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on threats to Lake Issyk-Kul according to the measure on the preparation of measures to mitigate negative anthropogenic impacts for the preservation of Ramsar and potential Ramsar sites

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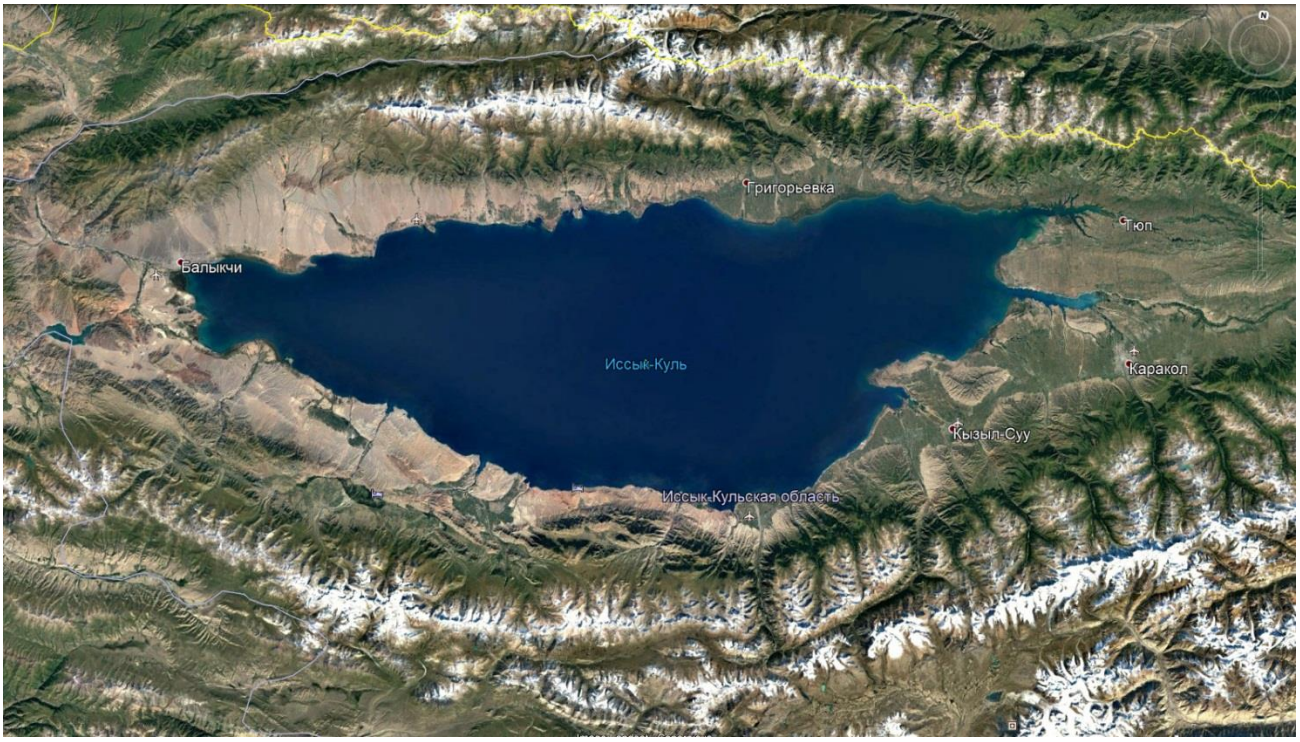
Geography and history of the lake, status, significance.

Issyk-Kul Oblast, located in the eastern part of Kyrgyzstan, was formed on November 21, 1939. After several subsequent reorganizations, it was approved in its present form on December 14, 1990.

The oblast borders on the Republic of Kazakhstan to the north and northeast, on the east and southeast with the People's Republic of China, on the west and southwest with the Naryn oblast, and on the northwest with the Chui oblast. The area of the region is 43,1 thousand square km (21,6 % of the total area of the republic).

The region has 5 districts (Ak-Suu, Zhety-Oguz, Ton, Tyup, Issyk-Kul), 3 cities (Balykchi, Karakol, Cholpon-Ata). The administrative center of the region is the city of Karakol. The population is 501.9 thousand people (according to the National Statistical Committee of the Kyrgyz Republic at the beginning of 2021).

The main area of the Issyk-Kul hollow is filled with the waters of the Issyk-Kul lake of the same name surrounded by the ridges of the Central Tien Shan.



