas, marked by more than 90% of the soil of the Republic.

Problem of irrational use of land for grazing livestock and economic management is now compounded by numerous small agro and livestock groups, are unable to provide cost-effective use, purchase of machinery, fertilizers, veterinary care of cattle transhumance, to provide reserve stocks of feed, processing of agricultural products. There are socio-economic problems of the reorientation

of farms. Under these conditions, increases indiscriminate use of valuable natural areas, excluding the norms of withdrawal of resources, i.e. increased their degradation, desertification degrees.

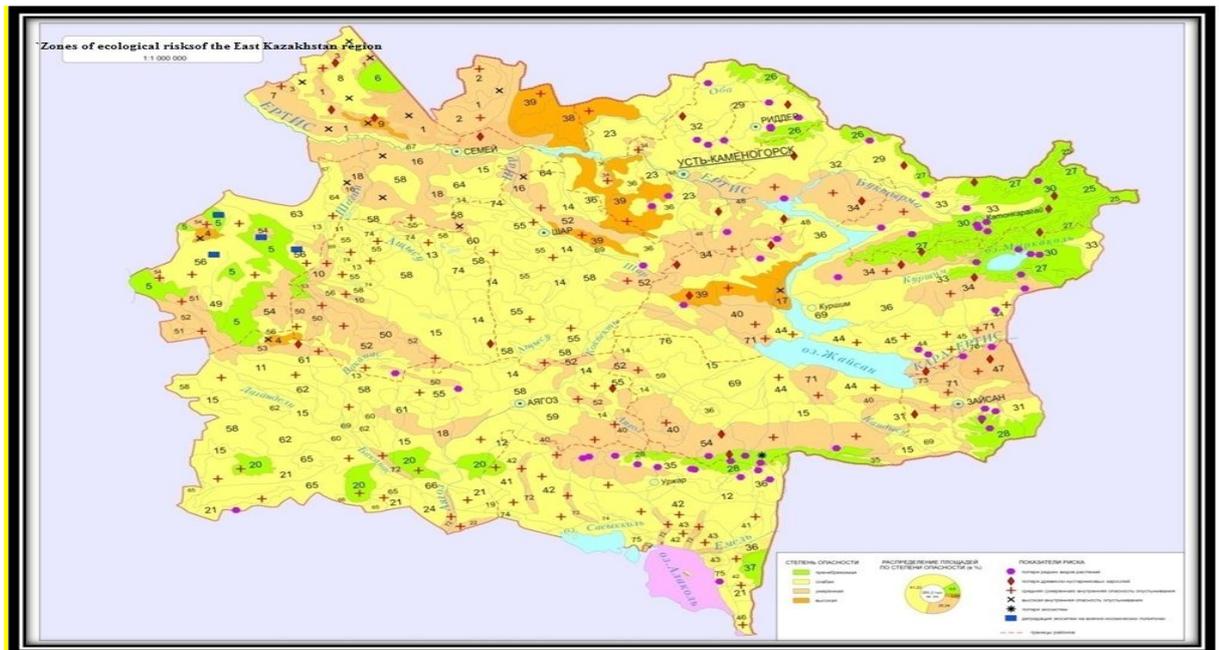
Karaganda region is located within the boundaries of the region of Central Kazakhstan and occupies an area of 4220, 9 thousand hectares. The specificity of the region lies in the peculiarities of morphological features is a special region of the Kazakh shield - Saryarka and high biodiversity of ecosystems. Central Kazakhstan is a separate and unique on the territory of zonality, which unites three areas of steppe and two desert subzones. The region is unique in the diversity of the types of soils, caused by the zonal and provincial peculiarities of the climatic conditions, terrain, which determines the specifics of the diversity of flora, fauna and ecosystems. In Central Kazakhstan allocated 67 of ecosystems, which characterizes considerable natural diversity. The area of the damaged territories and zones of ecological risk, including loss of habitats of rare species of plants and ecosystems, constitute more than 50%. A high degree of risk in Central Kazakhstan according to the ecological zoning has been registered for 32 ecosystems, on the area of 22 457, 2 thousand hectares (Fig. 2).



**Fig. - 2 Zones of ecological risks of the Karaganda region – Central Kazakhstan**

This is essentially a large, plenty of highly disturbed ecosystems, their desertification due to natural and anthropogenic impacts (plowing, grazing, felling of trees and shrubs), a high degree of internal danger of desertification on the stony-gravelly soils, on slopes of low hills, many years of haphazard grazing, the effects of industrial and radioactive anomalies.

The territory of the East Kazakhstan region stretches for 283, 2 thousand km<sup>2</sup>, is located in the basin of the upper Ертіс, and is bordered on the East by China, on the South with the Almaty region, on the North-East - with Russia, in the West - with Karaganda and Pavlodar oblasts. Characterized by a significant species ecosystem and landscape diversity, respectively, the climatic zonation. In the north-east there are ranges of Kazakhstan Altai, in the south-east ridge flanked Medium Tarbagatai Saura and central part of the area bordering the lake. Zhaisan is presented accumulation plains Zhaysansk depression. In the East Kazakhstan region identified 75 major ecosystems, including fir pine forests, pine forests, aspen-birch forests in combination with sand and feather grass and forb steppes, meadows on mountain meadow alpine and subalpine soils, mountain tundra, fragments of steppe and desert vegetation (Fig. 3).