Lake Issyk-Kul is located in the northeastern natural and climatic zone of Kyrgyzstan and occupies a large high-altitude deep tectonic basin. It is framed by the Kungei Alatau ridge in the north and the Terskei Alatau ridge in the south. Relief is very complex, there are three main complexes: plain, foothill-adir and mountain. The Basin is part of the geographical province of the Northern Tien Shan. It stretches 240 km from west to east and 75 km from north to south. The length of Lake Issyk-Kul is 182

km, its maximum width is 58 km, the average depth is 278 m and the maximum depth is 668 m.

The area of the water surface is 6,236 km2 . The volume of water is 1738 km3. Lake Issyk-Kul, located on the main migration routes of birds of the Asian continent, has always played an important role in the life of waterfowl. In 1976 it was included in the list of the Ramsar Convention on Wetlands of International Importance. In 2002, the Government of Kyrgyzstan ratified the Ramsar Convention treaty, which took into account the global importance of the natural complexes of the Issyk-Kul Basin and the international importance of Lake Issyk-Kul as a wintering site for waterfowl.

Lake Issyk-Kul is the unique largest lake of the Tien Shan and serves as a natural reservoir, where rain and snow waters flowing down from the slopes of the ridges surrounding the lake accumulate. Due to the large volume of water contained therein and the large surface area of the mirror, the lake regulates the diurnal and seasonal temperature variations in the Issyk-Kul basin. Water evaporating from the surface of the lake precipitates on the slopes of the framing ridges, contributing to the growth of tree and shrub vegetation in the mid-mountain zone.

Among the lakes of the world, lying at an altitude of more than 1,200 m. Issyk-Kul ranks second and is only slightly inferior to Lake Titicaca in terms of surface area.

The lake receives melted snow water and water from rainfall on the mountain slopes. In the summer, a large volume of water from the melting glaciers of the high mountain belt enters the lake. A large part of the water of the rivers flowing into the lake is disassembled for irrigation in the summer when they reach the foothill plain, and most of the rivers do not carry their water into the lake.

Average surface water temperatures in July - August +19.5 +20.2°C, in January - February +4.1 +4.8°C. In winter shallow bays are covered with ice in severe frosts.

Water is chloride-sulfate-sodium, in summer there is crystallization and precipitation of CaCO3. It is also brackish (water salinity is 5.8-5.9 %). Transparency up to 20 m in summer and 47 m in winter.

The lake has a chloride-sulphate-sodium-magnesium type of mineralization. The small value of the total salinity of the water indicates that the Issyk-Kul, as an endless water body, has a young age.

The lake is one of the intermediate points of rest and replenishment of energy resources for waterbirds making seasonal migrations between their nesting sites in Kazakhstan and Western Siberia (Russia) and wintering sites in India and Pakistan. Serves as a summer moulting site for many bird species nesting in Kyrgyzstan and adjacent regions of Kazakhstan. More than 30 species of wetland ducks nest on the islands and the coastal zone of the lake, and about 70 species of birds inhabit the coastal biotopes formed under the influence of the lake.

During the period of nesting and summer-autumn migrations, 131 species of birds were recorded on the territory.

The lake is inhabited by 26 species of fish that make up the ichthyofauna of Lake Issyk-Kul. Endemic fish species - 7 species, indigenous fish species - 5 species and introduced from outside, as well as imported - 14 species.

The uniqueness of the Issyk-Kul ecosystem as an object of world historical and cultural heritage made it possible to create the Issyk-Kul biosphere territory on September 25, 1998 (formed by the Resolution of the Government of the Kyrgyz Republic dated September 25, 1998 No. 623 "On the Issyk-Kul biosphere territory").

Since 2001, the Issyk-Kul biosphere territory has been included in the Planetary Network of Biosphere Reserves of the United Nations Educational, Scientific and Cultural Organization (UNESCO), created as territories for the preservation of objects of the world historical and cultural heritage and unique ecosystems. As one of the largest biosphere reserves in the world under the patronage of UNESCO, the Issyk-Kul biosphere territory has the status of a specially protected natural area of national importance.

The objectives of the formation of the biosphere territory are:

- preservation, restoration and use of natural areas with rich natural and cultural heritage;
- support for long-term, sustainable economic and social development of territories, including their recreational use, taking into account the preservation and restoration of natural resources;
- implementation of long-term environmental control, monitoring and environmental research, environmental education and training.

The lands of the biosphere territory are in state, municipal, private and other forms of ownership. Changes in the territorial structure of ownership, the procedure for exercising by land owners their rights and guarantees of their protection are determined by the legislation of the Kyrgyz Republic in the field of the use of natural resources and environmental protection, transfer (transformation) of land plots, regulation of land and water relations, as well as civil legislation.

In accordance with the Law of the Kyrgyz Republic "On Biosphere Areas" and in accordance with international standards, the Ysyk-Köl Biosphere Territory is divided into four zones with different regimes of protection and use:

- The core zone;
- The buffer zone;
- The transition zone;
- The sanitation zone.

1. The core zone contains strictly protected areas of the territory, providing preservation of all landscape and biological diversity. All economic activities are

prohibited in this zone. Only research, conservation and monitoring activities are allowed in the core zone with the least possible impact on the protected communities.

The total area of the core zone is 804,117.0 hectares.

№	Name	Total area, in hectares
1	Issyk Kul State Nature Reserve	2 320,3
2	Karakol State Nature Park	24 134,3
3	"Khan-Teniri" State Nature Park	214 473,4
4	Sarychat-Eertash State Nature Reserve	149 118,0
5	Glaciers	337 501,0
6	Mirror of the water of the lake “Issyk Kul”	76 570,0
	Total:	**804 117,0**

2. In the buffer zone, various forms of activity are carried out that prevent the negative impact on the state of the core ecosystems:

1) scientific research;

2) environmental monitoring and control of ecosystem changes;

3) forestry activities and protection of forest massifs;

4) traditional land use in the framework of long-term preservation and invulnerability of core biodiversity;

5) recreational use, outdoor recreation, use of resources of fauna and flora, tourism, carefully controlled and regulated in ecologically permissible norms;

6) creation of an open-air museum;

7) use of mineral waters and medicinal resources;

8) environmental education, organization of demonstration sites, new technology centers and conducting training programs and environmental management;

9) archaeological research.

The total area of the buffer zone is 2,278,567.8 ha.

№	Name	The total area, in ha
1	11 nature reserves	61 472,0
2	State land reserve lands	513 751,9
3	Lands of the state forest fund	308 456,5
4	Agricultural and other lands	772 187,8
5	The lake Issyk Kul	547 359,0
6	Khan-Teniri State Nature Park (buffer zone)	61 326,9
7	Karakol State Nature Park (buffer zone)	14 013,7
	TOTAL:	2 278 567,8

In the buffer zone the following activities are forbidden - the establishment of new settlements, location and operation of industrial facilities, construction and

operation of production facilities, geological exploration and development of minerals, main forest harvesting, except reforestation, thinning and sanitary cutting, introduction (acclimatization) of new species of plants and animals, actions which change the hydrological regime of the core, and other activities which may impact the ecosystem as a whole, as well as it can impact the conservation and use of objects of historical and cultural heritage.

3. A variety of productive activities are allowed in the transition zone. Economically interested groups and citizens living in the area jointly participate in the production and long-term use of natural resources in compliance with environmental requirements, ensuring the sustainability of the ecological and economic development of the area. In the transition zone there are arable lands, agricultural, industrial and health-improving complexes, mineral water sources, mineral deposits, museums, as well as experimental plots with production centers.

The total area of the transition zone is 1,231,506.8 ha.

№	Name	The total area, in ha
1	Lands of populated areas	20 248,0
2	Agricultural and other lands	501 532,9
3	Roads	329 900,0
4	License areas	369 674,0
5	Closed Joint Stock Company "Kumtor Gold Company"	10 070,0
6	Orto-Tokoy Reservoir	81,9
	Total:	**1 231 506,8**

4. Regeneration, recultivation, remediation, anti-erosion, pasture restoration and afforestation activities are carried out in the sanitation zone in order to restore disturbed landscapes.

The area of the sanitation zone was 208.4 hectares.

№	Name	The total area, in ha
1	Tailings dump "Kadzhi-Sai"	208,4
	Total:	208,4

In accordance with the laws of the Kyrgyz Republic "On Specially Protected Natural Areas" and "On Biosphere Territories", the Issyk-Kul Biosphere Territory has the status of a specially protected natural area (hereinafter - SPNA).

The basic principles of the laws of the Kyrgyz Republic "On Specially Protected Natural Areas" and "On Biosphere Territories" provide for the development of SPNA system as the main component of the ecological system, ensuring the conservation and restoration of biological diversity, unique and typical landscapes, and state regulation of SPNAs.