**Fig.3 - Zone of ecological risk of the East Kazakhstan region**

A significant impact on the environment has technogenic impacts, which leads to a slowdown of their biological functions and death. As an example, you can cause shrinkage of the relic Ridder-boron in Ridder. To the category of threatened ecosystems can be attributed rich herb-gramineous, dry steppes, larch forests. Forest area has decreased as a result of fires, predatory, poaching logging and destruction of forest pest species over large areas of unique belt pine forests of Irtysh region.

Uncontrolled industrial felling of coniferous forests of Rudny Altai causes also the natural systems not less damage than unauthorized felling.

In general, only about 10% of unique diversity of ecosystems of the Eastern Kazakhstan corresponds to their background as, more than 25% are of moderate transformation and 4% of the territories close to a crisis condition.

In the field there is a lot of very strong man-caused impact in places of extraction of ore. Many roads worsen the environmental situation. Emissions of toxic substances into the atmospheric air also have a negative impact on both a human and the environment.

Analysis of zones of ecological risk Republic (Northern, Western, Southern, Central and Eastern) shows that the total area varying degrees of desertification is 91.6 % of the area of the Republic, desertification is absent only in the area of 8.4 %. Severe and very severe desertification (risk) is subject to 510, 91 thousand km<sup>2</sup> or 19.1% of the territory of the Republic. The zone of risk is critical of the degree of disturbance are considered as a zone of crisis. Among the regions in the square of the strong and critical degree of degradation of the largest area is marked in the region of the Central and Western Kazakhstan - 53, 9 and 19.9%, respectively.

Map of the zones of ecological risk of the Republic of Kazakhstan is demonstrating a complex and diverse situation of degradation of ecosystems on a degree of risk and indicators of the risk of loss of species, ecosystems, wood-and-shrubby thickets, the degree of internal danger of desertification ecosystems, their soil cover with intensive anthropogenic impact. As a whole for the Republic of Kazakhstan on the analysis developed by the maps of the ecological zoning allocated to five degrees of danger, in principle, the appropriate degree of desertification - the degradation of land, ecosystems and especially of soil-vegetation cover.

As a result of ecological zoning of Kazakhstan overall picture of the situation of desertification ecosystems and degree of danger of the further destabilization of the environment emphasizes the predominance of a moderate degree of hazard - 42.3 % of the area of the Republic. But this is already the ultimate boundary of anthropogenic impact and further extraction of resources (soil-plant in particular) should be in a number of ecosystems is limited. Lowering of

standards for the use to 10%-20% is the need for self-regulation of ecosystems and the preservation of the reproducibility of resources. Conditions of moderate degree of danger represent the ultimate sustainability of ecosystems to a number of anthropogenic impacts. For example, to removal of plant biomass. And due to additional factor of drought in dry years and seasons of rare species, the drying up of the soil, and reduction of species diversity of ecosystems, productivity and change of ecosystems.

**Results of ecological zoning** of Kazakhstan confirm the problems of the natural environment on a large territory of the regions (19, 05 %). The category of relatively disadvantaged attributed moderately desertified ecosystems - moderate risk (57.82%), because their operation is already requires strict regulation and seasonal monitoring of the environment, especially during droughts.

Prospects of improvement of the environment, combating desertification and improving the conditions of sustainable development are directly linked to ecosystems, their biodiversity; dynamics; use and resistant to external influences and time of self-regulation in some degree or other violations. Analysis of the environmental zoning of the territory of Kazakhstan and the degree of danger of their transformation (background, weak, moderate, high, and catastrophic), including a list of key ecosystems, their overall condition, the comparative evaluation of the characteristics and data on the use and confirms the necessity of improving the management of land use, which includes: creation of a system of unified environmental monitoring on specific ecosystems areas, with the expansion of the posts weather services; development of a series of environmental maps using space images in GIS format for the assessment of disturbance of ecosystems. Development of regional maps of land with view of zonal ecosystems; formation of base of data on changes in the biodiversity of specific ecosystems, their condition, and productivity; development of corrective annual and seasonal norms of use of specific, especially disturbed to varying degrees of ecosystems, pockets of rare ecosystems and species.

Restricting the use of rare, globally important and valuable resource of flora, fauna and ecosystems, ensuring the people and businesses that use natural resources at risk warning information on environmental degradation; the implementation of measures for land reclamation and sustainable balancing of the natural environment for sustainable development and respect for environmental safety regions. [8].

The real base of information to combat desertification for the conservation of biodiversity should be the establishment of restrictions and regulations of the use of specific natural ecosystems, and not their complexes. With a colorful landscape (areas, territorial partition, and integrated mezzoecosystem) restrictions must be different, in essence, a type of restrictions, and the rate of use, the seasonality of application and other indicators. For this it is necessary to make changes in the Ecological Code on the issues of specially protected natural territories, zones of ecological risk for the stop of recourse and measures on biodiversity conservation of existing ecosystems. [9].

Trend analysis should form part of the new National Strategy and Action Plan on conservation of biodiversity in the framework of the Partnership Programme “Green Bridge”, which will lead to:

- slow the process of degradation of the environment and the suspension of wasteful use of natural resources with the replacement of traditional unsustainable patterns of production and consumption on the model of a Green economy;
- radical change of the existing situation and status of activities on environmental protection and sustainable development, carried out at the national, regional and global levels;
- cooperation on a new level the efforts of states, international, public organizations and private sector for the achievement of common goals, important not only for the countries and the region, but also of the entire world community.

Such an approach will also apply mutually beneficial mechanisms for regional cooperation and trade to a more efficient use of water and energy, transfer of clean technologies and investments - with a minimum of corruption capacity [10].

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