Who owns the property, who are the stakeholders, who manages and uses it, are there any management programs

1. Lake Issyk-Kul is managed by the Ministry of Agriculture, Water Resources and Regional Development of the Kyrgyz Republic and is a fishery body of national importance.

According to the Law of the Kyrgyz Republic "On Aquaculture, Fishery and Protection of Aquatic Biological Resources" of March 17, 2021 № 35, fishery reservoirs of state significance include natural and artificial water bodies (lakes, reservoirs, rivers and their sections), which:

1) are or may be used for fishery activities;

2) are important for the reproduction of fish stocks.

2. Fishery reservoirs of national importance include lakes Issyk-Kul and Son-Kul, Toktogul, Bazar-Korgon, Kirov, and Orto-Tokoi reservoirs.

3.Lake Issyk-Kul is a fishery water body of national importance with the zoning of the "Ysyk-Kol" biosphere area into separate zones (core zone, buffer zone, transition zone, sanitation zone) with a special regime of protection and use:

1) in the core zone is allowed:

a) research activities to study the ichthyofauna of Lake Issyk-Kul and the study of factors negatively affecting the condition of aquatic bioresources and their habitat;

b) ichthyologic monitoring for annual assessment and prognosis of changes in biological condition, number and habitats of endemic, rare and disappearing fish species and conditions of their habitat under the influence of natural and anthropogenic factors for restoration of populations of endemic and disappearing fish species;

c) work on protection of fish stocks;

2) activities not negatively affecting the condition of core ecosystems are allowed in the buffer zone, including:

a) scientific research on aquatic bioresources;

b) commercial fishing;

c) use of aquatic bioresources for recreational purposes;

d) recreational and sport fishing, development of fishing tourism;

3) fish farming (aquaculture), artificial reproduction of fish stocks is allowed in the transition and sanitation zone.

Issues of Issyk-Kul region development are reflected in a number of normative legal acts adopted in recent years:

- The concept of sustainable development of the ecological and economic system "Issyk-Kul" for the period up to 2020 (approved by the Decree of the President of the Kyrgyz Republic of February 10, 2009);

- The Program of the Government of the Kyrgyz Republic on the development of tourism for 2019-2023 (approved by Decree of the Government of the Kyrgyz Republic No. 36 of January 31, 2019);

- Law of the Kyrgyz Republic "On Aquaculture, Fishery and Protection of Aquatic Biological Resources" of March 17, 2021 No. 35.

What kind of environmental services provides.

Since August 2008 a ban (moratorium) was imposed on fishing, transportation, purchase, sale and export from the Kyrgyz Republic of especially valuable and endemic fish species inhabiting Issyk-Kul and Son-Kul lakes, for a period of 5 years, including fish products and caviar made from them, with the exception of cases of fish caught for scientific purposes, and reproduction of fish stocks and caged fish (Law of the Kyrgyz Republic "On prohibition of harvesting, transportation, purchase, sale and export of especially valuable and endemic fish species inhabiting Issyk-Kul and Son-Kul lakes" of August 4, 2008 No. 191, which became void only in 2017 under the Law of the Kyrgyz Republic of May 24, 2017 No. 88).

Before the ban, fisheries operated on the shores of the Issyk-Kul lakes, which made commitments to protect the water area, fish stocks, and monitor the condition of the water. When the moratorium was introduced, they were out of work and began to work illegally, and they were joined by other amateurs of illegal fishing. Therefore, the bans imposed from 2008 to 2017 did not yield the expected results.

Currently, only fishing in Lake Issyk-Kul for recreational purposes, i.e. by rod, in small quantities, is allowed. This requires only a fishing pass from the Issyk-Kul Regional Society of Hunters and Fishermen, which on average sells 300 to 500 passes each year for approximately 150,000 soms (172,500 rubles).

In addition, fishing for scientific and control purposes is conducted.

Fishing for scientific and control purposes is carried out in order to:

- scientific and ichthyological studies of ichthyofauna of water bodies;

- Assessment of the presence, distribution and condition of fish stocks and food in water bodies;

- determination of the total allowable catches of fish;

- regulation of the fishing regime.

Fishing for scientific and control purposes is coordinated with the main user of fishery reservoirs of state significance and is carried out on the basis of:

- annual resource research plan;

- programs of scientific and ichthyologic works;
- schedules of control fishing.

Fishing for scientific and control purposes is carried out by:

- scientific institutions specializing in fishery research of aquatic bioresources;
- by specialists-ichthyologists of the authorized body in the field of fisheries.

In the water area of Lake Issyk-Kul there are three cage and two pond fish farms where the family of carp and salmon fish is bred.

№ п/п	Location (district aimak, village)	Name Name of water body, type of water body (lake, pond, pool, reservoir, ten-day regulation pools, daily regulation pools, quarry) or fishery	Category of water body (fishery, irrigation, economic-drinking, cultural-domestic)	Type of fishery activities (lake/grazing, pond/basin/plant nursery, fishery: commercial/sports/amateur/recreational)	Type of fishery (full-system / half-system, fish nursery)	Actual area/depth o water body min./average. (ha/m)	Types of farmed fish	Note
1	2	3	4	5	6	7	8	9
Issyk Kul lake								
1	Иссык-Кульская обл Джергаланский залив	участок оз. Иссык-куль Липенка Ырдык	рыбохозяйственное	прудовое рыбное хозяйство	неполно-системное	100 га	семейство карповых	ОсОО М-Стайл Токтогулов Т.Х.
2	Тюпский район	залив «Кутургинский»	участок озера ИссыкКуль, рыбохозяйст	садковое рыбное хозяйство	неполно-системное	5 га	семейство карповых	ЧП Харлов С.Ю.

			венный					
3	село Курменты	затон «Широкий»	участок озера ИссыкКуль, рыбохозяйственный	садковое рыбное хозяйство	неполносистемное	4,6 га	семейство карповых	ЧП Жаманграев С.Ж.
4	Село Бокон-баево	Тонский рыбозаводный	рыбохозяйственное	прудовое рыбное хозяйство	полносистемное		семейство карповых и лососевых	«Тонский рыборазводный завод»
5	г Балыкчы	оз. Иссык-Куль Садок	участок озера ИссыкКуль, рыбохозяйственный	садковое рыбное хозяйство	неполносистемное	2 га	семейство карповых	ЧП Казакбаев А,С.

- **What are the anthropogenic impacts.**

There are 340 business entities in the Issyk-Kul region, of which: gas stations (gas stations) - 76; transport enterprises - 23; recreational enterprises - 194; industrial enterprises - 35.

There are 120 wastewater treatment plants (WWTPs), of which 25 are in bad condition, 35 are in poor condition, and 60 are in good condition; WWTPs of Kumtor Gold Company, Balykchy, Karakol, Cholpon-Ata cities.

Wastewater treatment facilities of large cities (Balykchy, Karakol and Cholpon-Ata) are located in close proximity to the shoreline of the lake, treated wastewater may well enter the lake and thus affect the quality of lake water.

There is practically no biological treatment at the facilities, the equipment for quality biological treatment (radial sedimentation tanks, anaerobic treatment units) is out of operation.

Biological treatment is carried out to some extent only in settling ponds (only by air aeration and solar radiation).

According to the results of the inventory of consumption waste disposal sites conducted by the State Agency of Environmental Protection and Forestry under the Government of the Kyrgyz Republic, as of 2019 there are 406 landfills on the territory of the country. The total area of land occupied by landfills is about 616.306 hectares.

Of the 406 dumpsites available, only 107 (26%) are sanctioned. Many landfill sites (almost 96%), even those that are sanctioned and have appropriate documents of title, are not transformed into the appropriate category of land necessary for the location of landfills, that is, into the category of land for industry, transport,

communications, energy, defense, and other purposes. Of these landfills in Issyk-Kul region there are 94 dumps, of which 4 are authorized.

Operational capacity of many landfills in large cities was designed for 15-20 years (1970s), but this period has extended for more than 30 years.

According to the latest inventory, many landfills have been formed and are operating without complying with technical, sanitary and environmental safety standards.

Landfills are becoming a dangerous source of pollution of the natural environment because:

- environmental requirements for waste disposal sites stipulated by legislation are not always observed, concerning environmental monitoring, keeping records of the quantity and characteristics of the disposed waste with an indication of its origin, date of delivery, identification of the producer or collector of the waste, and, if there is hazardous waste, the exact location of its disposal, dosimetric monitoring of each waste lot to prevent radioactive substances from getting into the landfill;

- some waste disposal sites perform partial sorting of plastic bottles, cardboard, and glass containers, but most landfills do not have sorting;

- consumption waste in most cases is a hazardous waste that contains toxic substances that pose an immediate or potential danger to human health or the environment;

- some hazardous types of consumption waste, such as: medical, construction, electronic and electrical waste, etc., generated by households and trade, due to the lack of a processing system, go directly to dumps and landfills for burial;

- the material and technical base of the existing system of waste management is insufficient and outdated to a large extent;

- insufficient financing of the waste management sphere, both on the state level and in the private sector.

In addition, there are 50 boiler houses, 2 tailing pits (Kadzhi-Sai - 150 thousand cubic meters; Kumtor - 40 million cubic meters).

Cleaning of the coastal forest belt of the lake for arrangement of beaches became more frequent.

On average during summer season 1.0 million tourists rest on the lake, more than 40% of them come from abroad, and this number increases every year. With this the number of watercrafts operating on gasoline and diesel fuel (water motorcycles - more than 60 units, motor ships, steamships - more than 20 units, etc.) is also increasing.

As a result, there is an increased anthropogenic load on the lake, the level of pollution is caused by household waste (plastic, food residues and other household garbage), water area and coastal zone. Pollution of lake water by oil products increases, practically because of the operation of water transport that is serving tourists. Because of the increase of the flow of tourists increases, the number of cars coming to the Issyk-Kul hollow also increases, as well as the degree of exploitation of local transport.

Uncontrolled fishing (poaching) causes great damage to population numbers and biodiversity. The lake is polluted with polyethylene Chinese fishing nets and plastic bottles.

In the period from 2016 to 2020, employees of the Directorate of the Issyk-Kul Biosphere Territory, the State Inspectorate for Environmental and Technical Safety, the Department of Fisheries, the Ministry of Emergency Situations of the Kyrgyz Republic and law enforcement agencies of Issyk-Kul region, during operational

activities (to combat poaching) and cleaning from solid waste and fishing nets in the coastal area of Lake Issyk-Kul were seized from poachers, and collected from the depth of Lake Issyk-Kul. Issyk-Kul 2,682 pieces of fishing nets with a total length of 223,640 meters.

Also, the use of insecticides and herbicides, and mineral fertilizers in agriculture carried out in the surrounding area leads to their washing into the lake and water pollution.

Proposal of measures to mitigate negative anthropogenic impacts.

Certain measures are proposed to mitigate negative anthropogenic impacts:

- introduction of economical mechanisms of nature management, stimulating the development of the economy and its transition to resource-saving and "clean" technologies;
- regulating permitted and prohibited activities associated with the use of natural resources for the purposes of environmentally-oriented natural resource management;
- introduction of promising and innovative technologies for the use of natural resources;
- introduction of a ban on the import and sale of Chinese and Korean fishing nets to minimize illegal fishing and pollution of the lake's water area;
- preventing the import of GMOs, conducting an analysis of their spread, and developing appropriate methods for controlling and reducing the negative consequences of these processes
- strict observance of water protection zones established for water bodies where certain activities are subject to limitation or prohibition, in order to prevent pollution, littering, silting up and depletion of water bodies, and also to preserve habitats of aquatic biological resources and other objects of fauna and flora; the types of activities subject to limitation or prohibition in water protection zones include:

1) location and operation of livestock farms;
2) application and use of pesticides, organic and chemical fertilizers;
3) operation of enterprises of industrial production;
4) storage, processing and disposal of wastes;
5) construction of buildings;

- expansion of specially protected natural areas;
- radical reconstruction and conversion to operating landfills, which have become a dangerous source of environmental pollution.
- reducing the area of unauthorized dumpsites;

- solving the issues of sorting, processing and recycling of waste as raw materials for the needs of the economy; organizing waste processing plants;
- developing and conducting training in pre-school and educational institutions on waste management;
- informing the population through animated videos in the media about waste management and biodiversity conservation;
- organization and implementation of separate waste collection;
- creation and development of a mechanism of economic incentives for waste processing enterprises;
- strengthening anti-poaching protection measures;
- raising public awareness on biodiversity conservation, wetlands;
- strengthening cooperation of stakeholders;
- strengthening the role of science and education in the conservation of biological diversity and wetlands;
- organization of advanced training courses in the field of biodiversity conservation, development of methods to improve the effectiveness of wetland management.